



# ATLEC

**Assistive Technology Learning  
Through a Unified Curriculum**

ICT based Assistive Technology increases opportunities  
*Learn it, use it, train others!*



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# ATLEC

## Assistive Technology Learning Through A Unified Curriculum

### “ATLEC Training course”

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For further information related to the ATLEC project please visit:

The project website ([atlec-project.eu](http://atlec-project.eu));  
Facebook page ([facebook.com/ATLECproject](https://facebook.com/ATLECproject));  
Twitter page ([twitter.com/ATLEC\\_project/](https://twitter.com/ATLEC_project/)).

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## Introduction

Studies throughout Europe under ACCESSIBLE and AEGIS (FP7 projects), and KA3 project IMPACT highlighted in their pan-European surveys with over 1000 end-users and Assistive Technology (AT) specialists that training is the core barrier towards using assistive technology (AT) by end-users. This lack of training is subsequently also recognised as the main barrier to acquiring gainful employment in a (regular) working environment.

A quick assessment of the ATLEC partner countries raised the following issues:

- Belgium: Although there is some ICT AT training available by suppliers, and special vocational training centres for adults, it is time limited and expensive. People with disabilities (PwDs) depend on the assistance available and often need more time to become familiar with their device and/or software. Hence there is a need for specific training in accordance with the individual needs and speed of learning as well as considering the level of knowledge of ICT.
- Greece: According to research by the National Observatory of Information Society (2007) only 4 in 10 disabled people appear to be aware of AT solutions that meet their accessibility needs in using ICT. 11% of non-users of ICT with a disability believe that this prohibits them from use and 9% that there is no suitable assistive technology for their needs. Non-use of ICT is further attributed to lack of digital skills for 23% of non-users with disability, while 45% of all participants with a disability believe that using ICT and AT requires a high level of digital skills. The benefits of investing in training on AT are clearly linked with bridging the digital gap for PwDs.
- UK: There is no national system for training. There is a lack of resources in terms of AT in the UK. Once students are using the devices (AT) it is then difficult to manage and maintain the resources as well as to train staff and the user to utilise the device to its best function.
- Italy: Official statistics here illustrate that the number of people with a registered disability assessing the labour market is decreasing year after year. AT skills are also essential. Although there are legal obligations for public and private organisations to employ a certain amount of people with disabilities, PwDs find face challenges when looking for employment due to a lack of specific training and matching of skills with job profiles.

This training course targets:

- **People with disabilities** (learners and potential trainers) that currently have a job, or are in the process of looking for one, or would like to be employed, but face a barrier due to the lack of basic ICT skills;
- **Trainers of ICT AT training centres, as well as VET centres and special education centres** that want to improve their knowledge on ICT AT training and incorporate it into their current training practices;
- **Human resource (HR) staff at companies** that want to improve their knowledge of ICT AT so that they may develop a better understanding of the needs of new or current employees that have one or multiple disabilities.

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## 1. ICT digital society

Information and Communication Technologies (ICT) play an essential role in supporting daily life in today's digital society. They are used at work, to stay in touch with family, to deal with public services as well as to take part in culture, entertainment, leisure, and political dialogues. They are also an important factor in improving the inclusion of people with disabilities in current society. And this can be at home, in the street, or at work. In this respect we talk about inclusive ICT, which means that computers should be usable by everyone; for example by utilising screen reader software to use software programmes.

The following terms come up when we talk about this inclusion:

- **Digital divide** is the term used to describe the growing gap, or social exclusion, between those who have access to and the skills to use ICT and those who, for socio-economic and/or geographical reasons, have limited or no access.
- **e-inclusion** aims to ensure that "no one is left behind" in enjoying the benefits of ICT. e-inclusion means both inclusive ICT and the use of ICT to achieve wider inclusion objectives. It focuses on the participation of all individuals and communities in all aspects of the information society. An e-inclusion policy, therefore, aims to reduce gaps in ICT usage and promote the use of ICT to overcome exclusion, and improve economic performance, employment opportunities, quality of life, social participation, and cohesion.<sup>1</sup>
- **e-accessibility** includes computer accessibility. Approaches are essentially based on inclusion and the social model of disability as it applies to information technology goods and services; the Design For All principle, also called universal design or inclusive development in other fora, means availability of adequate assistive technology.<sup>2</sup>

The following sections focus on the usage of ICT, the internet, what impact ICT has on daily life, and how accessibility has been embedded in many ICT applications.

### 1.1. ICT is everywhere

ICT is an acronym that stands for "Information Communications Technology". There is in fact not a universally accepted definition of ICT because the concepts, methods, and applications involved in ICT are constantly evolving on almost a daily basis. It is difficult to keep pace with the changes - they happen so quickly.

Let's focus on the three words behind ICT:

- Information
- Communications
- Technology

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<sup>1</sup> [http://ec.europa.eu/information\\_society/activities/einclusion/index\\_en.htm](http://ec.europa.eu/information_society/activities/einclusion/index_en.htm)

<sup>2</sup> [http://en.wikipedia.org/wiki/Digital\\_inclusion](http://en.wikipedia.org/wiki/Digital_inclusion)

A good way to think about ICT is to consider all the uses of digital technology that already exist to help individuals, businesses, and organisations use information.

ICT covers any product that will store, retrieve, manipulate, transmit or receive **information** electronically in a digital form. For example, personal computers, digital television, email, robots.

ICT is thus concerned with the storage, retrieval, manipulation, transmission, or receipt of digital data. Importantly, it is also concerned with the way these different uses can work with each other.

In business, ICT is often categorised into two broad types of product: -

- the traditional computer-based technologies (things you can typically do on a personal computer or using computers at home or at work); and
- the fast-growing range of digital communication technologies (which allow people and organisations to communicate and share information digitally)

**Table 1: Traditional computer based technologies**

Application	Use
<b>Standard Office Applications - Main Examples</b>	
<b>Word processing</b>	E.g. Microsoft Word: write letters, reports etc
<b>Spreadsheets</b>	E.g. Microsoft Excel: analyse financial information; calculations; create forecasting models etc
<b>Database software</b>	E.g. Oracle, Microsoft SQL Server, Access: managing data in many forms, from basic lists (e.g. customer contacts) to complex material (e.g. catalogue)
<b>Presentation software</b>	E.g. Microsoft PowerPoint: make presentations, either directly using a computer screen or data projector. Publish in digital format via email or over the internet
<b>Desktop publishing</b>	E.g. Adobe Indesign, Quark Express, Microsoft Publisher: produce newsletters, magazines and other complex documents
<b>Graphics software</b>	E.g. Adobe Photoshop and Illustrator: create and edit images such as logos, drawings, or pictures for use in DTP, web sites, or other publications

The C initial of ICT refers to the **communication of data by electronic means**, usually over some distance. For example, by using the internet via a laptop, PC, or smartphone.

The fast-growing range of digital communication technologies is embracing our lives in every aspect. The following provides an example of ICT usage and penetration:

- Home environment: you watch digital TV at home, which is brought into the house via a cable or ADSL line, using a modem and router. Without it, TV channels would appear black.
- Education: the internet is used to find information e.g. via Wikipedia, while online training courses are accessed using e-learning platforms, also accessible via the internet. When we visit a library, we use a computer to look up the book we want to read. In many cases, we can also download a book to a tablet PC and read it on the tablet PC itself.
- Banking: we use online banking via the internet, or interact with an ATM to withdraw or deposit money, or check the status of our bank accounts. If we want to buy online, we use a credit card (VISA, MASTERCARD, etc.) or make use of PayPal account or a similar online payment modality offered e.g. by our own bank.

- Buying goods online: whether we want to book a flight ticket or a seat for the cinema or the opera, it can be purchased online via the internet.
- Work: in the office or in factories, computers are omnipresent and are being used to operate machines and to handle data.

To learn more about these topics, there are the training courses on basic ICT skills training developed in the context of the ViPi project which are freely available via [www.vipi-project.eu](http://www.vipi-project.eu). The courses (available in Greek, English, Lithuanian and Dutch) contain 3 units, addressing the different levels of competences of the learners/trainees:

- Unit 1 Computer Basics for Beginners
- Unit 2 Basic ICT Skills
- Unit 3 Higher Basic ICT Skills

In addition, you can also download a whole range of free supportive games via this [link](#). They are available in Dutch, English, Greek, and Lithuanian. The topics addressed range from knowing the PC and its components and input and output devices, to the appropriate usage of the internet, and various software applications such as text editors and electronic calculation sheets etc.

Furthermore, an online version of the training material is available via <http://vipi-skills.eu/ATutor/> while <http://www.vipi-skills.eu/> includes a wide range of supporting learning materials (called “learning objects”).

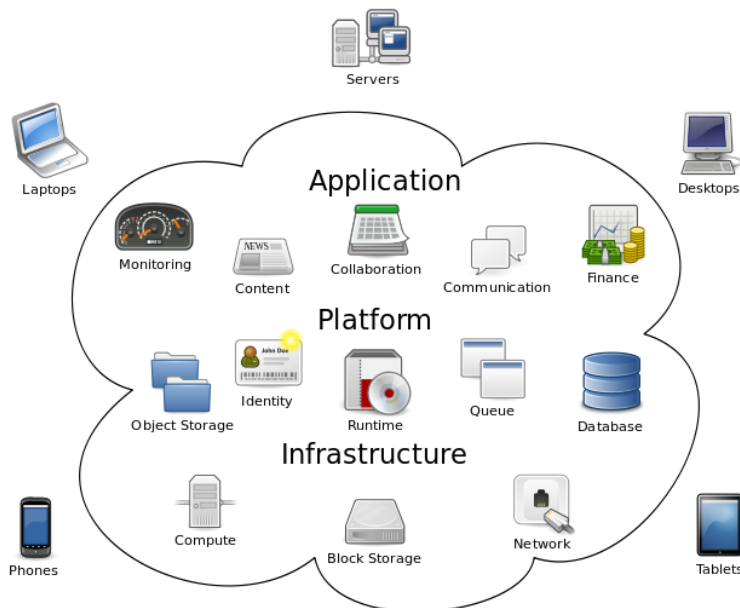
## **1.2. New technology trends**

In the following we have highlighted some new technology trends which are regularly used in the media and which are increasingly making inroads into daily life.

- Cloud computing: cloud computing is a synonym for distributed computing over a network and refers to the ability to run a program on many connected computers at the same time.

Some examples of cloud computing:

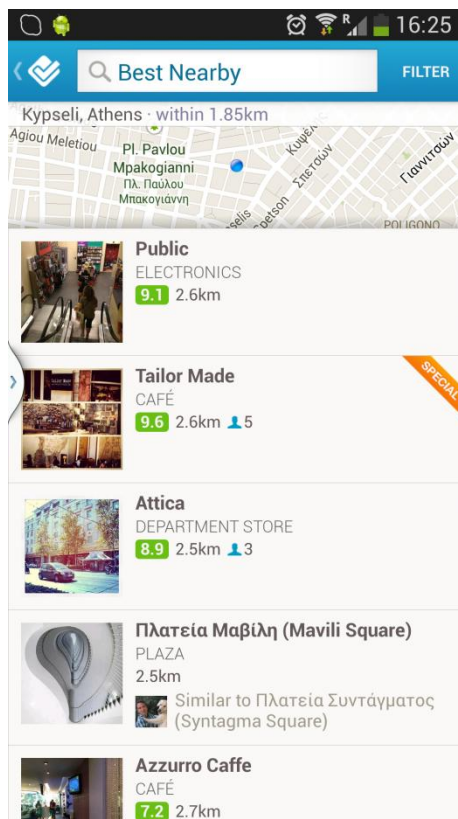
- Email on the go: Email communication now plays a central role in most of our busy lives. That's fine if you don't go out much but if you travel a lot, this may cause problems. Unless you carry a mobile WiFi-enabled laptop with you everywhere you go or use push email on your mobile phone, having an email client sitting on your computer at home means that whilst out and about you risk spending time outside of the communication loop. This is one area where the cloud finds its most frequent and expedient application. Online email has been offered by all the significant and sizeable companies such as Microsoft, Yahoo and Google for a number of years. One of the easiest, most convenient, and well known is Gmail.
- No need for local data storage: Data stored on your home or business computer has many of the same restrictions as email and, as with email, the cloud offers a solution. Storing your MP3s, videos, photos, and documents online instead of at home gives you the freedom to access them wherever you can find the means to get online. Examples include DropBox, Google's Drive, etc.



**Figure 1: Cloud Computing<sup>3</sup>**

- Personal mobile technology: iPhones, Android smartphones, iPads, tablets, etc., are all mobile devices that allow the owner/user to interact not only through voice via traditional calling, but also via a wide range of applications (apps) that allow communication via text and multimedia messages, video, etc. In addition, as user, s/he can also interact with a local environment. A good example is a user visiting a museum and scanning a QR code (Quick Response Code) under a painting to retrieve additional information from the internet (access is in many cases provided by museums). In short, the mobile technology that we use on a daily basis gives the owner/user the possibilities to directly interact with his/her environment and access and share information easily with others. Increasingly, mobile technology is also used to learn wherever and whenever, thus allowing the user to e.g. access additional training when being in a specific place where certain knowledge is required. A good example is the mobile device by ATLEC which offers the user the possibility to learn about assistive technologies wherever s/he is.
- Location based social media: Going somewhere is now also becoming an interactive event which users want to share with their peers. Applications like Foursquare allow users to indicate where they are, what they are doing, and provide ratings for local restaurants, for example.

<sup>3</sup> [http://en.wikipedia.org/wiki/File:Cloud\\_computing.svg](http://en.wikipedia.org/wiki/File:Cloud_computing.svg)



**Figure 2: Foursquare application shows POIs in area where user is (in this case downtown Athens, Greece) and where he can interact with other users**

- Near Field Communications: Near field communication (NFC) is a set of standards for smartphones and similar devices to establish radio communication with each other by touching them together or bringing them into close proximity, usually no more than a few inches. Present and anticipated applications include contactless transactions, data exchange, and simplified setup of more complex communications such as Wi-Fi.<sup>4</sup>

<sup>4</sup> [http://en.wikipedia.org/wiki/Near\\_field\\_communication](http://en.wikipedia.org/wiki/Near_field_communication)



**Figure 3: Example of how a mobile device can interact with various other environments and/or devices via NFC.<sup>5</sup>**

- Augmented Reality: Augmented reality (AR) is a live, direct or indirect, view of a physical, real-world environment whose elements are augmented (or supplemented) by computer-generated sensory input such as sound, video, graphics, or GPS data.<sup>6</sup>



**Figure 4: Viewing a scene through the smartphone brings up additional information about what you see.<sup>7</sup>**

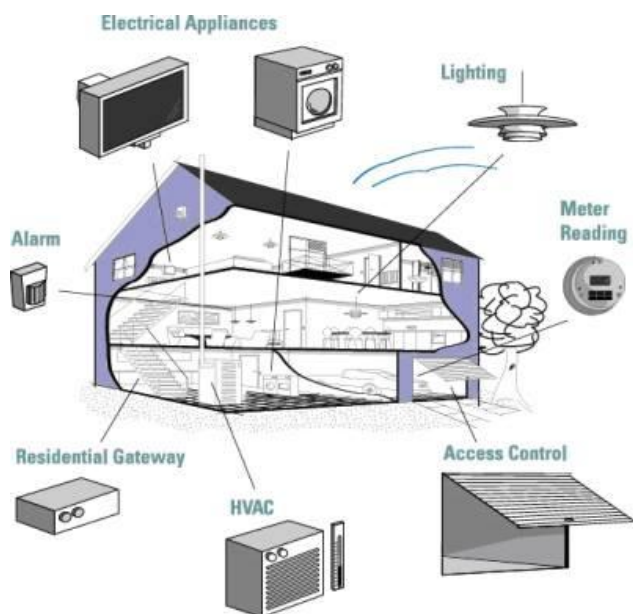
<sup>5</sup> <http://www.zoekmachine-marketing-blog.com/wp-content/uploads/2012/11/what-is-nfc.jpg>

<sup>6</sup> [https://en.wikipedia.org/wiki/Augmented\\_reality](https://en.wikipedia.org/wiki/Augmented_reality)

<sup>7</sup> <http://new.doit-mobile.com/wp-content/uploads/2013/07/tourism-historic-picture.png>



- Ambient intelligence: In computing, ambient intelligence (AmI) refers to electronic environments that are sensitive and responsive to the presence of people. Ambient intelligence is a vision for the future of consumer electronics, telecommunications, and computing that was originally developed in the late 1990s for the time frame 2010–2020. In an ambient intelligent world, devices work collectively in order to support people in carrying out their everyday life activities, tasks, and routines in an easy, natural way using information and intelligence that is hidden in the network connecting these devices. As these devices grow smaller, more connected and more integrated into our environment, the technology disappears into our surroundings until only the user interface remains perceivable by users.<sup>8</sup>



**Figure 5: House equipped with ambient intelligence so that different devices communicate with each other. E.g. when a window is open and the heating is on, then the window is closed to limit the loss of energy.<sup>9</sup>**

- Radio frequency identification: Radio-frequency identification (RFID) is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects.<sup>10</sup> Think for example of the chip that is implanted in house pets to identify them in case they run away.
- Natural user interfaces (language, touch, gesture): In computing, a natural user interface, or NUI, or Natural Interface is the common parlance used by designers and developers of human-machine interfaces to refer to a user interface that is (1) effectively invisible, or becomes invisible to its users with successive learned interactions and (2) is based on nature or natural elements. The word natural is used because most computer interfaces use artificial control

<sup>8</sup> [http://en.wikipedia.org/wiki/Ambient\\_intelligence](http://en.wikipedia.org/wiki/Ambient_intelligence)

<sup>9</sup> [http://m.eet.com/media/1167520/living\\_in\\_an\\_intelligent\\_home\\_fig1.jpg](http://m.eet.com/media/1167520/living_in_an_intelligent_home_fig1.jpg)

<sup>10</sup> [http://en.wikipedia.org/wiki/Radio-frequency\\_identification](http://en.wikipedia.org/wiki/Radio-frequency_identification)



devices whose operation has to be learned.<sup>11</sup> A good example is how smartphones can now be interacted with, using spoken text, gestures of hands, eyes, etc., but also how games can be played using the Kinect from Microsoft's Xbox.



**Figure 6: Using a Kinect and Xbox to play a rally game<sup>12</sup>**

### 1.3. Short history of the internet

The internet is a means of connecting a computer to any other computer anywhere in the world via dedicated routers and servers. When two computers are connected over the internet, they can send and receive all types of information such as text, graphics, voice, video, and computer programs.

No one owns the internet, although several organisations the world over collaborate in its functioning and development. The development of hypertext based technology (called the World Wide Web, WWW, or just the Web) provided means of displaying text, graphics, and animations, and easy search and navigation tools that triggered the internet's explosive worldwide growth.

As many of the ICT we use on a daily basis can or is connected to the internet (think about TV, smartphones, PCs, laptops, and even domotic systems), it will be beneficial to have a short summary on how the internet became the vast network it is today.

The origins of the internet reach back to research commissioned by the United States government in the 1960s to build robust, fault-tolerant communication via computer networks. This so-called Advanced Research Projects Agency's Wide Area Network (then called ARPANET) was established by the US Department of Defence in the 1960s to enable the collaboration in military research amongst business and government laboratories. Soon after, Universities and other US institutions connected to

<sup>11</sup> [http://en.wikipedia.org/wiki/Natural\\_user\\_interface](http://en.wikipedia.org/wiki/Natural_user_interface)

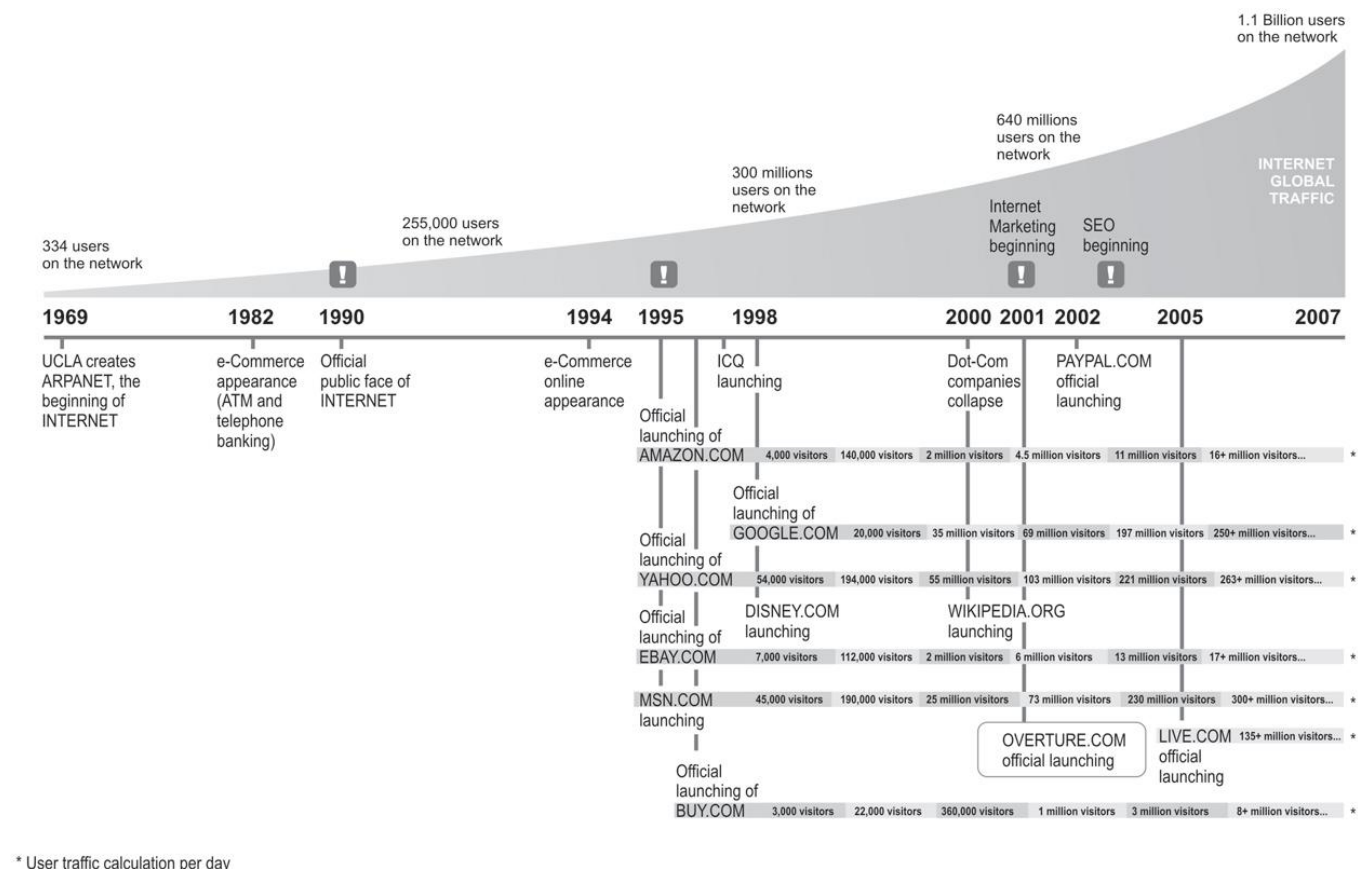
<sup>12</sup> <http://www.geek.com/wp-content/uploads/2010/10/kinect.jpg>

it. This resulted in ARPANET growing beyond everyone's expectations and acquiring the name "Internet".

The funding of a new U.S. backbone by the National Science Foundation in the 1980s, as well as private funding for other commercial backbones, led to worldwide participation in the development of new networking technologies and the merger of many networks.

Though the internet has been widely used by academia since the 1980s, the commercialisation of what was by the 1990s an international network resulted in its popularisation and incorporation into virtually every aspect of modern human life.

As of June 2012, more than 2.4 billion people—over a third of the world's human population—have used the services of the internet; approximately 100 times more people than were using it in 1995.



**Figure 7: 1969 to 2007 timeline displaying the growth in internet usage<sup>13</sup>**

Many people use the terms internet and World Wide Web, or just the Web, interchangeably, but the two terms are not synonymous. The World Wide Web is a global set of documents, images and other resources, logically interrelated by hyperlinks and referenced with Uniform Resource Identifiers (URIs).

<sup>13</sup> [http://www.whatgoddoes.com/wp-content/uploads/2012/09/internet\\_timeline.jpg](http://www.whatgoddoes.com/wp-content/uploads/2012/09/internet_timeline.jpg)

URIs symbolically identify services, servers, and other databases, and the documents and resources that they can provide. Hypertext Transfer Protocol (HTTP) is the main access protocol of the World Wide Web, but it is only one of the hundreds of communication protocols used on the internet. Web services also use HTTP to allow software systems to communicate in order to share and exchange business logic and data.

Freely available World Wide Web browser software, such as Microsoft's Internet Explorer, Mozilla Firefox, Opera, Apple's Safari, and Google Chrome, lets users navigate from one web page to another via hyperlinks embedded in the documents. These documents may also contain any combination of computer data, including graphics, sounds, text, video, multimedia, and interactive content that runs while the user is interacting with the page. Client-side software can include animations, games, office applications, and scientific demonstrations. Through keyword-driven internet research using search engines like Yahoo! and Google, users worldwide have easy, instant access to a vast and diverse amount of information online. Compared to printed media, books, encyclopaedias and traditional libraries, the World Wide Web has enabled the decentralisation of information on a large scale.

As of July 2013, the following browsers' popularity<sup>14</sup> was measured:

**Table 2: Global desktop and mobile stats combined from StatCounter<sup>15</sup> (Top 5 browsers)**

Date	Internet Explorer	Chrome	Firefox	Safari			Opera			Android	Mobile Total
				Desktop + Laptop	Mobile	Total	Desktop + Laptop	Mobile	Total		
July 2013	20.27% (25.55%)*	36.29% (42.78%)*	16.60% (19.25%)*	7.10% (8.57%)*	4.27%	11.37%	1.01% (1.16%)*	2.73%	3.74%	4.97%	17.35%

\* Desktop percentages only

The above figures illustrate that Chrome has now become the most popular browser worldwide.

The Web has also enabled individuals and organisations to publish ideas and information to a potentially large audience online at greatly reduced expense and time delay. Publishing a web page, a blog, or building a website involves little initial cost and many cost-free services are available.

Many people use the World Wide Web to access news, weather and sports reports, to plan and book vacations, and to find out more about their interests. People use chat, messaging, and email to stay in

<sup>14</sup> [http://en.wikipedia.org/wiki/Usage\\_share\\_of\\_web\\_browsers](http://en.wikipedia.org/wiki/Usage_share_of_web_browsers)

<sup>15</sup> <http://gs.statcounter.com/#browser-ww-monthly-200807-201308>

touch with friends worldwide, in much the same way as people used to write to a 'pen pal'. The internet has seen a growing number of Web desktops, where users can access their files and settings.

Social networking websites such as Facebook, Twitter, and MySpace have created new ways to socialise and interact. Users of these sites are able to add a wide variety of information to pages, to pursue common interests, and to connect with others. It is also possible to find existing acquaintances which allows communication among existing groups of people. Sites such as LinkedIn foster commercial and business connections. YouTube and Flickr specialise in users' videos and photographs.

## **1.4. Activities**

The learner, the tutor/trainer and, if appropriate, a carer:

- Specific exercises are done, based on instructions in ViPi training material.
- Discuss how each of the new technology trends has already penetrated your daily life and how you make use of it. What potential barriers are there?

## **1.5. ICT makes life easier**

### **1.5.1. ICT also usable by me and by others**

Using ICT equipped devices is not always easy, and they are more challenging for those with a disability. However, current ICT often has features that are embedded into devices to accommodate the needs of the users.

This section will not focus on assistive technology, but will pay attention to how ICT provides embedded basic support. We are going to explore this via a range of devices, indicating what options/settings are made available that can help people with disabilities to use regular consumer devices, without having to invest in (expensive) assistive technologies.

Use ICT at home

- TV:
  - Subtitling: TV channels are increasingly obliged to deliver subtitles alongside their programming. The remote control often has a "subtitles" button so that this function may be activated on the programme you are watching.




**Figure 8: Subtitles in 2 different colours to indicate 2 different people are speaking<sup>16</sup>**

- Audio Description: Movies are increasingly also accompanied by an audio description audio channel (free of charge, although digital TV is required). Audio description describes what is happening on screen using the gaps between dialogue. This helps viewers with visual impairments to follow what is happening. Audio descriptions of changes of location, actions, facial expressions, gestures and so on contextualise the dialogue and set the scene. They are incorporated at certain points between dialogue or commentary to avoid interrupting the flow of the programme. This feature is increasingly available on DVDs and Blu-rays as well.  
Example: <http://www.youtube.com/watch?v=V15Cleszgqk> (Making Your Community's Vision a Reality (Audio Described)).
- Talking features: no matter what your level of sight is, you can independently find your favourite programmes from the on-screen TV guide, discover something new from an interesting programme description, skip up and down channels without feeling lost, turn audio description on and off, and set scheduling reminders so that you do not miss a moment. The built-in voice guidance works by announcing on-screen information and the most important menus. As you become more familiar with your TV you can change the level from beginner to expert if you want fewer instructions. All this is standard within the TV at no extra cost and without the need for any extra equipment. A good example is the Voice Guidance feature in the majority of Panasonic's Viera 2012 televisions.  
Example: <http://www.youtube.com/watch?v=qMuEHwcoR40> (Panasonic TV voice guidance demo)

<sup>16</sup> ITV broadcast



- HD Digital TV recorder that talks; this helps people with sight loss as they can listen to operating instructions.  
Example: <http://www.youtube.com/watch?v=8ssIAVa9hyo> (demo of TVonics DTR-HD500 talking freeview recorder)
- Screen reader: screen reading technology that helps people with sight loss to ascertain what's happening on the screen without having to ask a sighted friend for assistance (e.g. Apple's VoiceOver).  
Example: <http://www.youtube.com/watch?v=cQqY1325BQY> (Apple TV Accessibility)
- DVD players:
  - DVDs with audio description: Many new films are now being released on DVD and Blu-ray with an audio description track included on the disc. To identify whether a film has audio description you will need to check the information box on the back of the disc's packaging. It will be listed as an optional audio or language track. DVD players may have a button on the remote control that will allow you to cycle through the different sound tracks available on the DVD, until you reach the audio description sound track. This button may be labelled as "audio", "language" or as a row of three circles intersecting one another. Some DVDs now also have talking menus and details of the titles available.  
Example: <http://www.youtube.com/watch?v=B8BD9txkGL4> (This is a sample of a video with audio description from "The Hunger Games".)
  - The majority of interaction with the DVD player is through the remote control, so ensure you choose one that is well designed. Depending on the level of sight you have, issues you could consider are:
    - Are the buttons fairly large and well-spaced?
    - Can the buttons easily be located by touch?
    - Is the number 5 distinguished with a bump?
    - Are the buttons different shapes to aid location?
    - Are the buttons grouped sensibly by function?
    - Can the batteries be changed fairly easily?
    - Is there good contrast between the buttons and the background?
    - Is any writing on the remote control in clear print, with good contrast between the print and background?
- PC:
  - Windows 7<sup>17</sup>: Windows 7 offers novel techniques in speech recognition and touch technology. This can be activated by clicking the Start button , clicking Control Panel, clicking Ease of Access, and then clicking Ease of Access Center. The Ease of Access Center provides a convenient, centralised place to locate accessibility settings and programs. The Ease of Access Center can also be found in the Control Panel by selecting Windows logo key+U and also when logging into Windows. The following accessibility settings and programs can be activated.
    - **Windows Speech Recognition** now works better — and with more programs. Instead of using the keyboard, you can just tell your computer what to do. Start

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<sup>17</sup> <http://www.microsoft.com/enable/products/windows7/>

an e-mail by speaking the recipient's name, surf the web without a keyboard, or dictate your documents.

- **Magnifier** can help people with low vision, but everyone will appreciate its ability to enlarge hard-to-see text and pictures. Full-screen mode magnifies the entire desktop and lens mode zooms in on particular areas. Inside the Magnifier window, you can click buttons and input text as you normally would.
- **On-Screen Keyboard** lets you "keyboard without a keyboard," with a choice of several different input methods: clicking mode, hovering mode, and scanning mode. With Windows Touch and a touch-screen monitor, you can also input text by tapping directly on the screen. Word prediction also speeds things up: type the first few letters of a word and Windows will finish it for you.
- **Narrator and visual notifications:** Windows 7 can read on-screen text aloud and describe some events (like error messages), helping you use your computer without the display. With Audio Description, you can hear a narration of what's happening in a video. Windows can also replace sound alerts with visual cues like a screen flash, so system alerts are noticeable even when they're not heard.
- **Make text on your screen larger or smaller:** You can make the text and other items on your screen, such as icons, easier to see by making them larger. You can do this without changing the screen resolution of your monitor or laptop screen. This allows you to increase or decrease the size of text and other items on your screen whilst keeping your monitor or laptop set to its optimal resolution.

Supporting video: [http://www.youtube.com/watch?v=zde\\_h67XEck](http://www.youtube.com/watch?v=zde_h67XEck).

Below is an overview table of the accessibility features embedded in Windows 7:

**Table 3: Overview of accessibility features in Windows 7**

Feature	Description
<b>Ease of Access Center</b>	Provides a centralised location in the Control Panel where you can adjust accessibility settings and programs. You can also look at recommendations for settings to make your PC easier to see, hear, and use.
<b>Magnifier</b>	Magnifies the screen or a portion of the screen to make text, images, and objects easier to see.
<b>On-Screen Keyboard</b>	A visual, on-screen keyboard with all the standard keys that you can use instead of a physical keyboard. On-Screen Keyboard also lets you type and enter data with a mouse or other pointing device.
<b>Narrator</b>	Reads aloud on-screen text and describes some events (such as the appearance of an error



Feature	Description
	message) that happen while you're using the computer.
<b>Speech Recognition</b>	Enables you to interact with your computer using only your voice while maintaining, or even increasing, your productivity.
<b>Change text size</b>	Allows you to enlarge text and objects making them easier to see, all without compromising graphics quality.
<b>Personalisation</b>	You can add a personal touch to your computer by changing the computer's theme, colour, sounds, desktop background, screen saver, font size, and user account picture. You can also select specific gadgets for your desktop.
<b>Touch</b>	If you've got a touch-screen monitor, you can just touch your computer screen for a more direct and natural way to work. Use your fingers to scroll, resize windows, play media, and to pan and zoom.
<b>Keyboard shortcuts</b>	Keyboard combinations of two or more keys that, when pressed, can be used to perform a task that would typically require a mouse or other pointing device. Keyboard shortcuts can make it easier to interact with your computer, saving you time and effort.
<b>Sticky Keys</b>	Instead of having to press three keys simultaneously (such as CTRL, ALT, and DELETE), you can press one key at a time when Sticky Keys is activated.
<b>Mouse Keys</b>	Instead of using the mouse, you can use the arrow keys on the numeric keypad to move the pointer.
<b>Filter Keys</b>	Ignore keystrokes that occur in rapid succession and keystrokes that are held down for several seconds unintentionally.
<b>Visual Notifications</b>	Replace system sounds with visual cues, such as a flash on the screen, so system alerts are announced with visual notifications instead of sounds.
<b>Captions</b>	Get information via animations and video that some programs use to indicate that activity is happening on your computer.

- Windows 8<sup>18</sup>: Just like Windows 7, Windows 8 offers support for accessibility, but the way it is presented and accessible is quite different. Windows 8 introduces touch-only devices, allowing the user to directly interact with everything on the screen by touch, without using a keyboard or mouse, including managing accessibility options in the Ease of Access Center. In Windows 8, the most commonly used accessibility options are accessed right from the sign-in screen. Select the Ease of Access button in the lower-left corner of your screen, or press the Windows logo key+U, to choose the settings for your PC that you would like available on start up.
  - **Magnifier:** This enlarges part—or all—of the screen, so it's easier to read. For more information, see Use Magnifier to see items on screen.
  - **Narrator:** This is a screen reader that reads the text on your screen aloud. For more info, see Hear text read aloud with Narrator.
  - **On-Screen Keyboard:** This lets you use your mouse or other pointing device to interact with a keyboard on the screen.
  - **High Contrast:** This heightens the colour contrast of some text and images on your screen, which helps make those items easier to identify.
  - **Use the computer without a display:** Here, you can turn on Narrator, turn on audio descriptions for videos, set up Text to Speech, and change how long dialog boxes stay open.
  - **Make the computer easier to see:** If you occasionally have trouble seeing items on your screen, adjust these settings to make the screen easier to see. You can change to a high contrast theme, turn on Magnifier, adjust colours, and remove unnecessary animations and background images.
  - **Use the computer without a mouse or keyboard:** Windows includes an on-screen keyboard that lets you enter text by selecting characters on the screen. You can also use Speech Recognition to control your PC with voice commands, and dictate text into programs. For more info, see How to use Speech Recognition.
  - **Make the mouse easier to use:** This setting lets you change the size and colour of the mouse pointer, and use the numeric keypad to control the mouse.
  - **Make the keyboard easier to use:** You can adjust the way Windows responds to mouse or keyboard input so that key combinations are easier to press, typing is easier, and accidental keystrokes are ignored.
  - **Use text or visual alternatives for sounds:** Windows can replace system sounds with visual cues and display text captions for spoken dialogue in multimedia programs.
  - **Make it easier to focus on tasks:** These settings include a number of ways to help you focus on reading and typing. Use them to turn on Narrator, adjust how the keyboard responds to certain keystrokes, and change the way certain visual elements are displayed.
  - **Make touch and tablets easier to use:** When you choose this option, Narrator starts automatically when you press the Windows logo button and Volume Up

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<sup>18</sup> <http://www.microsoft.com/enable/products/windows8/>

button simultaneously. You can change this so Magnifier or On-Screen Keyboard starts instead.

Supporting video: <http://www.youtube.com/watch?v=bPAqk-C71yg>

Below is an overview table of the accessibility features embedded in Windows 8:

**Table 4: Overview of accessibility features in Windows 8 (Professional)**

Feature	Description
<b>Ease of Access Center</b>	Provides a centralised location where you can adjust accessibility settings and programs. It also provides recommendations for settings to make your PC easier to see, hear, and use.
<b>Magnifier</b>	Magnifies the screen or a portion of the screen to make text, images, and objects easier to see.
<b>On-Screen Keyboard</b>	A visual, on-screen keyboard with all the standard keys that you can use instead of a physical keyboard. On-Screen Keyboard also lets you type and enter data with a mouse or other pointing device.
<b>Narrator</b>	Reads aloud on-screen text and describes some events that occur, or error messages that appear, while you're using the computer.
<b>Speech Recognition</b>	Enables you to interact with your computer using only your voice while maintaining, or even increasing, your productivity.
<b>Change text size</b>	Lets you make text and objects larger and easier to see without compromising the graphics quality.
<b>Personalisation</b>	You can add a personal touch to your computer by changing the computer's theme, colour, sounds, desktop background, screen saver, font size and more.
<b>Touch</b>	If you've got a touch-screen monitor, you can just touch your computer screen for a more direct and natural way to work. Use your fingers to scroll, re-size windows, play media, and to pan and zoom.
<b>Keyboard shortcuts</b>	Keyboard combinations of two or more keys that, when pressed, can be used to perform a task that would typically require a mouse or other pointing device. Keyboard shortcuts can make it easier to interact with your computer, saving you time and effort.
<b>Sticky Keys</b>	Instead of having to press three keys simultaneously (such as CTRL, ALT, and DELETE) you can press one key at a time when Sticky Keys is activated.
<b>Mouse Keys</b>	Instead of using the mouse, you can use the arrow keys on the numeric keypad to move the pointer.
<b>Filter Keys</b>	Ignore keystrokes that occur in rapid succession and keystrokes that are held down for several seconds unintentionally.
<b>Visual</b>	Replace system sounds with visual cues, such as a flash on the

Feature	Description
<b>Notifications</b>	screen, so system alerts are announced with visual notifications instead of sounds.

- Mac OS X<sup>19</sup>: Every Mac comes standard with assistive technologies that help people with disabilities enjoy the power and simplicity of OS X. It includes features such as an advanced screen reader, FaceTime, and literacy tools that help those with a wide range of abilities get more from their Mac.
  - **VoiceOver** is the screen reader that comes standard with every Mac. It tells you exactly what's happening on your Mac, and lets you fully interact with it using gestures, a keyboard, or a Braille display. It also uses Alex, the voice of Mac, who speaks to you in a natural tone.
  - **Zoom** is a powerful built-in magnifier that lets you enlarge your screen up to 20 times, so you are able to see the display more clearly. You can use it full screen or picture-in-picture, allowing you to see the zoomed area in a separate window while keeping the rest of the screen at its native size. The hardware acceleration engine lets you boost the size of everything on your screen — text on a web page, family photos, a place on a map.
  - **Dictation** lets you talk where you would type. So you can reply to an email, search the web, or write a report using just your voice. Navigate to any text field, activate Dictation, and then say what you want to write. Dictation converts your words into text.
  - If a higher contrast helps you better see what's on your display, OS X lets you **invert colours onscreen**. You can also increase and decrease contrast or switch to grayscale. Once you set your colours, the settings apply system wide, so you get the same view in every app.
  - OS X lets you **magnify your cursor** so it's easier to see where you are and follow along as you move around your Mac. Set the cursor size once and it stays magnified even when its shape changes. Your Mac also remembers your cursor size settings even after you log out, shut down, or restart.
  - **Slow Keys** adjusts the sensitivity of the keyboard to process only the keystrokes you mean to make. It builds in a delay between when a key is pressed and when it's entered. You can adjust the delay and choose to have a sound play when a key is entered.
  - **Sticky Keys** combines your keystrokes for you by letting you press keys one at a time, instead of simultaneously, to enter commands. Enter a key combination — such as Command-S (for Save) — and OS X displays each pressed key, accompanied by a sound effect, so you can make sure that the right keys are entered.
  - With **Speakable Items**, you can control the computer using your voice instead of the keyboard and you don't have to train your Mac to use it. Use Speakable Items

<sup>19</sup> <http://www.apple.com/accessibility/osx/>

to do things like close or minimise windows, navigate menus, open and switch between apps, turn text into sticky notes, or start a screen saver. You can even have your Mac acknowledge when it's heard you.

- If you have difficulty using a mouse or trackpad, use **Mouse Keys** to control the cursor with the numeric keypad. Press a number key as the mouse button, and use other number keys to move around the screen or to drag and drop items. Easily navigate menus, the Dock, and all your windows.
- Sometimes it's easier to use a pointing device than a keyboard. The **Keyboard Viewer** in OS X lets you do exactly that. It's an image of a keyboard that floats above other applications (so it's always handy) and you can customise it to fit your screen. Then "type" using a mouse or other pointing device. Turn on Sticky Keys and you can also enter keyboard shortcuts.
- With **Text to Speech**, you can highlight any text and Alex will read it aloud. Other male or female voices can be selected to do the reading. You can even adjust the speaking rate and choose from over 20 built-in languages.
- To help with vocabulary and word-building skills, OS X provides **word completion**. After typing just a few letters, hit the escape key and OS X suggests words. Select the word you want, and OS X automatically completes it for you.
- Ubuntu<sup>20</sup>: Ubuntu aims at making the operating system, and its derivatives, usable by as many people as possible across ages, languages, and physical abilities. This includes providing an accessible platform with high quality assistive tools and ensuring that other applications work well with these. The assistive tools on Ubuntu, along with the entire operating system, are provided free of charge but are not always that straightforward and user-friendly.
  - **Screen Reader**: Orca is a free, open source screen reading software suitable for visually impaired and blind users. Using various combinations of speech synthesis and Braille, Orca helps to provide access to applications and toolkits that support the AT-SPI (e.g. the GNOME desktop and Unity).
  - Ubuntu ships with a selection of **high contrast themes** complete with custom icons and mouse cursors. To activate a new theme, press the super key on your keyboard and type "gnome-control-centre" without the quotes. Press enter to activate the Gnome control centre and then click appearance.
  - **Keyboard modifiers**: The GNOME desktop environment supports several options for modifying the behaviour of the mouse and keyboard. The modifier keys (Shift, Ctrl and Alt) can be made Sticky so that when they are pressed once they remain active until the next key is pressed, making it possible to write upper case characters or use keyboard shortcuts while only pressing one key at a time. Other features include Slow Keys and Bounce Keys, which control the reaction rate and repeat rate of keys, and Mouse Keys, which allow the numeric keypad to be used to control the mouse cursor. In GNOME, these features can be activated on the Keyboard Accessibility panel (from the gnome control centre, which can be accessed by pressing the super key on your keyboard, typing "gnome-control-

<sup>20</sup> <https://help.ubuntu.com/community/Accessibility>

center" without the quotes and then pressing enter. In Xubuntu: Applications Menu -> Settings -> Settings Manager -> Accessibility -> Mouse tab -> check Use mouse emulation checkbox.

- Ubuntu includes the **onBoard on-screen keyboard**, a lightweight text-entry application, extensible through macros, scripts, and custom layouts. Also available is the Gnome On-screen Keyboard (GOK) which, in addition to basic text entry, also provides facilities for controlling the entire desktop behaviour through the on-screen keyboard by gathering information about other applications and sending them control signals through the GNOME assistive technology framework AT-SPI.
- **Mousetrap** is a standalone GNOME application that allows users with physical impairments to move a mouse cursor. It uses a webcam to track the motion of any object visible by the camera and moves the mouse cursor according to the path of the tracked object (a user's head, for example). Distributed with software that allows accessible mouse clicking, MouseTrap will give most physically impaired users access to the full functionality of a mouse. The ultimate goal is to have a usable, stable solution that allows users to control their cursors just as well as someone using a mouse.
- For users that cannot click with a hardware button, there is a utility named **Mousetweaks** that enables them to perform the various clicks by software.
- **Dasher** provides an intuitive way to enter text without using the computer keyboard. It uses the head-mouse or eyetracker.
- It is possible to control applications using **voice commands**. Julius speech recognition engine can be used to recognise voice commands and execute pre-set commands.
- Mobile phone: Mobile operating systems are providing increasingly embedded supportive functionalities and apps that support the usage of smartphones by people with various disabilities.
  - iOS: iPhone, iPad, and iPod touch come with built-in assistive features that allow people with disabilities to use iOS to its full extent.
    - **VoiceOver:** VoiceOver is a screen reader that lets you know what's happening on your Multi-Touch screen — and helps you navigate it — even if you can't see it. Touch the screen to hear what's under your finger, then gesture to control your device. VoiceOver works with the apps that come with your iPhone, iPad, or iPod touch.
    - **Guided Access:** Guided Access helps people with autism or other attention and sensory challenges stay focused on the task (or app) at hand. With Guided Access, a parent, teacher, or therapist can limit an iOS device to stay on one app by disabling the Home button, and even restrict touch input on certain areas of the screen. This is so wandering taps and gestures won't distract from learning.
    - **Speak Selection:** If you have a hard time reading the text on your iOS device, use Speak Selection to read your email, iMessages, web pages, and books to you. Highlight text in any application, tap Speak, and then Speak Selection reads the selected text aloud. You can adjust the voice's dialect and speaking rate and have words highlighted as they're being read.



- **Siri:** Siri, Apple’s intelligent assistant, helps you do the things you do every day. All you have to do is ask. Say something like “Tell Jay I’m running late” or “Remind me to make reservations for Saturday.” Siri can send messages, place phone calls, schedule meetings, set reminders, look up movie times, and more. And Siri is integrated with VoiceOver, so you can ask where the nearest sushi restaurant is and hear the answer read aloud.
- **AssistiveTouch:** iOS devices are remarkably intuitive and easy to use. AssistiveTouch lets you adapt the Multi-Touch screen of your iOS device to your unique physical needs. If you have difficulty with some gestures, like pinch, you can make them accessible with just a tap of a finger. Custom gestures can also be created. If you have trouble pressing the Home button, you can activate it with an onscreen tap. Gestures like rotate and shake are available even when your iOS device is mounted on a wheelchair and iOS devices support a number of third-party assistive devices that help you interact with your iPhone, iPad, and iPod touch.
- **Dictation:** Dictation lets you talk where you would type. Tap the microphone button on the keyboard, say what you want to write, and your iOS device converts your words (and numbers and characters) into text. So it’s easy to type an email, note, or URL — without typing at all.
- **Zoom:** Zoom is a built-in magnifier that works wherever you are in iOS, from Mail and Safari to the Home and Lock screens. It works with all apps from the App Store. A simple double-tap with three fingers instantly zooms in 200 percent, and you can adjust the magnification between 100 and 500 percent. While you’re zoomed in, you can still use all of the familiar gestures to navigate your device. Zoom also works with VoiceOver, so you can better see — and hear — what’s happening on your screen.
- **Large Text:** You can increase the font size in your iOS apps up to 56 points. When you activate Large Text, the text inside your alerts, Calendar, Contacts, Mail, Messages, and Notes is converted to a larger, easier-to-read size.
- **Invert Colours:** If a higher contrast helps you better see what’s on your display, iOS lets you invert the colours onscreen. Once you set your colours, the settings apply system wide, even to video, so you get the same view no matter what you’re seeing.
- **Visible and Vibrating Alerts:** iPhone lets you know when something’s up, in a way you’ll notice. It delivers both visual and vibrating alerts for incoming phone and FaceTime calls, new text messages, new and sent mail, and calendar events. You can set an LED light flash for incoming calls and alerts or have incoming calls display a photo of the caller. Choose from different vibration patterns or create your own.
- **Dictionary:** Dictionary definitions are integrated into iOS so you can look up any word, any time. For example, you’re reading an article on astronomy and are stuck on some terminology. Simply look it up in the dictionary for an instant definition. Get quick access to definitions and commonly used phrases to help with spelling, pronunciation, and grammar.



- **Safari Reader:** For some students, navigating the web can be a sensory overload. Safari Reader reduces the visual clutter on a web page by removing distractions. It strips away ads, buttons, and navigation bars, allowing you to focus on only the content you want. Safari Reader works with Speak Selection and VoiceOver to provide auditory reinforcement for what you're seeing.
- **Speech:** People with speech impairments can also benefit from iOS features. FaceTime lets you communicate visually, whether you use sign language, gestures, or facial expressions. iMessage lets you chat with others via text. And Speak Selection helps with speech development by speaking the words you're reading. You can also compose your own text and have your iPhone, iPad, or iPod touch speak it for you.
- Useful iOS 5 Accessibility Features:  
<http://www.youtube.com/watch?v=gRTw6r6K7gY>
- Android: while Android is continuously upgraded (at the time of writing the current version is 4.3) and features improve, the following provides a good overview of what Android offers as default support for people with disabilities. You can turn these on by going to Settings > Accessibility:
  - **TalkBack** is a pre-installed screen reader service provided by Google. It uses spoken feedback to describe the results of actions such as launching an app and events such as notifications.
  - **Explore by Touch** is a system feature that works with TalkBack, allowing you to touch your device's screen and hear what's under your finger via spoken feedback. This feature is helpful to users with low vision.
  - **Accessibility settings** let you modify your device's display and sound options, such as increasing the text size and changing the speed at which text is spoken. Colour inversion is not currently supported and Android also lacks both a flexible screen zoomer and universal support for large font sizes.

Studying the different Android versions, it is clear that accessibility has been improved with each upgrade. Below is a short overview of the built-in accessibility features:

- Android 1.6 "Donut"
  - First version to support Accessibility. Comes with Pico TTS engine.
  - Some talking apps can use alternative speech engines if you install TTS Extended but Loquendo voices are not compatible.
- Android 2.1 "Eclair"
  - Some talking apps can use the Loquendo TTS engine.
- Android 2.2 "Froyo"
  - Fixed bug that could cause an application to suddenly stop talking.
  - Support for alternative TTS engines is built-in. All talking apps can use Pico, Espeak, Loquendo, or other speech engines.
  - Accessibility Settings adds a new option, Power button ends call, so that you don't need to find an End Call button on the touch screen to hang up.
- Android 2.3 "Gingerbread"
  - No major changes to Accessibility in this version.
- Android 3.1 "Honeycomb"

- Only available on tablet devices.
- Web accessibility can be enabled in Accessibility settings.
- Android 4.0 "Ice Cream Sandwich"
  - Enable Accessibility on brand-new devices by drawing a rectangle at the initial set-up screen.
  - "Explore by touch" feature. Use touch gestures to explore and interact with on-screen content on devices without physical buttons.
  - TalkBack includes KickBack and SoundBack functionality.
- Android 4.1 and later "Jelly Bean"
  - TalkBack, the built-in Android screen reader, now includes a gesture mode that allows the user to navigate around the screen and activate items. When TalkBack and Explore by Touch are turned on, you can use simple gestures to navigate your device:
    - Drag one finger. Explore your screen and hear audible feedback for what is being touched.
    - Double-tap anywhere on the screen. Opens or activates the item that you last touched.
    - Swipe up or down using two fingers. Scroll lists and pages.
    - Swipe left or right using two fingers. Change pages and screens.
    - Swipe right (or down) using one finger. Move to the next item.
    - Swipe left (or up) using one finger. Move to the previous item.
    - Swipe down then up in a single motion. Transition to the next reading level when reading blocks of text, then swipe right to read forwards or left to read backwards.
    - Swipe up then down in a single motion. Transition to the previous reading level when reading blocks of text, then swipe right to read forwards or left to read backwards.
    - Swipe right then left in a single motion. Move to the next piece of information.
    - Swipe left then right in a single motion. Move to the previous piece of information.
  - Android 4.1 has eliminated the need for a third-party keyboard, bringing the previous features of the Eyes-Free Keyboard into the latest version. To use the Eyes-Free Keyboard, move your finger to a letter, symbol, or function icon, then lift your finger to activate the button.
  - Improved Voice Search.
  - Instant dictation feature.
- Android 4.2+
  - Magnification: Visually impaired users can now enter full-screen magnification with a triple-tap on the screen and even type and interact with the device while zoomed in.
  - Adjust the system text size under the Display OR Accessibility Settings.
  - Triple tap to enter full screen magnification when you enable 'Magnification gestures'.

- Enable 'TalkBack', a screenreader for Android, right from the power menu.
- Blind or low vision users can use 'Gesture Mode' to reliably navigate the UI using touch and swipe gestures in combination with speech output.
- With the new accessibility focus feature, you can move a cursor between controls to maintain a target for the next action or a source for the next navigation event. You can double tap anywhere to launch the current item with accessibility focus.
- Text traversal in accessibility now gives you more control – choose to move between pages, paragraphs, lines, words or characters.
- TalkBack now supports gestures to trigger actions, to navigate applications, and traverse text.
- Android now offers full support for Braille accessibility services (to use this, you need to download BrailleBack on Google Play).
- Android 4.3 "Jelly Bean"
  - Dial pad Autocomplete: by touching numbers or letters, the dial pad will suggest phone numbers or names.
- Series of videos showcasing accessibility features in Android 4.0.:  
<http://www.youtube.com/playlist?list=PL5F26C3C9D6316323>
- Accessibility updates in the new JellyBean 4.2:  
<http://www.youtube.com/watch?v=LEQHyc3NMGc>
- iOS and Android; a comparison
  - A good comparison between iOS and Android Accessibility is demonstrated here:  
<http://www.youtube.com/watch?v=DvYbe1J9nr8>
- ATM (Automatic Teller Machines): ATMs also provide a number of embedded supporting technologies which are also similar to kiosks.
  - **Speech Output:** Operating instructions and orientation, visible transaction prompts, user input verification, error messages, and all other information displayed on-screen is usable by individuals with a visual impairment. Speech can be delivered through an industry standard connector for a headset or a telephone handset.
  - **Audible tones** are used for visible output that is not displayed for security purposes, such as asterisks representing personal identification numbers.



**Figure 9: Using ATM with headphone jacket for support<sup>21</sup>**

### **1.5.2. Activities**

The learner, the tutor/trainer and, if appropriate, a carer

- Demonstrations of all devices and their usage by people with disabilities (without specific additional assistive technology as this is addressed in the following chapters).
- Videos of people with disabilities facing challenges in using certain ICT driven devices.
- Identify the various devices at home and in the office that are ICT driven, and how they can be used with disability.
- Identify the core functionalities of each device and how they can be used with disability.
- Identify the reasons why each one is used and how they can be used with disability.
- Identify the benefits, challenges, and opportunities with regards to using these devices with a disability.

### **1.5.3. Additional reading**

- "Getting Started: iPads for Special Needs", Rahman, Sami; Taschenbuch

<sup>21</sup> <http://www.youtube.com/watch?v=Jzah0A6IC5o>

## 2. Assessment

Before actual training can take place, the level for the learner needs to be identified. Within ATLEC training, 4 levels have been identified:

- **Access:** This level is relevant for learners (and their immediate environment: formal and informal carers, educators) who aim to acquire awareness of the use of personal ICT AT solutions and develop very basic skills in using them proficiently, most likely with support.
- **Foundation:** This level is relevant for learners who aim to acquire basic knowledge of personal ICT AT solutions and develop adequate skills in using them proficiently with little or no support.
- **Intermediate:** This level is relevant for learners who aim to acquire in-depth knowledge of personal ICT AT solutions, including critical awareness, and develop proficient skills in using them independently to increase their level of activity and participation.
- **Advanced:** This level is relevant for learners who aim to acquire wider knowledge of ICT AT solutions for a wide range of other users in order to be able to support them appropriately.

This unit will support the assessment to be conducted before assigning learners to levels.

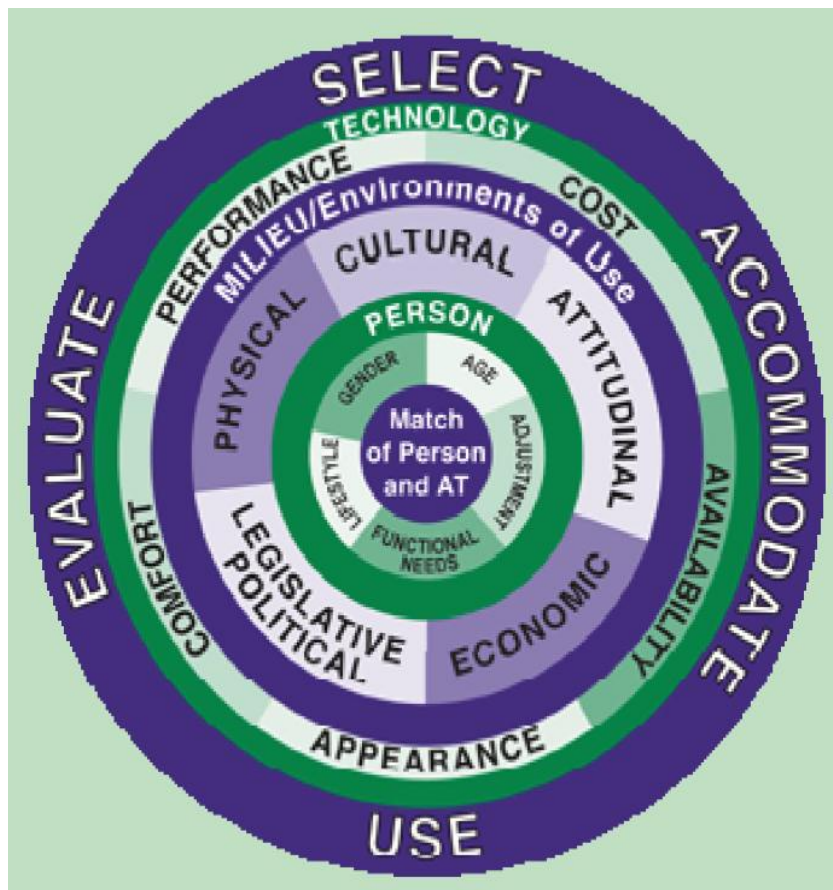
### 2.1. Which ICT AT solutions are needed? Matching person and Technology

The importance of good protocols for assessment of need and selection of AT has received increasing attention in the wider AT literature, with one motivation being the commonly observed tendency that much of the AT provided is not used.

#### 2.1.1. Matching Person and Technology (MPT) approach

One well-known example is the Matching Person and Technology (MPT) approach presented in the following exhibit.

Matching Person and Technology (MPT) is a series of assessments for evaluating the predisposition of a person and the outcome of technology use in a wide range of settings including the workplace and education. The MPT approach has been developed over a period of 20 years and has been subjected to a number of evaluation studies. The model upon which MPT is based is illustrated in the next figure. It is based on a bio-psychosocial approach to impairment and disability and has been benchmarked against the International Classification of Functioning, Disability, and Health. An important characteristic of the MPT methodology is the extent to which it empowers the active participation of the person in the assessment and selection process.



**Figure 10: The Matching Person and Technology Model<sup>22</sup>**

This is addressed in more detail in 3.8.7 Principles and tools to assess.

### **2.1.2. School Function Assessment Assistive Technology Supplement (SFA-AT)**

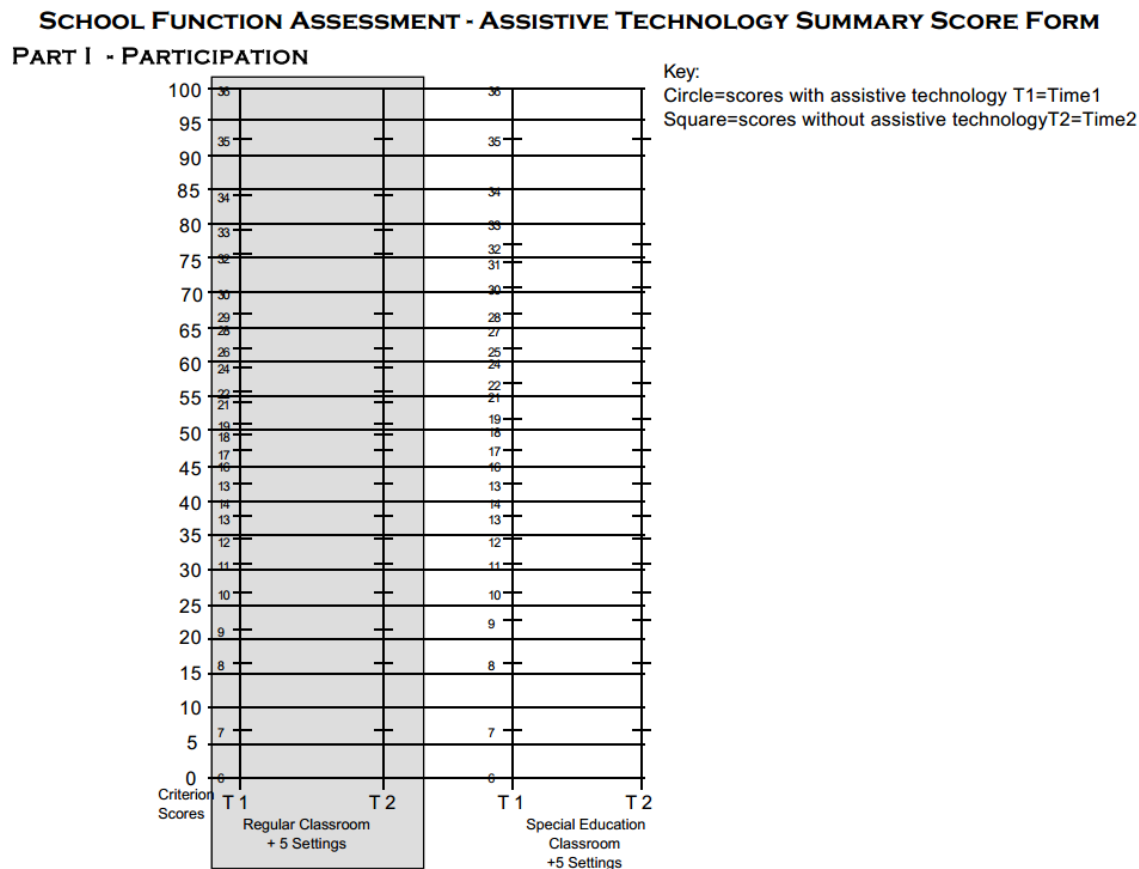
The SFA-AT is based on the School Function Assessment (SFA)<sup>23</sup>. It has been modified to focus specifically on how assistive technology impacts upon a student's ability to complete the functional tasks covered in the SFA. The SFA-AT is designed to focus on a student's performance over time so you

<sup>22</sup> Extracted from Scherer, M. J. (2008) Matching Person & Assistive Technology: Beyond Access to Participation. Presentation to the Assistive Technology & the Labour Market Conference, Prague October 2008 [http://www.atlm.eu/images/c/c6/Scherer\\_Prague2008.pdf](http://www.atlm.eu/images/c/c6/Scherer_Prague2008.pdf)

<sup>23</sup> The School Function Assessment (SFA) is used to measure a student's performance of functional tasks that support his or her participation in the academic and social aspects of an elementary school program (grades K–6). It was designed to facilitate collaborative program planning for students with a variety of disabling conditions. Source: <http://www.pearsonassessments.com/NR/rdonlyres/488D674B-461A-44CD-B1DD-232E77AD0924/0/SFAOverview.pdf>



will see that the SFA-AT includes scores for two points in time. These two points must be a minimum of 4 months apart but may be more than that.<sup>24</sup>



**Figure 11: Example SFA-AT Form (Participation)**

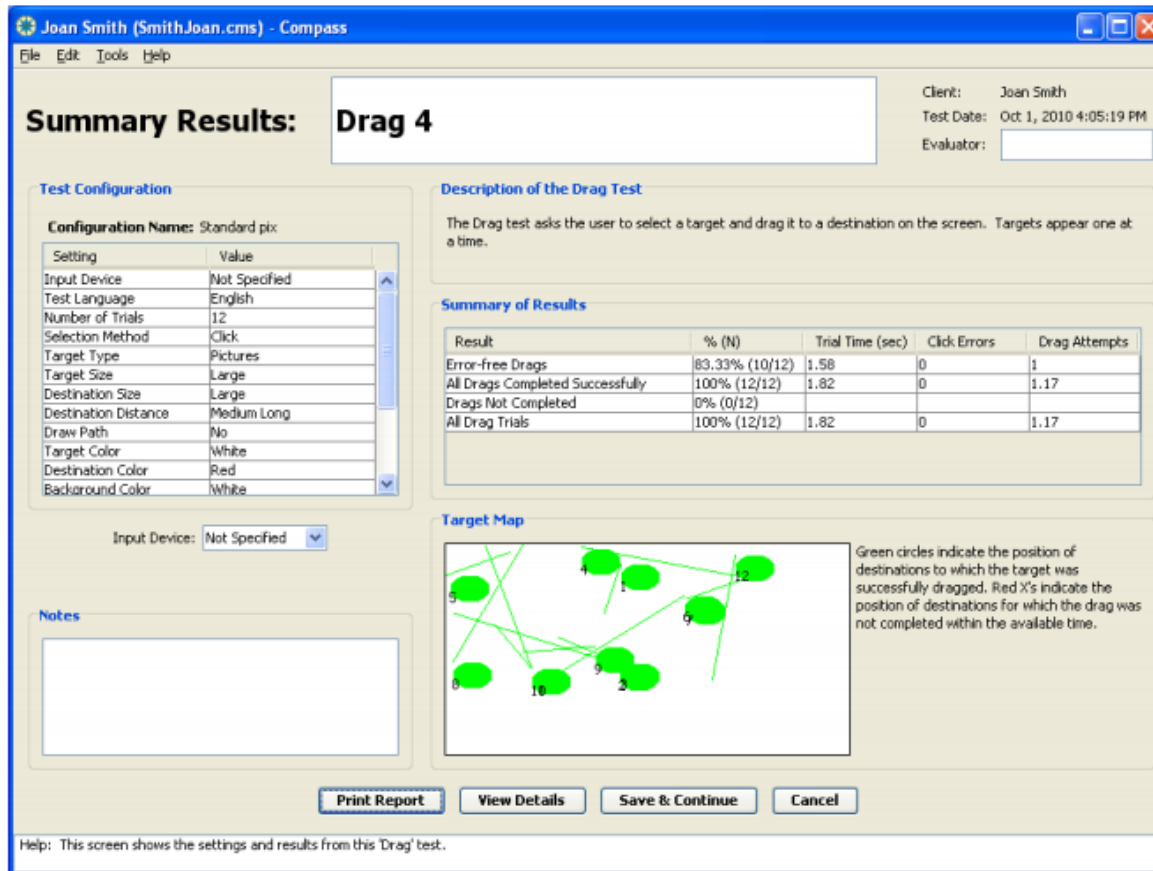
### 2.1.3. Compass - Software for Access Assessment

Compass software measures users' skills in various kinds of computer interaction. It is designed to help assistive technology professionals perform computer access evaluations with their students. Skills assessed include keyboard and mouse use, navigation through menus, and switch use etc.

Compass uses eight skill tests in three input device domains (pointing, text entry, and switch use) to record data on the speed and accuracy of user actions. A wide range of alternative keyboards, pointing devices, and switches can be used and each test can be configured to tailor the presentation to the user's needs.<sup>25</sup>

<sup>24</sup> <http://www.r2d2.uwm.edu/oats/sfa-at.html>

<sup>25</sup> <http://www.kprononline.com/compass.php>



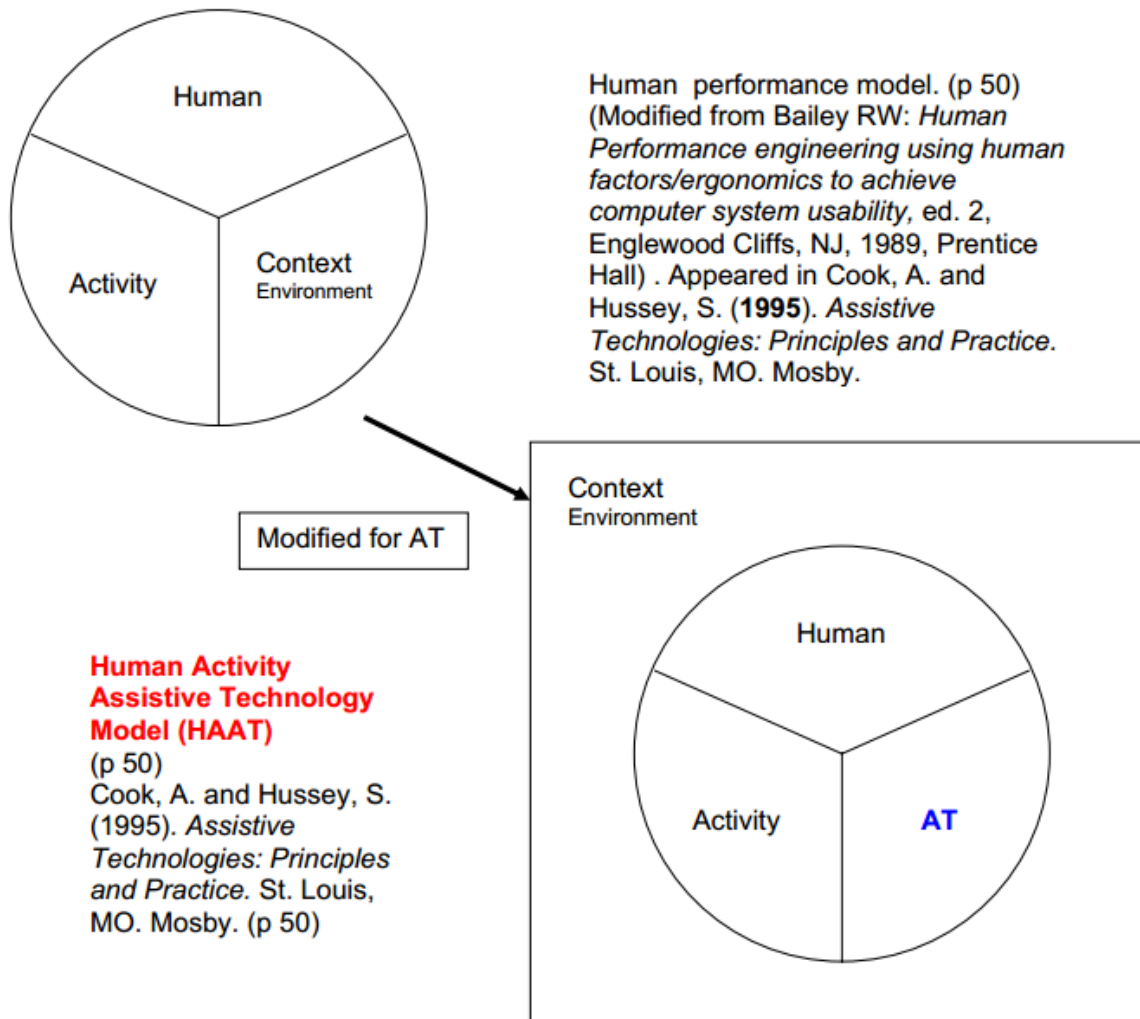
**Figure 12: Example of Compass tool result**

## 2.1.4. Human Activity Assistive Technology Model (HAAT)

This model proposes a framework for understanding the place of assistive technologies in the lives of people with disabilities. The model is comprised of four components: the human, the activity, the assistive technology, and the context in which all three of these exist.

**Human Performance Model** Bailey (1989) was developed by human factors engineers and psychologists ... to assist in the design and application of technology. Framework for studying human performance in tasks involving technology.

**Typically used to describe the performance of a human in a given task (activity) in a given situation (context – environment).**



**Figure 13: Human Activity Assistive Technology Model<sup>26</sup>**

### 2.1.5. Switch Assessment and Planning Framework for Individuals with Physical Disabilities

This tool provides practical support for relevant staff in the pre-assessment phase; it centres on to the gathering of appropriate information prior to the assessment to inform on possible starting points.

<sup>26</sup> <https://assistivetech-4alllearners.wikispaces.com/file/view/HAAT+model+info.pdf>

The Pre-Assessment Form helps staff collect relevant information. This information is then used to inform the assessment. It may be felt that an alternative mouse/keyboard device with appropriate settings and strategies would also be appropriate to evaluate.

Staff are encouraged to record relevant information on the Assessment Form (see Figure 14: Example pre-assessment form) following the guidance notes provided. They are also encouraged to consider the overall speed, accuracy, reliability and quality of an option as the ultimate aim is to establish a switch access method that offers the easiest, quickest, and the most successful method of access to an activity.

Space is given on the assessment form to record two possible options to compare. However, staff may need to try more than this to evaluate the most effective. Ideally assessments will be carried out by an interdisciplinary team comprising an occupational therapist, a teacher, a speech and language therapist, a physiotherapist, a carer/parent(s), and other professionals involved.<sup>27</sup>

1. What do team members want to learn from this assessment?
  
2. What would the team like to see the person do with technology?
  
3. What types of postural equipment (wheelchair, seating, standing frames, other) are used throughout the individuals day?
  
4. Are there any unsolved seating and positioning issues?
  
5. How often are switches used currently:
 

no use	Infrequent use once per month	Occasional use once per week	Used often 2 or 3 times per week	Used regularly, daily use	Frequent use well integrated into daily activities
--------	-------------------------------	------------------------------	----------------------------------	---------------------------	--

  - a. are they successful
  - b. detail equipment and software switches are used with
  
6. Are there any visual, perceptual or hearing difficulties?
  
7. What is the person's typical muscle tone?
 

severe tone	moderate tone	mild tone	normal tone
-------------	---------------	-----------	-------------

Is the tone:      Hypotonic (floppy)  
                          Hypertonic (spastic)  
                          Mixed

**Figure 14: Example pre-assessment form**  
**2.1.6. UK case: P Levels**

<sup>27</sup> <http://acecentre.org.uk/Websites/aceoldham/images/InfoSheets/SwAssessmentFramework.pdf>

Children with significant learning disabilities usually have their attainment and progress recorded as P levels. P level is short for performance level indicator and outlines the achievements of children with special educational needs who are working below the national curriculum level 1.

Ranging from P level 1 to P level 8, with the first three levels subdivided, they provide a common language to describe children in different settings. The first three P levels are not subject-specific as they relate to a child's general development and describe an increasing involvement with their surroundings or other people. Assessment is made by observing the child's responses in specific situations.

- P level 1(i) describes a child who is encountering experiences, and where their participation is only through another's provision of stimuli.
- P level 1(ii) describes a child who shows awareness of something happening and can pay attention to an event or person.
- P level 2(i) describes a child who pays attention and begins to respond and to show the ability to distinguish between different people, places, or events.
- P level 2(ii) describes a child who shows a more consistent and focused response; they may turn their head to follow movement with their eyes or move other parts of their body.
- P level 3(i) describes a child who shows intentional participation and may anticipate familiar events.
- P level 3 (ii) describes a child who shows preferences and will seek to join in with, or vocalise about, the activity or other people. It may include a range of non-verbal communication sounds.
- P levels 4–8 cover the points where children gain and develop skills in different subject areas within a range of experiences at a pre-national curriculum level.

**B Squared** is a means of assessing children's performance within the P levels. Special and mainstream schools working with children who have significant learning disabilities use the P levels as a means of recording progress. The difficulty for teachers is to establish progress within these fairly broad bands of achievement.

B Squared is a computer program that assesses pupils' progress and achievements. It uses a series of statements that contribute to an overall score, recorded as a percentage of a P level achieved. It is recorded by subject area, with automatic infill of statements common to more than one subject. The unequal attainments in different subjects, typical of children with particular areas of difficulty such as communication or physical impairment, can be accommodated.

The school will need to determine what percentage increase represents good progress for each pupil.

There are options for recording each assessment statement:

- Encountered: a pupil is encountering a stimulus but responds only passively, without engaging.
- Engagement: a pupil shows some signs of involvement though their responses are inconsistent.
- Gaining skills and understanding: a pupil starts to produce a more consistent response and is more consistently engaged.
- Mastered: a pupil shows mainly consistent responses.
- Confirmed: a pupil shows consistent responses.

A number of P level assessment statements depend upon a physical or visual ability. For example, English P level 2(i) contains the statements:

- Watches person directly in line of vision
- Attempts to copy facial expression

This is not relevant for a visually impaired child. An assessment can therefore be recorded as not applicable to the assessment, meaning the child cannot ever achieve this level and it should be discounted from the score.

An example of an assessment framework is displayed below.

**Table 5: The multi-disciplinary assessment framework**

Name	Assessment summary	Progress	Development aims and targets	Strategies for learning
Date	The <b>strengths</b> of the student and routes for learning for cognition and communication	Since last review	Target Routes for learning number on route map (P levels 1-3)	Using Routes for learning input (P levels 1-3)
Date of birth				
Vision				
Touch				
Hearing				
Taste / smell				
Fine movement				
Gross movement				
Physical well-being				
Cognition				
Communication				
ICT				
Independent living skills				
Relating to others				
Personality / learning style				



### **2.1.7. Activities**

The following activities are suggested.

- To complete a complex baseline assessment task (linked to National Curriculum Levels as appropriate)
- To design a basic assessment process related to the individual needs of the selected learner
- To implement the assessment process designed for the selected learner
- To find / design a method of recording for the assessment
- To use the ICF to capture the needs of an individual
- To design and apply the implementation path
- To use the ICF to capture the impact of an ICT AT intervention and carry out an evaluation checklist
- To design a quiz relating to ethics and safeguarding
- To evaluate activities through a means accessible to the individual
- We use some readily available ATs:
  - EduApps consists of over 50 Open Source and freeware Windows applications, running from a USB stick. EduApps provides a range of solutions to support writing, reading and planning as well as sensory, cognitive, and physical difficulties. This type of approach may be valuable where funding for Assistive Technology is limited.
  - AbilityNet Skillsheets have step by step guides on how to make changes and adaptations to your system - <http://micrnetw01.uuhost.uk.uu.net/content/factsheets/Skillsheets.htm>

### **2.1.8. Additional reading**

- "Technology Enhanced Learning for People with Disabilities: Approaches and Applications (Premier Reference Source)", De Pablos, Patricia Ordez; Gebundene Ausgabe
- "The Inclusive Corporation: A Disability Handbook for Business Professionals", Hogan, Griff
- "Getting Started: iPads for Special Needs", Rahman, Sami; Taschenbuch
- "Assistive Technology in the Workplace", De Jonge, Desleigh; Taschenbuch
- "Assistive Technology for People with Disabilities", Bryant, Diane Pedrotty; Taschenbuch
- "Assistive Technology Assessment Handbook (CRC Press Series in Rehabilitation Science in Practice)", Scherer, Marcia
- "Oplossingsgericht werken met mensen met een verstandelijke handicap (PM-reeks)", Teggelaar, J.J.N.

### 3. ICT AT

This unit will focus on defining what ICT based assistive technology is (referred to as ICT AT), and what categories of ICT AT exist and for what needs. Before exploring this in detail it is worth exploring some of the core concepts brought to us by the International Classification of Functioning, Disability, and Health (ICF) and confining and partially overlapping areas of knowledge, such as Universal Design and e-accessibility. It is important to be aware of the fact that the challenge of Assistive Technology is to enable the person with functional limitations to overcome activity limitations and participation restrictions. Most of the time the solution stands in the integration of well-designed mainstream products and services, accessible hard and software, and specifically designed devices.

Relevant glossaries can be found via the following links:

- <http://www.fctd.info/show/glossary>
- [http://www.fctd.info/resources/glossary/glossary\\_web.pdf](http://www.fctd.info/resources/glossary/glossary_web.pdf)
- [http://accessproject.colostate.edu/disability/modules/at\\_glossary/at\\_glossary.php](http://accessproject.colostate.edu/disability/modules/at_glossary/at_glossary.php)
- <http://www.education.uiowa.edu/centers/icater/glossary>
- <http://www.brainline.org/content/2009/11/assistive-technology-glossary.html>
- [http://www.setbc.org/download/LearningCentre/Topics/MakingItWork\\_Resources.pdf](http://www.setbc.org/download/LearningCentre/Topics/MakingItWork_Resources.pdf)

#### 3.1. Universal Design

Universal design or Design-for-All is a fairly new notion in the discussion regarding how to make society accessible for everybody and removing barriers against the societal participation of people with disabilities. Universal design means design or adaptation of the main solutions for access to an enterprise etc. so that it can be used by as many individuals as possible. The purpose of using the principle of universal design in the production of goods and services is to make products, means of communication, buildings, and surroundings accessible for all. The value of equality is evident in this principle; its aim is to ensure that everyone has an equal opportunity to participate in all parts of society. For example, individuals should be able to participate in employment, education, and culture and leisure activities without being dependent on special solutions and measures or, in the worst case, being excluded from such participation altogether.

The most pertinent definition on universal design today is put forward by the United Nations (UN) Convention on the Rights of Persons with Disabilities<sup>28</sup>.

*"Universal design" means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.*

*"Universal design" shall not exclude assistive devices for particular groups of persons with disabilities where this is needed (Article 2).*

In Europe universal design is used as a political principle for initiatives in order to ensure equality and accessibility for all. The EU currently uses the definition of universal design stated in the UN Convention on the Rights of Persons with Disabilities which has been ratified by the EU.

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<sup>28</sup> <http://www.un.org/disabilities/convention/conventionfull.shtml>

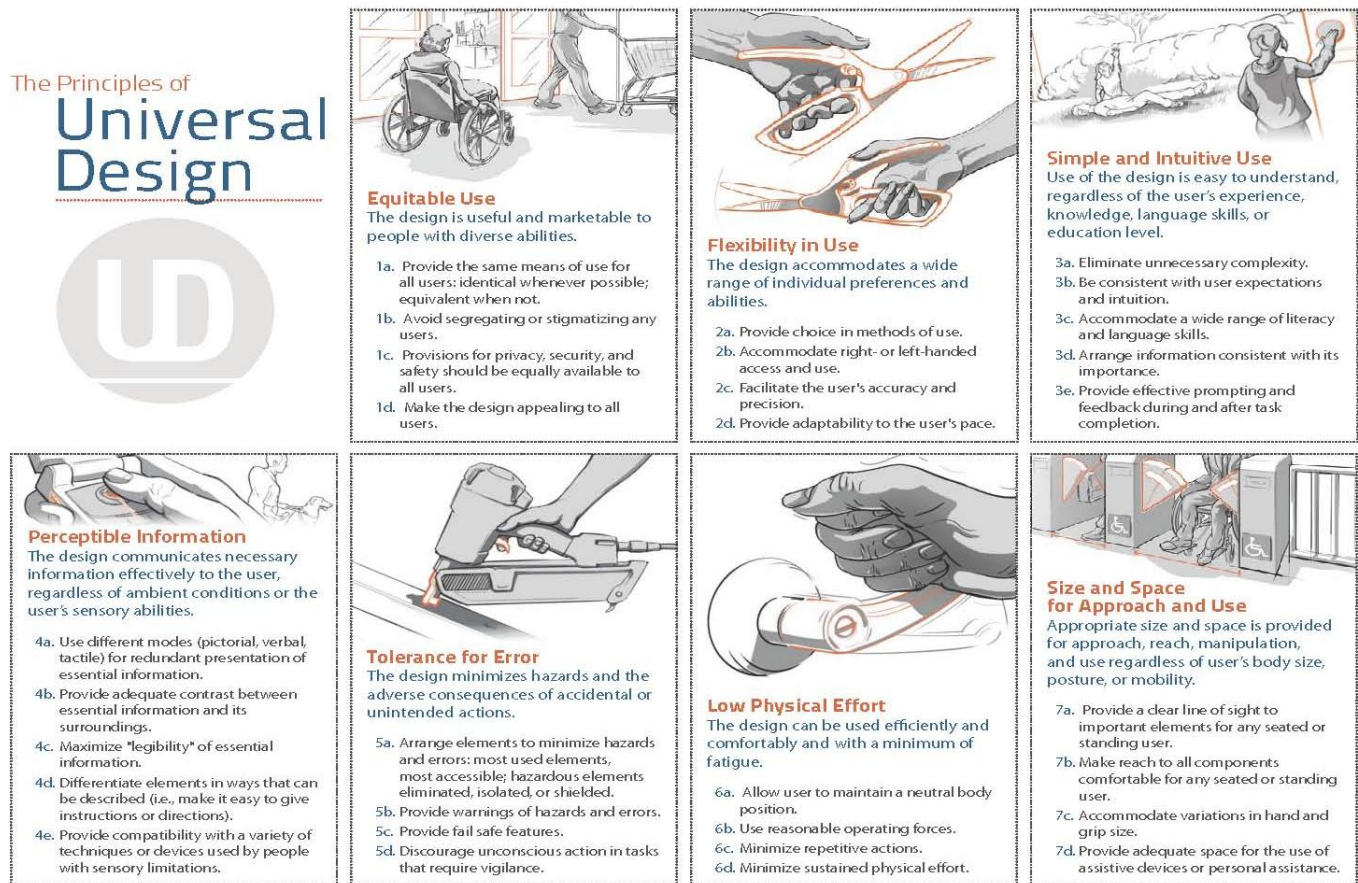
The term Universal Design was coined by Ronald L. Mace, founder and former program director of The Center for Universal Design at North Carolina State University. In 1997 he collaborated with a group of architects, product designers, engineers, and environmental designers to develop the “Seven Principles of Universal Design”<sup>29</sup>.

The ***seven principles of Universal Design*** are as follows:

- **Equitable Use:** The design is useful and marketable to people with diverse abilities.
- **Flexibility in Use:** The design accommodates a wide range of individual preferences and abilities.
- **Simple and Intuitive Use:** Use of the design is easy to understand, regardless of the user’s experience, knowledge, language skills, or current concentration level.
- **Perceptible Information:** The design communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities.
- **Tolerance for Error:** The design minimises hazards and the adverse consequences of accidental or unintended actions.
- **Low Physical Effort:** The design can be used efficiently and comfortably with minimum fatigue.
- **Size and Space for Approach and Use:** Appropriate size and space is provided for approach, reach, manipulation, and use regardless of the user’s body size, posture, or mobility.

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<sup>29</sup> <http://www.universaldesign.com/about-universal-design.html>



**Figure 15: The seven principles of Universal Design<sup>30</sup>**

### 3.2. e-Accessibility

We refer here to the definition<sup>31</sup> provided by EDF (European Disability Forum); access to mainstream ICT products and services by the widest possible number of people, regardless of their age or disabilities. This is in accordance with the concept of universal design.

The Status of eAccessibility in Europe is regularly assessed via the "Measuring progress of eAccessibility in Europe" (MeAC) studies, first published in October 2007 (and then also in 2008) and commissioned as part of the follow-up to the European Commission's Communication on eAccessibility of 2005.

An updated status of these MeAC studies (full report and its annexes, including the 2008 follow up report) can be found at:

[http://ec.europa.eu/information\\_society/activities/einclusion/library/studies/meac\\_study/index\\_en.htm](http://ec.europa.eu/information_society/activities/einclusion/library/studies/meac_study/index_en.htm).

A wealth of information on e-Accessibility can be found on the wiki-like eAccess+ hub that has been published by the eAccess+ network project ([http://hub.eaccessplus.eu/wiki/Main\\_Page](http://hub.eaccessplus.eu/wiki/Main_Page)). It is an

<sup>30</sup> <http://mile.mmu.edu.my/orion/xinlei/files/2013/01/130-195-1-pb-11.jpg>

<sup>31</sup> <http://www.edf-feph.org/Page.asp?docid=13389&langue=EN>

excellent tool for self-directed learning where students can easily access expert information on different aspects of e-Accessibility.

### **3.3. The ICF based approach to technology and functioning**

The International Classification of Functioning, Disability, and Health (ICF) is a classification of the health components of functioning and disability. After nine years of international revision efforts coordinated by the World Health Organisation (WHO), the World Health Assembly approved the International Classification of Functioning, Disability, and Health and its abbreviation of "ICF" on 22/05/2001. This classification was conceived in 1980 by the WHO and was then called the International Classification of Impairments, Disabilities, and Handicaps (ICIDH). It was created to provide a unifying framework for classifying the health components of functioning and disability. The ICF classification complements the WHO's International Classification of Diseases-10th Revision (ICD) which contains information on diagnosis and health conditions, but not on functional status. The ICD and ICF constitute the core classifications in the WHO Family of International Classifications (WHO-FIC).

The ICF is structured around the following broad components:

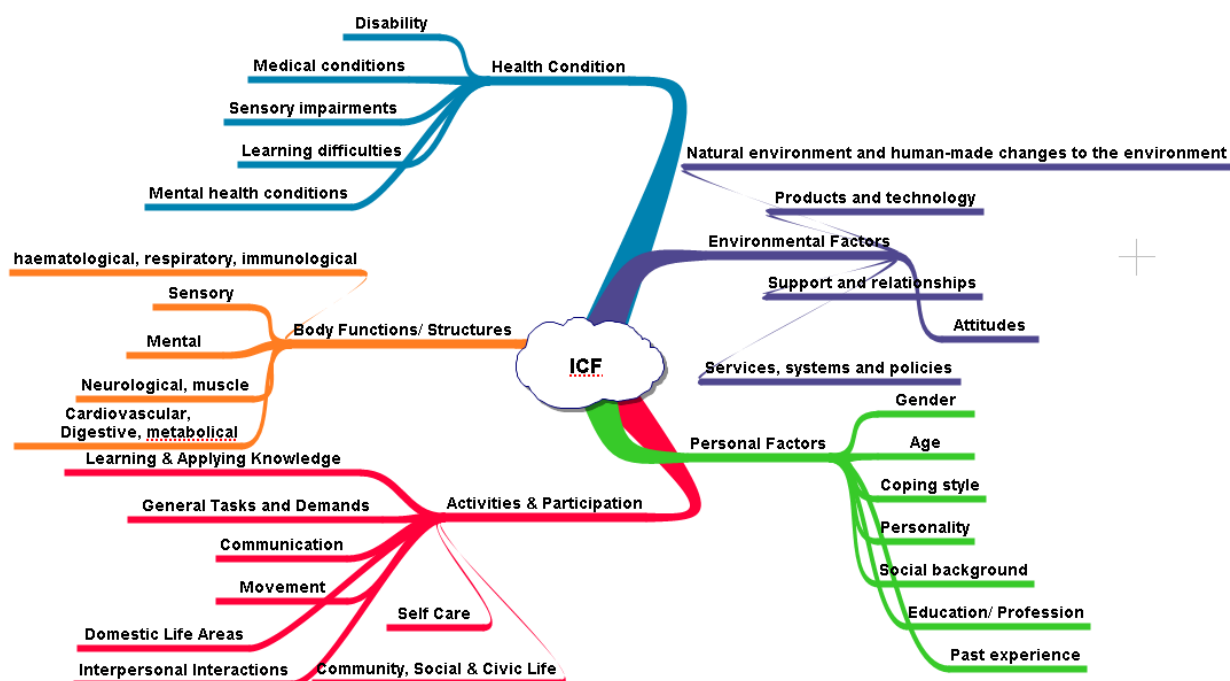
- Body functions and structure
- Activities (related to tasks and actions by an individual) and participation (involvement in a life situation)
- Additional information on severity and environmental factors

Functioning and disability are viewed as a complex interaction between the health condition of the individual and the contextual factors of the environment as well as personal factors. The image portrayed by this combination is one of "the person in his or her world". The classification treats these dimensions as interactive and dynamic rather than linear or static. It allows for an assessment of the degree of disability although it is not a measurement instrument. It is applicable to all people, whatever their health condition. The language of the ICF is neutral as to aetiology (study of causation or origination), placing the emphasis on function rather than condition or disease. It also is carefully designed to be relevant across cultures as well as age groups and genders, making it highly appropriate for heterogeneous populations.

Let's have a closer look at the various factors in the ICD and discuss their meanings:

- Body Functions are physiological functions of body systems (including psychological functions).
- Body Structures are anatomical parts of the body such as organs, limbs, and their components.
- Activity Limitations are difficulties an individual may have in executing activities.
- Participation Restrictions are problems an individual may experience in involvement in life situations.
- Environmental Factors make up the physical, social, and attitudinal environment in which people live and conduct their lives.
- Personal Factors relate to the individual's attitudes, beliefs, their culture, gender, and social background.
- Health Condition describes diseases, disorders, and injuries

The mind map below depicts examples for each of these categories:



**Figure 16: Examples for each of the ICF categories**

To access the ICF, use of the online ICF browser is recommended:  
<http://apps.who.int/classifications/icfbrowser/>.



**ICF Browser**
Language/Version : ICF - English

- ICF
  - b BODY FUNCTIONS
    - b1 CHAPTER 1 MENTAL FUNCTIONS
    - b2 CHAPTER 2 SENSORY FUNCTIONS AND PAIN
    - b3 CHAPTER 3 VOICE AND SPEECH FUNCTIONS
      - b310 Voice functions
        - b3100 Production of voice
        - b3101 Quality of voice
        - b3108 Voice functions, other specified
        - b3109 Voice functions, unspecified
      - b320 Articulation functions
    - b330 Fluency and rhythm of speech functions
    - b340 Alternative vocalization functions
      - b398 Voice and speech functions, other specified
      - b399 Voice and speech functions, unspecified
  - b4 CHAPTER 4 FUNCTIONS OF THE CARDIOVASCULAR, HAEMATOLOGICAL, IMMUNOLOGICAL AND RESPIRATORY SYSTEMS
  - b5 CHAPTER 5 FUNCTIONS OF THE DIGESTIVE, METABOLIC AND ENDOCRINE SYSTEMS
  - b6 CHAPTER 6 GENITOURINARY AND REPRODUCTIVE FUNCTIONS
  - b7 CHAPTER 7 NEUROMUSCULOSKELETAL AND MOVEMENT-RELATED FUNCTIONS

### b310 Voice functions

Functions of the production of various sounds by the passage of air through the larynx.

*Inclusions: functions of production and quality of voice; functions of phonation, pitch, loudness and other qualities of voice; impairments such as aphonia, dysphonia, hoarseness, hypernasality and hyponasality*

*Exclusions: mental functions of language (b167); articulation functions (b320)*

Search Fields

[Search]

Check the fields to be included in the search

☒ Titles
☒ Descriptions
☒ Inclusions
☐ Exclusions

**Figure 17: ICF browser**

The main lesson of the ICT is that people are not only disabled *in* their environment but also *by* their environment.

### 3.4. What is ICT AT

There are a number of definitions that exist with regards to Assistive Technology (AT). It usually refers to the devices or services aimed at compensating for functional limitations, facilitating independent living, or enabling older people or disabled people with activity limitations to realise their full potential. The scope of such a wide definition makes it possible for AT to cover any kind of equipment or service capable to fulfil the aforementioned definition: from walking devices to wheelchairs, from smart home products to medication reminders.

In the context of ATLEC; however, we focus on ICT AT, which is AT driven by ICT (high tech). In this respect we focus on Assistive technology that is used by individuals with disabilities in order to perform functions that might otherwise be difficult or impossible for them and that require the person's desire to use a device or application that is ICT in its very nature. For this reason we disregard mobility devices such as walkers and wheelchairs (low tech), but focus on hardware, software, and peripherals that assist people with disabilities in accessing computers or other information technologies. For example, people with limited hand function may use a keyboard with large keys or a special mouse to operate a computer, people who are blind may use software that reads text on the screen in a computer-generated voice, people with low vision may use software that enlarges screen content, people who are

deaf may use a TTY (text telephone), or people with speech impairments may use a device that speaks aloud as they enter text via a keyboard.

In this very same understanding, we also do not focus on non ICT devices (related equipment) required to make the whole solution work (e.g. a mounting system for an electronic communication device).

### 3.4.1. The need for ICT AT – Personas of typical ICT AT users

As detailed in the ICT unit, various mainstream ICT driven devices have embedded various solutions to assist people with disabilities in being able to use these devices. However, there are many more needs which are not readily integrated in currently available devices and which do not reach the level of precision required for certain disabilities. A good example is are the default screen readers provided e.g. in Windows which are of a basic (some may say even “poor”) quality and in the long term do not meet the needs of many people with visual impairments; individuals then look for other software solutions that can be run directly on the PC (HAL, JAWS, etc.).

In Annex 1, a range of examples that illustrate the need for ICT AT can be found. They are based on a range of personas as were created in the context of the AEGIS<sup>32</sup> and ACCESSIBLE<sup>33</sup> FP7 projects. To ease the overview, each of the disability groups has been linked with specific personas. It is important to note that many of the personas address multiple disabilities, as reflected in the table below.

**Table 6: Personas linked with disabilities**

Disability Persona	Motor impairments	Hearing impairments	Visual impairments	Speech impairments	Cognitive impairments	Expert
Jackie Dough	X			X		
Magda Paskimada	X	X		X		
Charles Lewis	X			X		
Maria Skoufakis	X			X		
John Howard Jones	X			X	X	
Maurice Nalobaka			X			
Kathleen de Munck			X			
David Burt			X			
Peter Brown				X	X	
Ellen Kell		X	X			
Nikolaos Souflakos			X	X	X	
Andy Catteeuw					X	
Matthew Perkins			X		X	
Benoit Dupré						X

<sup>32</sup> [http://www.aegis-project.eu/index.php?option=com\\_content&view=article&id=63&Itemid=53](http://www.aegis-project.eu/index.php?option=com_content&view=article&id=63&Itemid=53)

<sup>33</sup> [http://160.40.50.89/Accessible\\_Ontology/Version5.1/AccessibleOntologyOWLDoc/user.html](http://160.40.50.89/Accessible_Ontology/Version5.1/AccessibleOntologyOWLDoc/user.html)

Disability Persona	Motor impairments	Hearing impairments	Visual impairments	Speech impairments	Cognitive impairments	Expert
Clyde Channing						X
Ramin El-Fassi	X					
Nitesh Sarin			X	X		
Peter Vandezande	X				X	
Emma Karlsson		X		X	X	
Adam Ljung					X	
Jane Brown	X			X		
Edward Hodgins		X				
Tomasa Almaraz		X				
Gert Van Dijk			X			
Paulina Reyes			X			
Carlos Portillo				X		
Wayne Edwards				X	X	
Mikel Vargas	X					
Caroline Combs	X					
Märta Hansson			X			

A more detailed granularity is provided in the following tables:

**Table 7: Upper limb impairments**

Disability Persona	Cerebral palsy	Multiple sclerosis	Parkinson disease	Dyspraxia	Arthritis	Tic disorders	Rett Syndrome	Tourette syndrome	Quadriplegia	Dystrophy	Absent limb / reduced limb function
Jackie Dough				X							X
Magda Paskimada					X				X		X
Charles Lewis						X		X			
Maria Skoufakis							X				X
John Howard Jones			X								X
Ramin El-Fassi											X
Peter Vandezande		X									
Jane Brown	X										X
Mikel Vargas											X
Caroline Combs										X	X

**Table 8: Hearing impairments**

Disability Persona	Conductive Hearing Loss	Sensorineural Hearing Loss	Profound hearing loss	Deaf-blindness
Magda Paskimada	X			
Ellen Kell				X
Emma Karlsson	X			
Edward Hodgins	X			
Tomasa Almaraz			X	

**Table 9: Visual impairments**

Disability Persona	Loss of central vision	Loss of peripheral (side) vision	Blurred vision	Extreme light sensitivity	Night blindness	Blindness	Colour-blindness
Maurice Nalobaka				X	X		
Kathleen de Munck			X				
David Burt		X					
Ellen Keil						X	
Nikolaos Souflakos			X				
Matthew Perkins			X				
Nitesh Sarin							X
Gert Van Dijk			X				
Paulina Reyes						X	
Märta Hansson	X						

**Table 10: Speech impairments**

Disability Persona	Autism	Asperger's syndrome	Expressive language disorder	Communication disability
Jackie Dough			X	
Magda Paskimada				X
Charles Lewis			X	
Maria Skoufakis			X	X
John Howard Jones				X
Peter Brown		X		

Disability Persona	Autism	Asperger's syndrome	Expressive language disorder	Communication disability
Nikolaos Souflakos				X
Nitesh Sarin				X
Emma Karlsson				X
Jane Brown			X	X
Carlos Portillo				X
Wayne Edwards			X	X

**Table 11: Cognitive impairments**

Disability Persona	Dementia	Dysarthria	Down syndrome	Learning disability (LD)	Learning disability (LD) - Speech and language disorders	Learning disability (LD) - Academic skills	Learning disability (LD) - Nonverbal	Attention Deficit Hyperactivity Disorder	Traumatic Brain Injury	Alzheimer's disease
John Howard Jones	X									
Nikolaos Souflakos									X	
Peter Brown							X			
Andy Catteeuw								X		
Matthew Perkins			X							
Peter Vandezande	X									
Emma Karlsson		X								
Adam Ljung				X		X				
Wayne Edwards					X				X	

The main categories of ICT AT, related to the different needs of individuals with disabilities, are addressed in the following chapters and range from communication means to the need to access and use smartphones.

### **3.5. Categories of ICT AT for the computer**

The following provides an overview of the main categories of ICT AT used while working with a computer, related to the different needs of individuals with disabilities.

#### **3.5.1. The need to communicate with others**

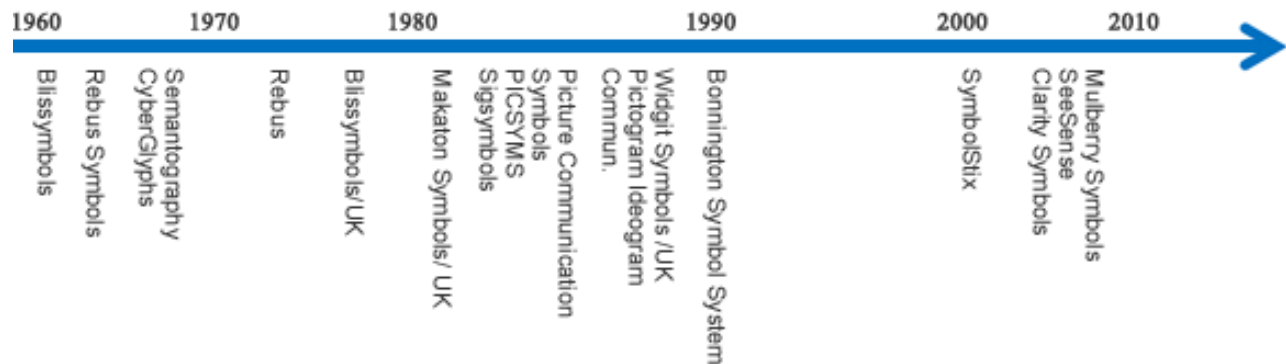
##### **3.5.1.1. PCs, smartphones, and tablets as communication devices**

Augmentative and alternative communication (AAC) is an umbrella term that encompasses the communication methods used to supplement or replace speech or writing for those with impairments in the production or comprehension of spoken or written language. AAC is used by those with a wide range of speech and language impairments, including congenital impairments such as cerebral palsy, intellectual impairment and autism, and acquired conditions such as amyotrophic lateral sclerosis and Parkinson's disease. AAC can be a permanent addition to a person's communication or a temporary aid.

AAC systems are diverse: unaided communication uses no equipment and includes signing and body language, while aided approaches use external tools and range from pictures and communication boards to speech generating devices. We focus here on this last group.

- AAC symbols sets: Some people with disabilities are not able to use speech as their principle means of communication. They may, however, be able to use an alternative method of communication such as symbols and symbolic languages. It is important to understand that symbols are different from pictures. Pictures generally convey a great deal of information at once but their focus is often unclear. Symbols, on the other hand, are designed to convey a particular meaning. Symbols or symbolic languages can be used to represent many aspects of verbal communication. Symbols can be presented through visual, auditory, and/or tactile media and can take the form of gestures, photos, manual signs, printed words, objects, 'reproduced' spoken words, or Braille. There are also different kinds of symbol sets; for example, Pictorial Communication Symbols, Minspeak and Makaton Symbols which can be helpful for people with a hearing impairment. Symbols can include simple body movements, such as nodding the head, shrugging the shoulders, and other gestures that are widely understood within a given culture. Symbol systems, such as single-meaning icons, can provide a means of basic communication ranging from simple, unambiguous responses like 'Yes' and 'No' to more complex concepts like feelings ('happy', 'sad', or 'hungry'.) There are a variety of symbols and symbol-based languages that can be used to express more complex types of communication and that allow individuals to interact and convey cause and effect responses. These have generally been developed for users and listeners who have difficulty with understanding written or verbal language, for example for adults or children with autistic spectrum disorder. Longer and more complex messages can be presented through different media of varying technical complexities, ranging from individual cards, paper charts and communication boards through to computer display programs and voice output devices. All of these systems have a common purpose: to provide an individual with the means to communicate more effectively regardless of disability.





**Figure 18: Symbol sets and systems (some milestones with examples)<sup>34</sup>**

- Examples of abstract non-verbal symbol sets<sup>35</sup>:
  - Blissymbols: Blissymbols, originally called Semantography, were designed by Charles K. Bliss as an international symbol system to promote communication among cultures and nations and hopefully bring peace in a period of war (World War II). Although this vision proved unsuccessful, the symbol system was the first to be used as a visual communication system. In 1971, McNaughton began to use Bliss' system in Canada as a means of communication with non-verbal physically disabled children; from this point on the system became known as Blissymbols. As the Blissymbol system requires the user to have a certain level of cognitive ability, it is mainly used with people with good cognitive skills. Blissymbols is a visual communication system that has a finite number of symbols. However, with the use of indicators and different strategies, the user can produce unlimited messages; any limitations thus reflect the limitations of the user.
  - Makaton Vocabulary Development Project (MVDP): The MVDP was formed in the UK in 1972 by Margaret Walker, who was working as a Speech and Language Therapist. The purpose of the project was to develop a sign language for adults with learning disabilities. A selection of symbols from the Rebus glossary were added in 1984 and additional symbols have been developed over time. The fact that Makaton symbols can be used as a part of a multi-modal communication approach distinguishes the set from the other symbol sets. According to the Makaton Charity, the Makaton Vocabulary is a unique language development programme because the vocabulary is divided into nine stages, based on a progressive sequence whereby students first acquire the core vocabulary and in later stages are able to communicate with others. If the user is able to manage a more advanced vocabulary, grammatical markers are added to the symbols.
- Examples of picture symbol sets<sup>36</sup>: Picture symbol systems provide more concrete representations of concepts than abstract non-verbal systems such as Blissymbolics.

<sup>34</sup> <http://www.graphic-symbols.com/page.php?pageID=7>

<sup>35</sup> <http://www.graphic-symbols.com/page.php?pageID=7>

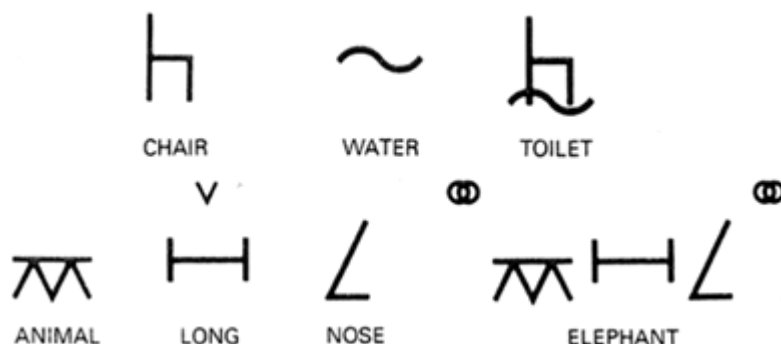
<sup>36</sup> <http://atcoalition.org/article/picture-symbol-systems-aac>

Some sets of pictures have been designed specifically for augmentative and alternative communication (AAC) use.

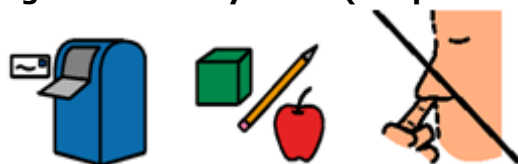
- Picture Communication Symbols (PCS) (Mayer-Johnson) - <http://www.mayer-johnson.com/category/symbols-and-photos/>: PCS is an expanding set of symbols that use cartoon-like drawings. The Mayer-Johnson has 12.000 images in its PCS library. PCS are used in a wide range of Mayer-Johnson products. One of these is Boardmaker, which allows users to create a variety of communication boards using PCS that can be printed out or used on a computer. A version of Boardmaker includes Speaking Dynamically Pro, which adds audio output capability. Recently, Mayer-Johnson has been developing apps for the iOS platform that use PCS in games such as Bingo and Memory.
- DynaSyms (Poppin and Company) - <http://www.poppinandcompany.com/dynasyms/index.shtml>: DynaSyms uses realistic drawings for concrete concepts and combines these drawings with specific symbols to convey more abstract concepts; for example, "forget" is conveyed by a face with a solemn expression combined with a downward-pointing arrow. Colour is also used as a cue; a red circle is used to indicate that the icon is communicating a concept rather than a specific object. The basic vocabulary is 5.000 symbols. Sets of DynaSyms are available for use with DynaVox AAC devices and with Boardmaker.
- Minspeak (Semantic Compaction Systems) - <http://www.minspeak.com>: Minspeak uses a limited number of concrete symbols, each of which can mean more than one thing. For example, depending on the other symbols it's combined with, the picture of an apple can also mean "red," "fruit," "bite," and so on. Minspeak is used in Prentke Romich AAC devices.
- Widgit (Widgit Software) - <http://www.widgit.com>: Widgit symbols use cartoon-like drawings for concrete concepts and a combination of random and logical symbols for abstract concepts; e.g., a plus sign for "and" and a triangle for "the." In some cases, similar abstract words have similar symbols, so that a circle inside a box means "in," the circle atop the box means "over," and so on. All parts of speech are represented and Widgit users are expected to communicate using full English sentences. The Widgit library has 11.000 icons. A companion "Snaps" vocabulary has 1.000 icons as photographs rather than drawings. Widgit symbols are available for use with a variety of AAC programs and devices, including Boardmaker and Dynavox.
- Arasaac - <http://www.catedu.es/arasaac/>: The portal offers ARASAAC graphic resources and materials to facilitate communication for those with difficulties in this area.<sup>37</sup>

<sup>37</sup> This project has been financed by the Department of Industry and Innovation of the Aragonese Government (Spain) as part of the Development Plan of the Centre of Technologies for the Education (CATEDU), under the authority of the Department of Education, University, Culture and Sports of the Aragonese Government.

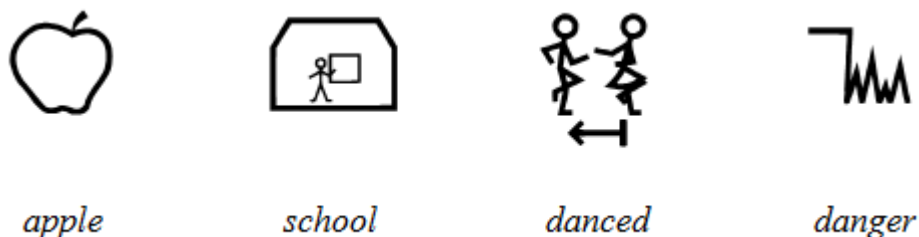
- SymbolStix (SymbolStix Online) - <http://www.n2y.com/symbolstix/>: SymbolStix uses a combination of realistic and cartoon-like drawings. Abstract concepts are represented by a series of related images; e.g., “What” is a question mark within a box, “When” is a question mark in front of a calendar, and “How much” is a question mark next to a hand holding money. The library has over 12.000 icons. SymbolStix pictures are used in a variety of AAC apps for iOS software, including ProLoquo2Go.
- Sclera (Sclera NPO) - <http://www.sclera.be>: Sclera was developed for the benefit of clients of a Belgian program for people with cognitive disabilities. The symbols are cartoon drawings presented mostly as white-on-black, which may be easier to see for some people with visual disabilities. Colour cuing is used in some instances; for example, a symbol may appear with a green background to indicate a positive association. Abstract concepts are represented by related images; e.g., “Who” is a question mark next to a person, and “Where” is a question mark next to a house.



**Figure 19: Blissymbols (adapted from Jones and Cregan, 1986, p.64)**



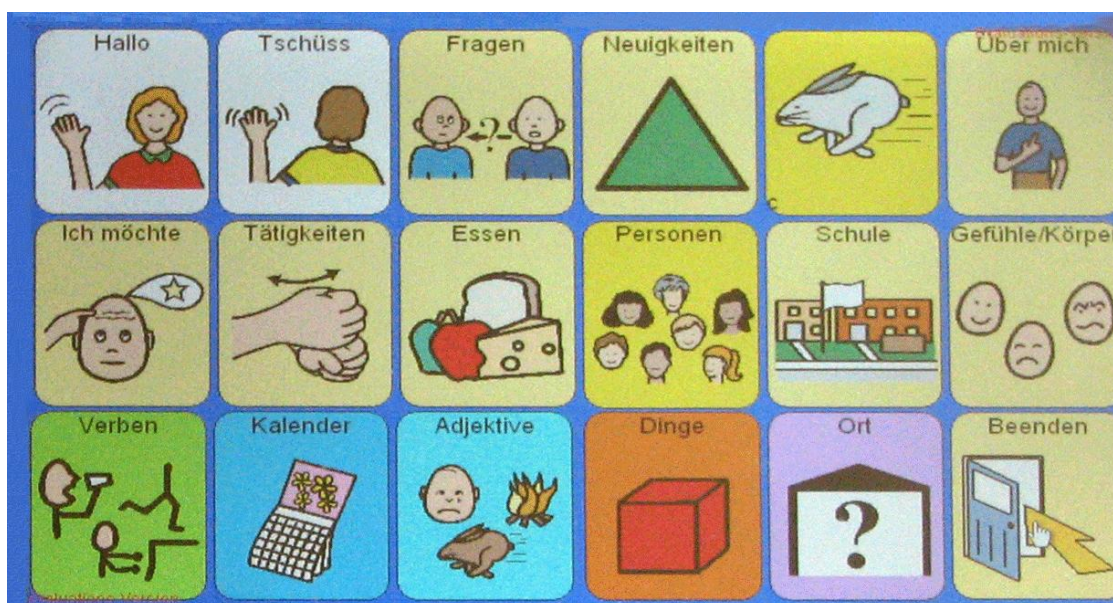
**Figure 20: Picture Communication Symbols**



**Figure 21: Makaton symbols**

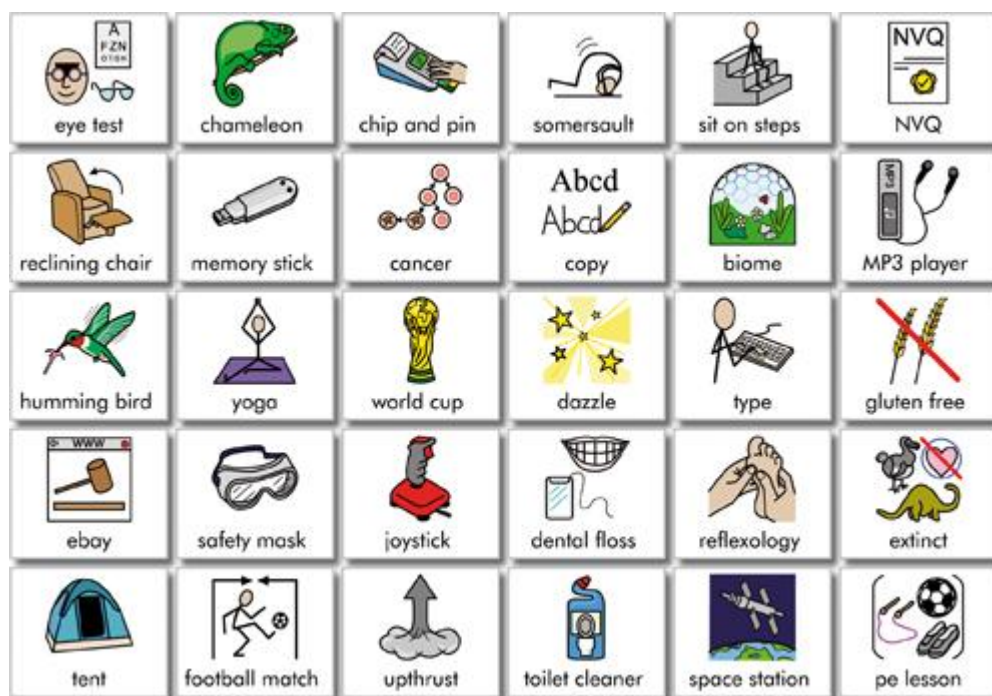


**Figure 22: Tobii symbol set on its communicator**



**Figure 23: Human System symbol set**



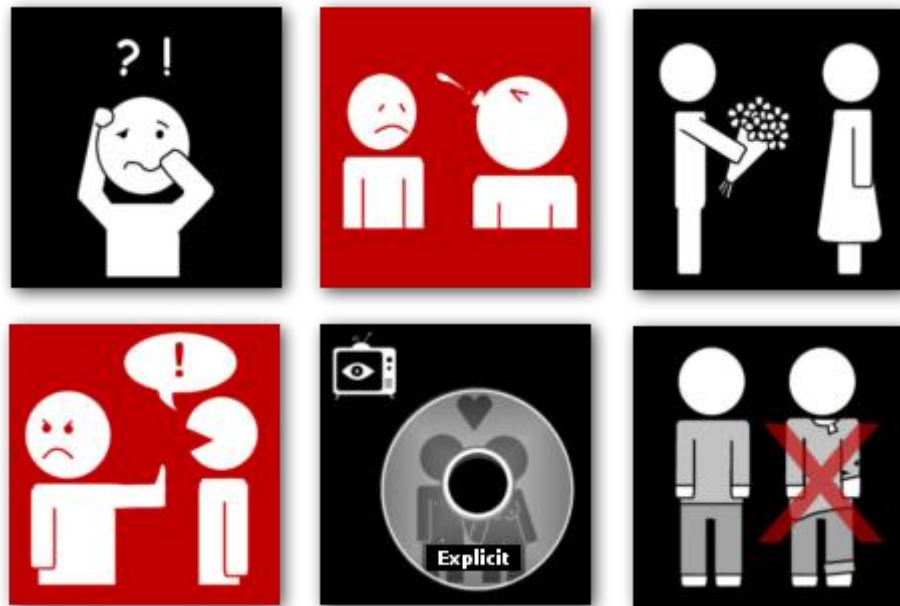


**Figure 24: Widgit symbol set<sup>38</sup>**



**Figure 25: Boardmaker Communication 1 symbol set<sup>39</sup>**

<sup>38</sup> <http://www.widgit.com/symbolupdates/symbols.jpg>



**Figure 26: Sclera symbols (adult concepts)<sup>40</sup>**

- AAC low tech grids editing software: A large variety of software is now available for the construction of communication grids. Software capable of searching for symbols would clearly be easier to handle and faster to use.
  - Boardmaker (Mayer-Johnson): Boardmaker is a graphics program designed for operators rather than disabled users. It contains a large set of PCS (Picture Communication Symbols and Photos) and symbols (upgradeable by means of add-ons) designed for the speedy production of printed materials for communication, rehabilitation activities, and teaching purposes: communication grids, calendars with symbols, labels to be applied to objects in the environment, or for the classification of containers etc. The symbols can be resized at will and are available in both black and white and colour. It produces clear-cut, sharp edged symbols in well-defined colours. Boardmaker facilitates the preparation of communication grids by providing hundreds of sample tables ready for the insertion of symbols. These include several currently available on the market. However, you can also construct your own tables with the cell layouts and sizes you prefer. You can add custom-designed symbols (drawings, photographs) to the Boardmaker library and give them a name to ensure they are easily available. Boardmaker allows you to change the name of any symbol or to add synonyms to facilitate subsequent searches. With use and the passage of time, this program becomes an organised archive of familiar images and symbols, making it much easier to work on the preparation of materials of



different kinds. Boardmaker's functions may be augmented by using the Speaking Dynamically program which enables you to create dynamic tables for users, for use in computer or dynamic displays.

- In Print 2 (Widgit): In Print 2 is a desktop publishing program for creating symbol-supported resources for printing. It is an excellent tool for anyone wanting to make accessible materials for their school, home, business, or community. In Print is supplied with the full Widgit Symbol Set, which has been developed to support access to information. In addition, it offers the design freedom of desktop publishing, enabling the user to create materials that have a professional look whilst being completely accessible. It allows you to create signs, labels and posters, books and leaflets, flashcards, worksheets and timetables, and is white-board friendly. A collection of templates and resources enables the quick creation of whatever you need. In Print's table features provide flexibility, allowing you to insert, remove, and resize rows and columns and merge cells. You can also drag and drop photographs onto individual words to personalise their meaning. Images are automatically stored within the document for use on other machines, making sharing symbols effortless.
- AAC software:
  - Examples<sup>41</sup>
    - Grid 2 is communication and PC access software. It can be installed on most Windows based devices, incorporating symbols and text with page-sets and keyboards. The software combines all the different styles of communication aids into a single program. Both text and symbols are used and it is available in around 20 different languages.
    - Tobii communicator is suitable for all levels of learning and physical ability. It features pictures for users who cannot write, or the choice of keyboard layouts. This is a complete solution for all aspects of communication, with 15000 Symbol Stix symbols or the option of using PCS symbols. Using the different Sono Suite products, the functions of the Tobii Communicator can be extended even further, from easy symbol expression to full computer control. The Tobii Communicator supports a full range of input methods from keyboard and mouse, to scan, switch, and eye control.
    - SymbolMate is ideal for creating paper-based communication pages and educational material with symbols and photos. Create, edit, and manage printed page sets for use with the S32. SymbolMate is available with a single license or for multiple users as a network package.
    - Mind Express (Jabbla): Mind Express™ is easy to use; its structure, functions, and content permit speech therapists, teachers, etc. to create communication boards and rehabilitation and educational activities. A wide variety of stimuli (graphic symbols, words, speech, and music) can be used to create interesting and challenging exercises. Numerous examples are already included in the program.

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<sup>41</sup> [http://assistive-technology.co.uk/products/augmentative and alternative communication devices/aac software](http://assistive-technology.co.uk/products/augmentative_and_alternative_communication_devices/aac_software)

The software allows you to customise all aspects of the tables and activities that you can create (presentation, content, methods of access, etc.).

- Clicker (Crick Software): Clicker supports scanning and is particularly suitable for use by children with learning disabilities, even in the cases of severe motor impairment. Clicker includes synthetic speech but you can also use other recorded sounds or audio files. The program also includes an extensive library of images, which can be expanded and integrated with other images imported through a scanner or downloaded from the web. With Clicker you can build multimedia exercises, "talking books", with linked activities, and you can also create screen keyboards with special function keys which can be associated with specially designed macro functions. As it's so easy to add graphics to Clicker cells, you can create grids using any pictures or symbols you like.
- Symwriter (Widgit): this is an innovative and powerful tool for writing texts that are automatically translated into symbolic form. SymWriter consists of two essential tools: 1) A text editor which automatically pairs words and symbols in the process of writing. Due to its powerful processing system and language, SymWriter considers the plurals of nouns and adjectives, person and verb tenses, articles, and prepositions; 2) environments within which you can create matrixes (grids) consisting of symbols, images, words and phrases for a variety of educational activities. The texts produced using the check boxes provided by an environment can be transcribed utilising the text editor symbolisation feature.
- Comunica (EasyLabs): Comunica is a communication software that allows you to create customised communication boards for use on a computer, with the possibility of both digitalised and synthetic voice output. The program allows you to use your own images (in WMF, GIF and JPEG format) for the creation of customised tables. It requires a Windows environment and is currently only available in Italian.
- Free AAC Software for iPhone / iPodTouch / iPad Devices can be found at <http://atcoalition.org/article/free-aac-software-iphoneipodtouch-ipad-devices>.
- Voice Output Communication Aids (VOCAs): Symbols are often used in combination with communication devices known as Voice Output Communication Aids (VOCA). VOCAs are electronic devices that are able to generate printed and/or spoken text. They aid individuals who are unable to use natural speech to meet all of their communication needs. There are many different products available. Some products are dedicated for communication purposes only while others are software programs in laptop or tablet computer systems. Tablet computers, for example, are becoming more popular and less expensive than traditional or older dedicated devices. Some have additional features built in such as appointment schedules and reminders, simple environmental control units, alternative access methods, dual displays, and abbreviation expansion programs.
  - Examples:



**Figure 27: Symbol based communication devices**

### **3.5.2. The need to access and control a PC, tablet PC, or smartphone**

#### **3.5.2.1. Alternatives for standard keyboards**

The standard 104-key Windows keyboard with the QWERTY layout has evolved from the early typewriter. It has changed relatively little over the years and it has remained the main input device for the personal computer. For some individuals the standard keyboard can be difficult or impossible to use. For example labels on keys may be difficult to see, a person may not have the fine dexterity to press on individual keys, or it may cause pain for the user after a period of use. Fortunately, a comprehensive range of alternative keyboards including large key, compact, wireless, high visibility, ergonomic, on-screen keyboards are available. These help people with disabilities to use a computer with greater ease and control.

- **Simplified keyboards:** The present arrangement of an AZERTY or QWERTY keyboard is not considered comfortable, logically arranged, or optimised for human efficiency. Character sets used in different tasks can be expected to yield different optimal key locations. New tasks are introducing new characters and changing the frequency of selected old ones. An example is the Dvorak Simplified Keyboard. This is an alternative keyboard layout or key map that replaces the QWERTY keyboard layout. There are many ergonomic issues with the QWERTY keyboard and the Dvorak Simplified Keyboard remedies those. Patented in 1936 by August Dvorak, the Dvorak Simplified Keyboard rearranges the layout of the keys to increase the productivity of the typist. Although it was developed for English, the Dvorak Simplified Keyboard has been adjusted to develop key maps for other languages. There is even a one handed layout.
- **Different size keyboards:** Depending on your need there are variations of the same keyboard in several different sizes. A good example is the BigKey Keyboard which has one inch square keys, making them much easier to see, find, and press. These are offered in 18 different models featuring different lowercase and colour keysets.



**Figure 28: BigKeys keyboards**

- Braille keyboards: The most common type of Braille keyboard is the chorded keyboard used on the Perkins braille and on electronic Braille notetakers. These keyboards do not have a separate key for each letter. There is one key for each dot of a Braille cell. To type one letter, all of the keys that correspond to the dots in that letter are pressed at the same time. The braille or notetaker advances to the next letter after the keys are released. A spacebar is located below the main keys. On occasion a computer or typewriter keyboard may have been labelled with Braille letters. Most blind people do not use these as they learn to memorise the keyboard layout and type by touch.



**Figure 29: Braille keyboard<sup>42</sup>**

- Overlay keyboards: An overlay keyboard is a specialised keyboard with no pre-set keys. Each key can be programmed with a wide range of different functions. Overlay keyboards are often used as a quick and easy way to input items with just two buttons. Overlay keyboards generally consist of a flat grid of unmarked buttons. After the keyboard is programmed, a sheet, called an overlay, is placed on top to identify each key. The overlay can consist of any combination of words, symbols, or even pictures.

<sup>42</sup> [http://cdn.shopify.com/s/files/1/0055/8312/products/kb-0164-large\\_grande.jpeg?0](http://cdn.shopify.com/s/files/1/0055/8312/products/kb-0164-large_grande.jpeg?0)





**Figure 30: IntelliKeys USB Overlay keyboard<sup>43</sup>**

- Ergonomic Keyboard<sup>44</sup>: An ergonomic keyboard is a computer keyboard designed with ergonomic considerations to minimise muscle strain and a host of related problems. Typically such keyboards for two-handed typists are constructed in a V shape, to allow right and left hands to type at a slight angle more natural to the human form. An ergonomic keyboard may reduce muscle strain and reduce risk of carpal tunnel syndrome or other kinds of repetitive strain injury, but there is no clear evidence of benefit.



**Figure 31: Microsoft ergonomic keyboard**

<sup>43</sup> <http://www.gokeytech.com/images/IK-USB-Package-copy.jpg>

<sup>44</sup> [http://en.wikipedia.org/wiki/Ergonomic\\_keyboard](http://en.wikipedia.org/wiki/Ergonomic_keyboard)



**Figure 32: Maltron ergonomic keyboard**

- Compact keyboards: Compact keyboards, as their name suggests, take up less space. This is an advantage where space is limited such as on a wheelchair tray. They also require a smaller range of extended movement in order to reach all the keys. The number pad is usually incorporated within the other keys and accessed via a special function key. Because of their compact size they may also be useful for one handed typing.



**Figure 33: Compact keyboard<sup>45</sup>**

- Expanded keyboards: Enlarged or expanded keyboards provide a larger surface area for locating or targeting keys. The size of the keys and the separation between the keys may be enlarged. In order to facilitate access further, keys may be grouped or organised differently, an alternative ABC layout may be used or keytop labels may be printed in high contrast. E.g. BigKeys keyboards are simplified computer keyboards with keys tops that are 1-inch square. Both ABC and QWERTY layouts are available along with easy-to-read key labels in multicolour or that have large black printing on bright-white or bright-yellow.

<sup>45</sup> <http://www.inclusive.co.uk/Img/Dyn/Cache/Products/886-634184159828286250332176146.jpg>





**Figure 34: Maltron expanded keyboard<sup>46</sup>**

- One-handed keyboards: these are designed for individuals who have functional use of one hand. Alternative designs include: alternative layouts, more compact keyboard layout to reduce the distance needed to access all keys, or ergonomically contoured layout. A good example is the Maltron keyboard which has been developed for those who need to perform keyboard operations with one hand. The shape of the keyboard matches the natural hand movement and the key arrangement minimises finger movement. Both a right and left and dual hand versions are available.



**Figure 35: Maltron One-Handed Keyboard<sup>47</sup>**

<sup>46</sup> <http://accesibilidadweb.dlsi.ua.es/contenido/hardware/disp-adaptados/maltron-expanded-keyboard.jpg>

- Flexible keyboards: Flexible keyboard are usually made from silicone material. As they can be folded or rolled it makes them very portable. They are impervious to liquids and robust and thus can be used in harsh environments.



**Figure 36: Flexible Ergonomic Keyboard<sup>48</sup>**

- Large print and High Contrast Keyboards: This is a standard keyboard with extra large print on the keys, making it suitable for users with a visual impairment.



**Figure 37: Large print and High Contrast Keyboard<sup>49</sup>**

- Accessories for keyboards:
  - Keyguards: these are usually a grid placed over the keyboard. It facilitates the accurate selection of keys by isolating and selecting a key whilst also providing support to the user's hand while typing.
  - Alphabet Keyboard Stickers: These can be placed on the key tops of a keyboard to enhance the label or emphasise certain keys. They are available in upper and lower case and in a range of colours.
  - Keyboard rest: Using a keyboard rest the angle can be adjusted to suit the user.

47

<http://ds5cvxtqu2rt0.cloudfront.net/media/catalog/product/cache/3/image/700x700/17f82f742ffe127f42dca9de82fb58b1/m/a/maltron-one-handed-large.jpg>

<sup>48</sup> <http://www.kos.ie/input-devices/ergonomic-keyboards/flexible-keyboard/>

<sup>49</sup> <http://www.aramedia.net/aramedia/Large%20Print%20Keyboard%20White%20on%20Black1.jpg>

- Wrists rest: Wrists rests are designed to keep your hand in a natural position, reducing risk of CTS (Carpal Tunnel Syndrome).
  - shields, helmets, mouth sticks, hands splint
- Onscreen keyboards: Onscreen keyboards are virtual keyboards on the computer screen. Usually they can be resized and moved around the screen. They are typically used with word prediction to assist typing. They can be directly accessed if used with a touch screen or alternatively a pointing device can be used to select the characters. There are various options for onscreen keyboards.
  - Microsoft Onscreen keyboard
    - Available in the accessibility options with Microsoft operating system. Older versions have little functionality but new operating systems allow keyboard resizing, word prediction, and switch access.
  - Typematic
    - Not vista compatible
    - Supplied with Genie Joystick
    - [www.click2go.ie](http://www.click2go.ie)
  - Penfriend
    - It has an onscreen keyboard (resizable), some very good word prediction, and many other useful functions
    - [www.penfriend.biz/](http://www.penfriend.biz/)
  - Grid2 or GridKeys
    - It has an extremely customisable keyboard layout, some very good word prediction, and other excellent functions, such as switch access or mobile phone access. It may be a little excessive if you just want a basic onscreen keyboard with word prediction.
    - [www.sensorysoftware.com/software.html](http://www.sensorysoftware.com/software.html)
  - Click-N-Type
    - This is Free. Resizable Onscreen keyboard with basic word prediction. Works with Vista.
    - [www.lakefolks.org/cnt/#Download](http://www.lakefolks.org/cnt/#Download)
  - RapidKeys
    - This is free. Resizable keyboard but without word prediction. However, there are many free word prediction applications with which it can be paired.
    - [rapidkeys.netfirms.com/en/index.htm](http://rapidkeys.netfirms.com/en/index.htm)
  - Saw
    - This is free. Similar to the Grid or Gridkeys. More than just an onscreen keyboard as the layout can be customised. Initial setup can be a little complicated.
    - [www.ace-centre.org.uk/index.cfm?pageid=2926A897-3048-7290-FED02B6A24887F44](http://www.ace-centre.org.uk/index.cfm?pageid=2926A897-3048-7290-FED02B6A24887F44)
  - SofType
    - Variety of keyboard layouts.
    - Resizable onscreen keyboard with word prediction. Vista compatible.
    - [www.orin.com/access/softype/](http://www.orin.com/access/softype/)
  - Skeleton Key

- Keyboard can be customised
- Word prediction
- [www.myskeletonkey.com/](http://www.myskeletonkey.com/)
- Keyboard emulators: A keyboard emulator replaces the keyboard of a computer by a specialised input device which produces signals to emulate those produced by the keyboard.

### 3.5.2.2. Alternatives for standard mouse

When you purchase a computer, it usually comes with a standard mouse. For many people, the mouse poses difficulties. They need to be rolled around a portion of the desk and held in one position while the button is pressed. As a result, they pose many problems for people with disabilities. The following list outlines some of the options that are currently available:

- Touchpad: These devices are often found built into laptops but are available as standalone input devices. They are stationary pads which are operated by sliding your finger across the surface. Clicking is achieved by tapping lightly on the surface or simply by clicking the raised buttons below the touchpad. They can be held in the hand or placed on a desk.



**Figure 38: Logitech touchpad<sup>50</sup>**

- Joystick: These types of devices work in a similar manner to joystick controls on a wheelchair. The mouse pointer moves fastest when the joystick is pushed fully forward.

<sup>50</sup> [http://www.instablogsimages.com/1/2011/09/28/logitech\\_touchpad\\_2jmea.jpg](http://www.instablogsimages.com/1/2011/09/28/logitech_touchpad_2jmea.jpg)



**Figure 39: Joystick<sup>51</sup>**

- Trackball: A trackball is basically an upturned mouse. With a trackball, the device itself remains static while only the ball on the top is moved using fingers, thumbs and palms. Larger trackballs are often suitable for operating by foot.



**Figure 40: Trackball<sup>52</sup>**

- Foot-Controlled trackball: Some of the larger trackballs can be operated by foot, such as the BIGtrack.



**Figure 41: BIGtrack<sup>53</sup>**

<sup>51</sup> <http://liveimageserver.dlf.org.uk/mee//products/med/0105619.jpg>

<sup>52</sup> <http://library.thinkquest.org/06aug/02177/Trackball.jpg>



- **Foot mouse:** A foot mouse / control can be used by a person who has limited or no use of their hands or arms. The foot mouse can be used to navigate through software programs and select things in much the same way as a conventional mouse. Most foot mice consist of two segments. One segment will be used to control the cursor whilst the second segment is used to click the mouse or to select shortcuts. Most foot mice include straps that help to hold the device in place on the foot during use. A long cable runs from the mouse and plugs into the computer via a USB port.



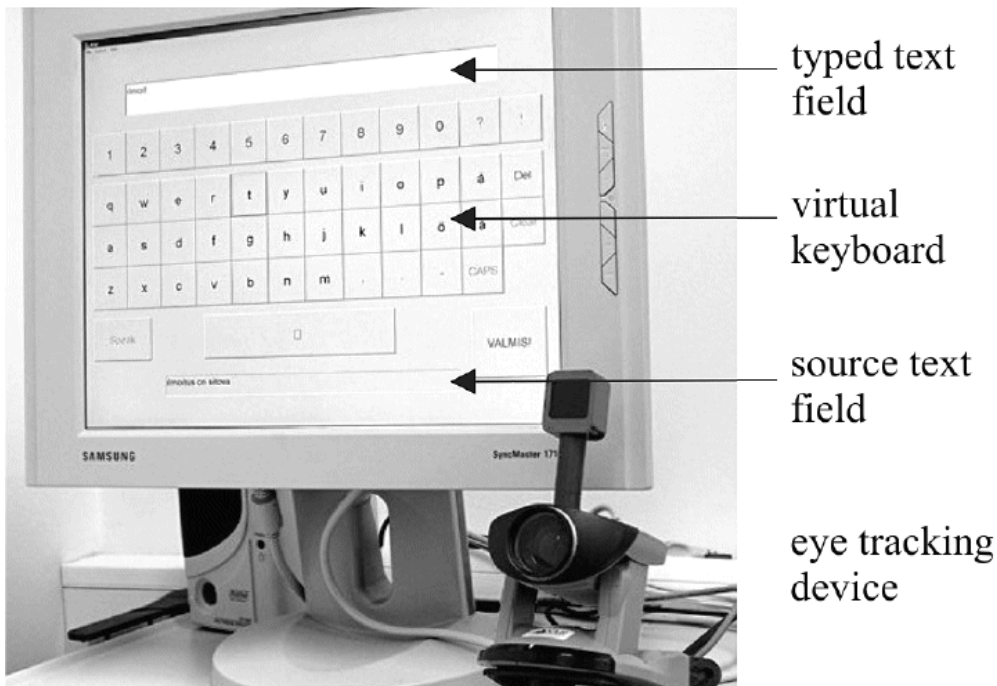
**Figure 42: FooTime foot mouse<sup>54</sup>**

- **Eye typer:** This can be used by people who cannot use a hand or foot operated mouse and a conventional keyboard. A camera is mounted onto the computer and it is set to focus on the user's eyes. The camera determines where the user is looking and monitors movements made by the eyes. Mouse clicks are performed with a slow eye blink.

<sup>53</sup>

[https://assetlibrary.dstewart.com/ImageFolio43\\_files/gallery/Product\\_Images/Web/PNG/Zoom/26124.png](https://assetlibrary.dstewart.com/ImageFolio43_files/gallery/Product_Images/Web/PNG/Zoom/26124.png)

<sup>54</sup> [http://bilila.com/yahoo\\_site\\_admin/assets/images/FM\\_Pic.194180943\\_std.jpg](http://bilila.com/yahoo_site_admin/assets/images/FM_Pic.194180943_std.jpg)



**Figure 43: Eye typer<sup>55</sup>**

- Pen Devices: These are held in the hand like a pen and come in two basic forms:
  - A device that acts in a similar manner to a mouse: you move it and a small ball rotates, moving your pointer in that direction (relative movement).
  - A device that you move on a tablet: the tablet represents the screen area, so if you touch the centre of the tablet, your cursor or mouse pointer will be in the centre of the screen. These tend to be called graphics tablets. They are widely used for drawing – larger-sized tablets are used for more detailed work.



**Figure 44: A touchpen for Windows 8 devices<sup>56</sup>**

- Touch screen: Touch screens act in the same way as a standard screen but have sensitive surfaces. Selections and movements are made by pointing (and touching) at the screen surface.

<sup>55</sup> <http://www.yorku.ca/mack/chi03d-f2.gif>

<sup>56</sup> <http://p.globalsources.com/IMAGES/PDT/B1054873070/Touch-Pen.jpg>



It is also possible to put a 'Touch Window' over the front of a standard monitor to give the same function. Touch screens are one of the key features of computer tablets such as the Apple iPad and many smart phones.



**Figure 45: Samsung Galaxy Tab 2 (10.1) with touch screen<sup>57</sup>**

- Head tracker mouse emulators: With this system, the pointer is moved across the screen simply by moving your head slightly. It works well with on-screen keyboards. Usually, a switch is used to perform the equivalent of a mouse click.
- Eye trackers: For people with very limited movement, there are systems that allow control of the computer by following the movement of the user's eyes. Some examples:
  - EyeGaze by LC Technologies Inc, [www.eyegaze.com](http://www.eyegaze.com)
  - Iriscom by Iriscom Sistemas SL, [www.iriscom.org](http://www.iriscom.org)
  - MyTobii by Tobii Technology, [www.tobii.com](http://www.tobii.com)



**Figure 46: Tobii device with symbol support<sup>58</sup>**

These devices, technically sophisticated and often high cost, require a relative stability of the head and a good ocular motility. There are both exclusively mono-ocular models and are bi-ocular models, depending on whether the operation of the system is bound to the tracing of one or both eyes. Although the stated purpose for these devices is primarily communication and

<sup>57</sup> <http://www9.pcmag.com/media/images/289491-samsung-galaxy-tab-2-10-1-touch-screen.jpg>

<sup>58</sup> <http://www.techpin.com/wp-content/uploads/2009/01/tobii-launhes-devices-with-symbols-and-text-to-speech-converter-2.jpg>

environmental control, in most cases it is possible to manage the entire use of the computer. Calibration is often required before use. This ensures the best performance of the system in relation to the characteristics of the specific user and the environmental situation. An indispensable component of the system is a desktop stand or floor (stand) to place the system, adequately depending on the position of the user. The range of features offered by these products is now very significant. In fact, most of the available models allow you to interact with face-to-face interpersonal communication software (writing with voice synthesis) or remote communication (email, chat, etc.) to perform the typical functions of a standard PC (activities of study, work and leisure) and, based on appropriately selected additional modules, to perform functions related to the control of the environment.

This kind of AT is designed for people in a state of severe motor deficits (up to the absence of motility), with a good eye control and discrete / good cognitive skills. They are mostly recommended in situations of severe acquired disability such as ALS (Amyotrophic Lateral Sclerosis).

- Mouse emulator software for other alternative access methods: A mouse emulator replaces the mouse by a specialised input device which produces signals to emulate those produced by the mouse.

### **3.5.2.3. Single movement special input devices**

Switch access may seem like an easy alternative input method for accessing the computer. However, the person's cognitive abilities must be considered. Having the physical ability to activate a switch does not mean the person will be able to use scanning as an input method. Switch scanning should only be considered after all other access methods have been ruled out. It is slow and tedious, but can be a successful access method for those who need to use it. Different modes of scanning can be used, based on the person's physical and cognitive abilities.

- **Automatic:** The user activates the switch to begin the scan. Scanning proceeds automatically at a predetermined rate until the student activates the switch again to make a selection. This requires a high degree of motor control by the user to wait for the desired selection and then activate the switch at the required time. It also requires the ability to continually attend and visually track the movement on the screen. This is not an ideal method of input for many users.
- **Single Switch Step:** In single-switch step scanning, the user must keep activating the switch until the desired selection is highlighted. To make the selection, they must wait for a certain period of time without activating the switch.
- **Two Switch Step:** In two-switch step scanning, one switch moves the highlight from one selection item to the next and the second switch selects the desired item. The user controls all timing and movement. Two-switch scanning can be extremely efficient, allowing the user to make selections more quickly when compared with single-switch scanning. While the action of two physical movements can require more motor planning and concentration, with practice it can become a rhythmic, kinaesthetic movement which requires less active thought.
- **Inverse:** The user must maintain the switch activation until the desired selection is highlighted. Releasing the switch makes the selection. This requires the ability to hold a motor pattern and

quickly release. The user must maintain direct attention to the screen and anticipate the need to release the switch.

There are two main types of switches; mechanical and electrical:

- **Mechanical switches** require that the user physically touches the switch for activation. The amount of pressure needed to activate these switches can vary. Examples include:
  - **Push** (sometimes called button or touch) switches are the most common type. The user activates the switch by pushing against its surface. These switches have a single surface area for activation. They are usually pressed with a hand, but can also be pressed by other body parts.
  - **Light Touch switches** require less pressure to activate than push switches.
  - Lever switches can be activated by pushing in any direction. They are easily mounted and are typically activated by the head or gross hand movement.
  - **Motoric-Specific Movements** activate switches such as pinch, grip, bat, pull, etc.
  - Pneumatic (sip and puff) switches depend on a change in air pressure for activation. Sipping activates one switch, puffing activates the other.
  - **Dual switches** are two switches in one housing, each having its own action. A dual switch can be used for Morse code or for 2-Switch Step Scanning.
  - **Wireless switches**: If cords and wires are a hindrance, consider a wireless switch that connects a receiver to the device and then transmits information through radio waves.
- **Electrical switches** do not require physical contact for activation. Different types of such switches include:
  - **Proximity switches** simply require a motion near the surface. They are sensitivity-adjustable.
  - **Fibre Optic switches** have a visible light and breaking this beam of light activates the switch. Fibre optic switches can be set up at any reliable site such as a finger or chin.
  - **Infrared switches** work by detecting a beam of reflected pulsed infrared light.
  - **Sensor switches** send up electrical impulses from the muscle (small movements) that activates the switch. This type of switch requires careful placement.
  - It is possible to use the same **switches used to drive a power wheelchair** to access the computer. Not all wheelchair electronics and/or switches have this capability.

In the following, a range of switches are presented:

- On/off switches: If the user is physically or cognitively unable to use any keyboard or pointing device, then a basic starting point may be to use switch input. A switch is simply a button that, when activated, sends a signal to the computer. This signal can then be used to drive various software packages. Switches come in a variety of shapes and sizes and can be operated by any controlled movement of the body. Switches work well with cause-and-effect software and programmes that require simple choices. A small switch interface box is needed to connect a switch to a computer.



**Figure 47: A switch connection with a PC<sup>59</sup>**

- Puff-sip switch: This kind of switch is excellent for someone with limited physical mobility. The puff-sip switch tube is placed in the mouth, as the person sips or blows, a switch connected at the other end goes off or on. The switch itself is then connected to the computer. Specific software running on the computer can take this input and act on it in any number of ways.



**Figure 48: IntegraSwitch sip and puff switch<sup>60</sup>**

- Morse Code: Morse Code - Morse code uses two switches and adaptive software to enter keyboard characters into a word processor. Morse code is not a common input method because it requires learning Morse code and it is slow, but for single switch users it can work well. Morse code input doesn't require the ability to watch the screen as visual scanning software does. If a single switch is used for entering the code, a dash is differentiated from a dot by holding the switch closed for a longer period of time. In two-switch Morse code, one switch is used for entering dots while the other is used for dashes. Mouse movement can be achieved using MouseKeys (accessibility feature that allows the keyboard number pad to replace the mouse), although it is tedious. An example of a Morse code device is the Darci USB. It is a plug and play

<sup>59</sup> <http://www.blitt.org/assets/images/switchdrivers/switchconnection.png>

<sup>60</sup> [http://www.rehabmart.com/images\\_html2/ABN10030300-IntegraSwitch\\_Pediatric%20Assistive%20Technology%20Switches1.jpg](http://www.rehabmart.com/images_html2/ABN10030300-IntegraSwitch_Pediatric%20Assistive%20Technology%20Switches1.jpg)

device that replaces the keyboard and mouse for Morse code input in any Windows application. EZ-Keys is a software program that provides Morse code access.

#### **3.5.2.4. Voice Recognition**

- Voice recognition software: Voice recognition software, also called speech recognition software, is the translation of spoken words into text. It is also known as "automatic speech recognition", "ASR", "computer speech recognition", "speech to text", or just "STT". The performance of speech recognition systems is usually evaluated in terms of accuracy and speed. Speech recognition is a very complex issue. Vocalisations vary in terms of accent, pronunciation, articulation, roughness, nasality, pitch, volume, and speed. Speech is distorted by a background noise and echoes, electrical characteristics. Accuracy of speech recognition vary with the following:
  - Vocabulary size and confusability
  - Speaker dependence vs. independence
  - Isolated, discontinuous, or continuous speech
  - Task and language constraints
  - Read vs. spontaneous speech
  - Adverse conditions

Good examples<sup>61</sup> of voice recognition software are Dragon Dictate for Mac, Dragon NaturallySpeaking from Nuance Communications for Windows 7, e-Speaking – software for Windows XP, Vlingo for smartphones.

- Voice recognition features integrated within operating systems: Most operating systems now have built-in voice recognition software (e.g. Windows Speech Recognition<sup>62</sup>, Mac OS X Lion speech recognition).

### **3.5.3. The need to use some functions and applications/software programmes of PCs, tablets, and smartphones**

#### **3.5.3.1. Software facilitating general PC functions**

The default accessibility features that are integrated within operative systems were addressed in "1.5.1 ICT also usable by me and by others".

What we address here are additional computer aids (not available as default software) that can make the interaction easier. As you will notice, most have been addressed in the previous sections.

- Types of assistive technology products for a computer<sup>63</sup>:
  - **Alternative input devices** allow individuals to control their computers through means other than a standard keyboard or pointing device. Examples include:
    - **Alternative keyboards**: featuring larger- or smaller-than-standard keys or keyboards, alternative key configurations, and keyboards for use with one hand.

<sup>61</sup> [http://en.wikipedia.org/wiki/List\\_of\\_speech\\_recognition\\_software](http://en.wikipedia.org/wiki/List_of_speech_recognition_software)

<sup>62</sup> <http://windows.microsoft.com/en-us/windows7/set-up-speech-recognition>

<sup>63</sup> <http://www.microsoft.com/enable/at/types.aspx>

- **Electronic pointing devices:** used to control the cursor on the screen without use of hands. Devices used include ultrasound, infrared beams, eye movements, nerve signals, or brain waves.
- **Sip-and-puff systems:** activated by inhaling or exhaling.
- **Wands and sticks:** worn on the head, held in the mouth or strapped to the chin and used to press keys on the keyboard
- **Joysticks:** manipulated by hand, feet, chin, etc. and used to control the cursor on screen.
- **Trackballs:** movable balls on top of a base that can be used to move the cursor on screen.
- **Touch screens:** allow direct selection or activation of the computer by touching the screen, making it easier to select an option directly rather than through a mouse movement or keyboard. Touch screens are either built into the computer monitor or can be added onto a computer monitor.
- **Braille embossers** transfer computer generated text into embossed Braille output. Braille translation programs convert text scanned-in or generated via standard word processing programs into Braille, which can be printed on the embosser.
- **Keyboard filters** are typing aids such as word prediction utilities and add-on spelling checkers that reduce the required number of keystrokes. Keyboard filters enable users to quickly access the letters they need and to avoid inadvertently selecting keys they don't want.
- **Light signaller** alerts monitor computer sounds and alerts the computer user with light signals. This is useful when a user cannot hear computer sounds or is not directly in front of the screen. As an example, a light can flash alerting the user when a new e-mail message has arrived or a computer command has completed.
- **On-screen keyboards** provide an image of a standard or modified keyboard on the computer screen that allows the user to select keys with a mouse, touch screen, trackball, joystick, switch, or electronic pointing device. On-screen keyboards often have a scanning option that highlights individual keys that can be selected by the user. On-screen keyboards are helpful for individuals who are not able to use a standard keyboard due to dexterity or mobility difficulties.
- **Reading tools and learning disabilities programs** include software and hardware designed to make text-based materials more accessible for people who have difficulty with reading. Options can include scanning, reformatting, navigating, or speaking text aloud. These programs are beneficial for those who have difficulty seeing or manipulating conventional print materials; people who are developing new literacy skills or who are learning English as a foreign language; and people who comprehend better when they hear and see text highlighted simultaneously.
- **Refreshable Braille displays** provide tactile output of information represented on the computer screen. A Braille "cell" is composed of a series of dots. The pattern of the dots and various combinations of the cells are used in place of letters. Refreshable Braille displays mechanically lift small rounded plastic or metal pins as needed to form Braille characters. The user reads the Braille letters with his or her fingers, and then, after a line is read, can refresh the display to read the next line.



- **Screen enlargers, or screen magnifiers**, work like a magnifying glass for the computer by enlarging a portion of the screen which can increase legibility and make it easier to see items on the computer. Some screen enlargers allow a person to zoom in and out on a particular area of the screen.
- **Screen readers** are used to verbalise, or "speak," everything on the screen including text, graphics, control buttons, and menus into a computerised voice that is spoken aloud. In essence, a screen reader transforms a graphic user interface (GUI) into an audio interface. Screen readers are essential for computer users who are blind.
- **Speech recognition or voice recognition programs** allow people to give commands and enter data using their voices rather than a mouse or keyboard. Voice recognition systems use a microphone attached to the computer, which can be used to create text documents such as letters or e-mail messages, browse the internet, and navigate among applications and menus by voice.
- **Text-to-Speech (TTS) or speech synthesisers** receive information going to the screen in the form of letters, numbers, and punctuation marks, and then "speak" it aloud in a computerised voice. Using speech synthesisers allows computer users who are blind or who have learning disabilities to hear what they are typing and also provide a spoken voice for individuals who cannot communicate orally, but can communicate their thoughts through typing.
- **Talking and large-print word processors** are software programs that use speech synthesisers to provide auditory feedback of what is typed. Large-print word processors allow the user to view everything in large text without added screen enlargement.
- **TTY/TDD conversion modems** are connected between computers and telephones to allow an individual to type a message on a computer and send it to a TTY/TDD telephone or other Baudot equipped device.
- Accessible and simplified software suites:
  - The **Eurovocs Suite** is a software package designed for people who have difficulty in using the standard keyboard. The suite consists of three programs: an onscreen keyboard (KeyVit), a word prediction module (SkipPy) and a text to speech engine (Doc Reader). The three components can be used separately or in combination and allow you to control the Windows operating system and all of its applications. They are fully adaptable to the specific needs of the user. Most importantly, the KeyVit keyboard also allows users with very severe motor disabilities to have access to all of the most popular applications, through the use of manual or automatic scanning.

Provision is made for the use of grids for the management of specific commands through pointing or the scanning of programme or operating system menus.

To facilitate the selection of buttons with a tracking system, there is a timed autoclick function: you only have to move the mouse cursor over the button you want to activate and keep it stationary in that position for a predetermined time to obtain the selection. Time intervals and sensitive screen locations are customisable.

The program comes with a number of keyboards designed to facilitate the use of certain applications, while you can still change the keyboard or create and save any new keys you want to configure.



- **Grid 2** allows you to write text, access multimedia content, browse the web, communicate via e-mail, Skype, SMS, operate IR remote controls for environmental management, control and use the main Windows programs, in a personalised way, through the use of external sensors or a joystick, or by means of scanning systems or eye control.

### 3.5.3.2. Writing aid software

It is possible to improve writing and reading skills for those that face challenges in understanding and/or using spoken language (e.g. people with aphasia) by using computer-based spell-checkers and programs for word prediction, similar to that used when writing SMS messages on mobile phones.

- Word processor for alternative access:
  - **GRAFIS**<sup>64</sup> is a word processing application specifically designed for disabled users. Target user groups of GRAFIS are users with motor impairments of upper limbs and users with learning disabilities. GRAFIS has been developed to provide the target user groups with an accessible, simple, and user-friendly word processing application that is still complete. It offers support for overcoming specific issues in addition to developing and enhancing writing skills.
  - **CLICKER 5** is the software package that combines in one product the potential of a multimedia word processor (text, graphics and audio) and the flexibility of an authoring system for the creation of virtual keyboards customised and accessed by pointing and scanning: the result is a productivity tool accessible to people with limited motor skills.
  - **XLBOOKS** is a productivity software that enables school-aged children with mild learning disabilities to be autonomous in tackling educational activities through the use of computers. In particular, the "squared notebook" allows the child to tabulate the four arithmetical operations, write, and solve mathematical expressions involving numbers and letters, etc. The "lined notebook" provides children with various compensatory tools (such as the prediction of words) in order to enable them to write text unaided.
  - **MULTITEXT** is a suite of productivity applications designed especially for pupils with disabilities. It includes a word processing program, a program to edit arithmetical notation, a program for tackling geometrical problems, and a graphics program. The user can interact with the program using a mouse, keyboard, and external sensors.
  - **FACILITIEOFFICE** is a selection of Macros, developed by Italian experts in accessibility, which have the aim of making Microsoft Office and Open Office more accessible for students with physical, sensory, and learning disabilities.
- Word prediction, grammar, and vocabulary support:
  - **WordQ** writing aid software is a writing tool used along with standard Windows word processing software to provide spelling, grammar, and punctuation assistance. It uses advanced word prediction to suggest words to use and provides spoken (text-to-speech) feedback.
  - **Co:Writer 4000** adds word prediction, grammar, and vocabulary support capabilities to any word processor or email program.
  - **Skippy** is a word prediction program for faster typing, especially useful when combined with a virtual keyboard in scan mode. It can store and customise an unlimited number of

<sup>64</sup> <http://www.ics.forth.gr/files/publications/antona/2000/Antona&Stephanidis.pdf>

word predictions. The program is fully configurable with regard to font size, text colour, background and other features beneficial for visually impaired users.

- Mouse skills: Mouse skills programs teach the users to practise moving the mouse around the screen, clicking, double clicking, dragging, etc.
  - **MANIPULER LA SOURIS** is a programme that is aimed at children who have to learn to manoeuvre the mouse (trackball/touch screen). Through simple playful activities, they learn to move and drag the cursor and to click.
  - **CatchMe 2.0** is a program to teach/consolidate the use of the mouse. It includes activities that enable users to master the main functions of the mouse (trackball/touch screen): moving and dragging the cursor, click, and double click. You can customise the environment according to the age of the user.
  - **Mouse Trainer** will quickly train any novice user to use the mouse. It is ideal for computer training centres and workshops. In about 60 minutes, a novice computer user can become acquainted with clicking, double-clicking, and dragging, without the intervention of a supervisor.
- Keyboard skills: Keyboard skills programs teach users to localise and memorise the position of keys on the keyboard.
  - **TuxTyping** is open source software that might fit the needs of users that have to learn the use of a keyboard. Entertaining exercises are proposed at different levels of difficulty.
  - **Dieci Dita** is a free program with exercises to learn the proper use of the keyboard. It is targeted especially towards users with low vision, but it is a resource for anyone who wants to improve their keyboard skills.
- **Switch and scanning skills:** Switch skills programs teach children with motor difficulties to train in the use of external switches and scanning.
  - **SENSwitcher** is a suite of programs designed to help teach early ICT skills to people with profound and multiple learning disabilities, those who need to develop skills with assistive input devices, and very young children new to computers. SEN Switcher is an online switch enabled application which targets ICT skills from purely experiential through cause and effect, switch building, timed activation, targeting, and row scanning.
  - **SENSwitcher** has been designed as a progressive teaching and assessment tool and is accompanied by an 18 page set of teachers' notes, together with assessment records, developmental skills progression models, and small step checklists linked to the Qualifications and Curriculum Authority (QCA) P Levels for ICT.
  - **SWITCHTRAINER** is software for children with e.g. haptic difficulties (especially arm and hand control) through which they can learn the use of external sensors. You can choose various scan types with one or more sensors.

### 3.5.3.3. Reading aid software

- OCR software: Optical character recognition (OCR) is the mechanical or electronic conversion of scanned images of handwritten, typewritten, or printed text into machine-encoded text. It is a common method of digitising printed texts so that they can be electronically searched and used in text-to-speech. This is especially appealing to blind and visually impaired users. A comparison of optical character recognition software is available [here](#).
- Synthetic speech system: A synthetic speech system is composed of two parts; the synthesiser that does the speaking and the screen reader that tells the synthesiser what to say.

- **Speech synthesis:** The synthesisers used with PCs are text-to-speech systems. Their programming includes all the phonemes and grammatical rules of a language. This allows them to pronounce words correctly. Names and compound words can cause problems, as they often contain unusual spellings and letter combinations. The synthesiser is usually software that works via the computer's sound card. Some synthetic speech sounds robotic, although some can sound almost human. Synthesisers are included when users purchase a screen reader. A comparison of speech synthesisers can be found [here](#). One issue is that not all languages are currently available but solutions such as Nuance Loquendo offer most European languages.
- **Screen readers:** Apart from the built-in screen reader support (see "1.5.1 ICT also usable by me and by others"), there are also other software solutions that can be run on a PC:
  - The most widely used screen readers are proprietary solutions: JAWS from Freedom Scientific, Window-Eyes from GW Micro, Dolphin Supernova by Dolphin (previously HAL), System Access from Serotek, and ZoomText Magnifier/Reader from AiSquared. The open source screen reader NVDA is equally gaining popularity through its improved functionalities. A comprehensive list can be found [here](#).
  - A side note must be made here regarding the price (and hence affordability) of these screen readers. Most are in fact quite expensive and every new Operating System requires an update of the screen reader software which is again relatively expensive. As a result, in some countries cheaper software is preferred. This may explain the rise of NVDA which is completely free.
- **Screen magnifier:** Apart from the built-in screen magnifier support (see "1.5.1 ICT also usable by me and by others".), there are also other software solutions that can be run on a PC:
  - A screen magnifier is software that interfaces with a computer's graphical output to present enlarged screen content. It is a type of assistive technology suitable for visually impaired people with some functional vision; visually impaired people with little or no functional vision usually use a screen reader. Ranges of 1- to 16-times magnification are common. The greater the magnification the smaller the proportion of the original screen content that can be viewed, so users will tend to use the lowest magnification they can manage. Screen magnifiers commonly provide several other features for people with visual difficulties:
    - **Colour Inversion:** Many people with visual impairments prefer to invert the colours, typically turning text from black-on-white to white-on-black. This can reduce screen glare and is useful for older people experiencing age-related macular degeneration.
    - **Smoothing:** Text can become blocky and harder to recognise when enlarged. Some screen magnifiers anti-alias or smooth text to compensate.
    - **Cursor customisation:** The mouse and text cursors can often be modified in several ways, such as circling it to help the user locate it on the screen.
    - **Different magnification modes:** Screen magnifiers can alter how they present the enlarged portion: covering the full screen, providing a lens that is moved around the un-magnified screen, or using a fixed magnified portion.
    - **Screen reader:** Some magnifiers come packaged with a basic screen reader, allowing whatever the user is pointing at to be read out.

- The most well-known screen magnifiers are: Dolphin Lunar, Magnifier (Windows), Virtual Magnifying Glass - Cross platform magnifier application, ZoomText.

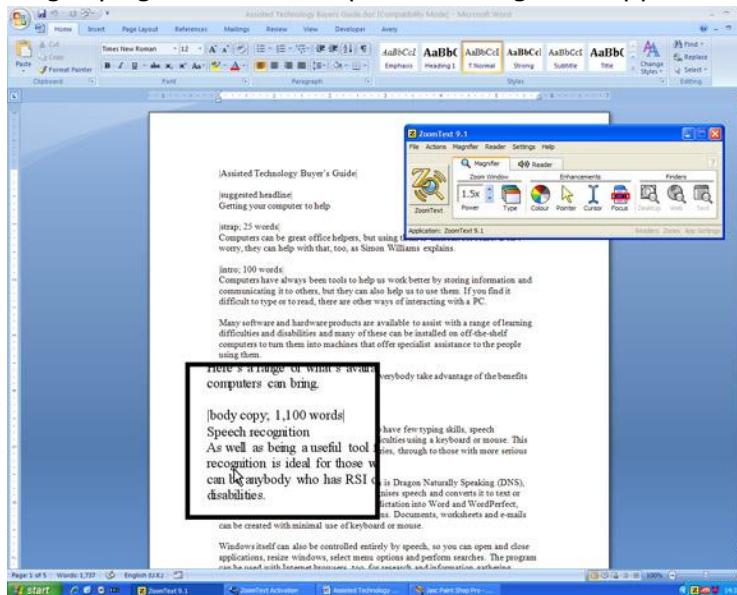


Figure 49: ZoomText 9.1 in action<sup>65</sup>

### 3.5.3.4. Alternative output solutions

- Braille Display: A refreshable Braille display or Braille terminal is an electro-mechanical device for displaying Braille characters, usually by means of round-tipped pins raised through holes in a flat surface. Blind or visually impaired computer users, who cannot use a normal computer monitor, use it to read text output. The software that controls the display is called a screen reader. It gathers the content of the screen from the operating system, converts it into Braille characters, and sends it to the display. Current operating systems usually have an Application Programming Interface to help screen readers obtain the required content information (including windows and slidebars), such as UI Automation (UIA) for Microsoft Windows, VoiceOver for OS X and iOS, and AT-SPI for GNOME. Speech synthesis is also commonly used for the same task and a user may switch between the two systems or use both at the same time depending on circumstances.

<sup>65</sup> <http://www.softwareknowhow.info/portals/0/articlresources/images/48-assisted-technologies-3.jpg>



**Figure 50: Braille display<sup>66</sup>**

- Braille printers: A Braille printer or embosser is an (expensive) impact printer that renders text as tactile Braille cells. Using Braille translation software (e.g. odt2Braille for OpenOffice.org, Tiger Software Suite 4 for MSWord), a document can be embossed with relative ease, making Braille production efficient and cost-effective. It does, however, require that the source document is well annotated and follows accessibility rules regarding document creation to ensure all data is correctly transferred.



**Figure 51: Braille printer<sup>67</sup>**

- Speech synthesis software: See 3.5.3.3 Reading aid software

<sup>66</sup> <http://blog.lib.metu.edu.tr/wp-content/uploads/2011/12/braille3.jpg>

<sup>67</sup> [http://www.braille.com.mx/4X4PRO\\_frilagd.jpg](http://www.braille.com.mx/4X4PRO_frilagd.jpg)

### **3.5.4. The need to make phone calls**

#### **3.5.4.1. Special phones (landline and mobile)**

- Landline adapted phones: the following provides an overview of accessibility features available from handset manufacturers<sup>68</sup>:
  - Accessibility features most desired by persons with disabilities
    - Clear audio
    - Large print capability
    - Text messaging
    - Connection to hearing aids
    - Audio amplification
    - Pip on figure 5
    - Large figure keys with good contrast
    - Good quality video, suitable for sign language, lip reading, and person recognition. Interoperable between IP and 3G networks.
    - Real time text together with voice
    - Total conversation ability (voice, text, video)
    - Flashing light on incoming call
    - Vibration on incoming call
    - Text relay service
    - Video relay for sign language
    - Captioned telephony relay service
    - Automatic voice to text (and sign) conversion (as soon as possible)
    - Own phone number in the national number plan leading through a relay service
    - SMS on fixed phones
  - Accessibility features in stationary phones today are:
    - For direct operation of the phone:
      - Large button phones
      - High contrast large number keys
      - Voice controlled calling
      - Stored number calling on specific memory keys with opportunity to have pictures of the destination on the keys
      - Extra loud ringing tone
      - Pip on key 5 for key navigation
      - Flash on incoming calls
      - Select high quality audio codec (available on IP and ISDN phones)
      - Programmable dialler with possibility to have pictures on the buttons
      - Self-voicing function that allows use of all features and functions without vision
      - Ability to operate all touch screen functions with gesture (coupled with voice)

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<sup>68</sup> [http://www.e-accessibilitytoolkit.org/toolkit/technology\\_areas/landline\\_phones#features](http://www.e-accessibilitytoolkit.org/toolkit/technology_areas/landline_phones#features)



- Ability to use full phone without vision or gesture (directly or via connected device)
  - Ability to control phone with AT (modem) commands
  - Ability to connect a Braille reader
  - Ability to install or activate a screen reader
  - Standardised external interfaces so that it is possible to connect standardised attachments and assistive devices
- For media production and perception:
  - Strong audio amplification
  - Inductive loop coupling from the handset to hearing aids
  - Handset designed for bone conducted audio perception
  - Short Message Service compatibility
  - Speakerphone function
  - Real-time text input and display
  - Video transmission, reception and display feature. (e.g. for sign language, lip reading, showing things or persons, general recognition)
- Accessibility features available externally through attachments:
  - To control calls:
    - Programmable dialler with possibility to have pictures on the buttons
    - Flashing devices connected via wire or wirelessly for visual alerting on incoming calls
    - Wireless vibration alert devices for tactile alerting on incoming calls
    - Mechanical handset lifter
    - Assistive devices using AT (modem) commands to control phone
    - Braille display
  - To produce and perceive the various media:
    - Headset
    - Hearing aid coupling (inductive) when held to ear
    - External handset amplifier
    - Neck loop and neck loop amplifier for inductive coupling to hearing aids
    - Alphanumeric keyboard
    - Braille display
    - Textphone addition
    - External video camera
- Relay Services are usually human operated services for media and mode (voice, text, and video) translation during phone conversations. The provision of relay services which are well integrated in the phone system is an important backbone capability for accessible phone services. Relay services are usually provided as community supported services as their operation requires much more human resources than regular person to person calls.
  - Existing types of relay services are (in all these cases, the other media such as voice, video, and text may also be handled in the call, ideally connected in two- or three-party call mode between the parties in the call who have terminals that can handle these media):

- Video relay services, translating between sign language in video and speech in a voice phone
- Text relay services, translating between real-time text in the text part of a phone and speech in a voice phone, usually for people with speech impairments, hearing impairments, deafness or deaf-blindness
- Speech-to-Speech relay services, supporting speech calls for people with speech impairments or cognitive disabilities
- Captioned speech relay services (Captioned Telephony), adding real-time text captions to a voice call, for people with hearing impairments or deafness
- Integration of relay services in the phone system implies:
  - Calls to a number for a person with disabilities should be able to invoke a relay service selected by the user if the user so decides.
  - Calls from a person with disabilities to another number should be able to invoke a relay service selected by the user if the user so decides.
  - Calls between two users who can and want to use the same modes and media in the call should be possible without invoking any relay service.
- Textphones, Video phones, Total Conversation Phones and Voice Phones: There are a number of different types of landline phones that support different media combinations (voice, video, text). Landline phones also use different types of network connections and call establishment standards (PSTN, VoIP(SIP) etc). Some examples of phones with specific accessibility features are:
  - Textphones for the analogue phone network: Dedicated devices or computer software that make it possible to use text in real-time in conversational mode. It is usually possible to alternate between text and voice during the call. A number of technical methods for analogue text telephony are implemented and international harmonisation has not been fully implemented.
  - Real-time text terminals for internet and other IP network connection: Such terminals can be seen as voice terminals with real-time text added which makes it possible to have calls in a mix of both text and voice.
  - Videophones for internet and IP network environments: Allow communication by video and audio. If they provide sufficiently smooth and sharp video they can be used for conversations in any sign language and also voice.
  - Total Conversation phones: Provide communication in real-time text, video and voice, thus providing a good opportunity to find modes that are suitable for each communication situation, especially when combined with suitable relay services. The video medium can be used for sign language, lip reading, or general recognition. The text medium facilitates using text according to the degree required in the conversation and the voice medium being used according to the user's wishes or capacities.
  - Voice phones: By themselves, they only provide for communication by voice. By means of the accessibility features mentioned above, however, they can be made accessible for people with certain disabilities. Voice telephony functionality can

also be included in computers where some types of accessibility are easier (e.g. non-visual).

We focus now specifically on telephone based communication aids for people with hearing disabilities:

- A wide range of phones have been specially adapted for use by people with a hearing loss to suit their hearing aids or cochlear implant. Some phones, particularly mobile phones, have text-based programs that can provide access to the phone for people who are deaf or have a hearing impairment.
  - Phones to suit hearing aid or cochlear implant<sup>69</sup>:
    - Loudness of speech: Many people with hearing loss require volume controlled phones. These allow the sound to be adjusted for their needs.
      - Hearing aids or cochlear implants can be used directly with the telephone: this is known as acoustic coupling.
      - Some people use what is known as inductive coupling: this involves the use of the T-switch in the hearing aid or cochlear implant and can include the use of a bluetooth device. This makes the sound clearer and reduces background noise.
    - Tone control:
      - Phones with tone control might help users to understand pitch and tone more clearly
    - Speaker phone: Some people find using this feature makes it easier to hear.
    - Cordless handsets: Some people like cordless phones because many come with a volume control. Digital technology, however, can make a buzzing noise when held close to a hearing aid or cochlear implant.
    - Captioned Telephony: This allows the person to use their voice over the phone line while at the same time receiving a captioned version of the message being spoken by the person they are calling.
    - Webcaptel: Internet-based captioned telephony service that can be used with either fixed line phones and a computer or a mobile phone that has internet access.
    - Volume control for phone ring: Phones that have adjustable ring volumes so you can hear the phone ringing. An answer machine may also be helpful to record any missed calls.
    - Background noise: Using a hearing aid with a T-switch will reduce background noise. Try to minimise the noise around you when you are using the phone. Hearing aids and cochlear implants can be sensitive to excessive background noise.
    - Neckloop: A person with hearing aids or cochlear implants will benefit from a neckloop, allowing them to hear with both ears rather than just the one you would use if using the handset directly. It includes a built-in microphone and permits hands-free use of the phone and allows you to use two hearing aids or cochlear

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<sup>69</sup> [http://deafnessforum.org.au/pdf/posted\\_files/the\\_right\\_phone\\_for\\_your\\_hearing\\_needs\\_final.pdf](http://deafnessforum.org.au/pdf/posted_files/the_right_phone_for_your_hearing_needs_final.pdf)

implants with a T-switch. The phone itself can be carried in a pocket or clipped on a piece of clothing, away from the hearing aids or cochlear implants.

- Phones that provide text-based solutions<sup>70</sup>:
  - Telephone Typewriters (TTY): The TTY is one of the oldest text-based solutions on the market. TTYS enable people who have a TTY to communicate with other people who have a TTY through the phone by typing messages to each other.
  - National Relay Services: Users of the TTY can also call people who do not have a TTY (and vice versa) by phoning through a national relay service. It operates by relaying messages from the TTY to a hearing person who receives the call and then relaying their response to the deaf person who can then read it on their TTY. Hearing impaired people who use their voice can also use a TTY to make a call through a national relay service – this is known as Speak and Read. They speak directly to the other person and then read the relayed responses on their TTY.
  - Video Relay Service: Video Relay Service is an online interactive video teleconferencing service. It means a deaf person using sign language can communicate with a hearing person over the phone, through a video interpreter (the interpreter is located elsewhere and using the internet to view the person signing).
  - SMS (Short Messaging System): Text messages are typed into the user's mobile phone and then sent to others who have a mobile. The disadvantage of SMS is that they are not in real time.
  - Real time text messaging: Many smartphones enable access to instant messaging programs such as Viber (includes audio messages and calls), WhatsApp (includes audio messages), Skype (includes video), Hangouts (includes video), etc. This allows virtually real time communication between users.

Mobile phones have increasingly been made accessible. In addition to the default available software which was addressed in "3.5.1.1 PCs, smartphones, and tablets as communication devices", some other assistive technology has been made available:

- Mobile adapted phones, using mobile assistive technology:
  - Switch Accessible Phone: The switch access can be used for single switch scanning or to answer and make phone calls and to read and compose text messages.
  - Braille interface: There are some initiatives to make mobile phones with a Braille interface. Examples are Samsung's mobile handset (the Touch Messenger), which features a Braille touch pad. However, a full Braille interfaced smartphone is not available yet.

### **3.5.5. The need to live independently and in safety**

#### **3.5.5.1. Systems for personal safety and security**

The following systems exist for personal safety and security.

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<sup>70</sup> [http://deafnessforum.org.au/pdf/posted\\_files/the\\_right\\_phone\\_for\\_your\\_hearing\\_needs\\_final.pdf](http://deafnessforum.org.au/pdf/posted_files/the_right_phone_for_your_hearing_needs_final.pdf)

- **Active and passive safety alarm solutions** - With regards to security of the person and living environments, there are two different families of solutions:
  - "active" safety systems that require voluntary action in reporting a hazard; they are usually equipped with connections for remote signalling and those of the latest generation provide many additional features such as hands-free communication with the number called.
  - "passive" safety systems that do not require voluntary action. Instead, sensors of various types (incontinence, epilepsy, pulse, etc.) detect a hazard and activate the safety procedures.
- **Personal pagers** - Among the main "active" safety systems, there are call systems that allow a person with reduced mobility and/or difficulty in verbal language to inform other people in times of need or simply ask for their attention. There are two types of call systems:
  - Call bell: consists of a transmitter unit and one or more associated receiving units positioned in the home of the people to be called. The user activates his unit via a button, a remote control, or an external sensor. It then sends signals to the receivers, which emit an acoustic signal and sometimes a light signal too.
  - Telecare: allows you to send a signal to preset numbers. It consists of a wearable remote control and a base unit connected to the telephone network. Once activated the remote control units automatically make calls to preset phone numbers with a recorded help message to alert people who are outside of the house. In some cases, hands-free communication is also enabled. The remote control can be activated via buttons or external sensors.
- **Environment and personal monitoring systems** - The detection and assessment of unexpected and potentially dangerous events that may occur in the living environment is possible through the use of sensors connected to dedicated systems. Among the most common are detectors for smoke, gas, flooding, security breach etc. If the sensors only record a change in the values set, it is then necessary to implement the procedures for the safety of the people concerned and of the environment. For example, when a sensor detects a gas leak, the system may stop the supply of gas, emit an audible signal and, when connected to a telephone switch, call emergency numbers. The movement or presence sensors detect the presence or movement of the individual and trigger preconfigured functions. This type of sensor can be used both to notify a possible intrusion into the home (and implement appropriate measures) and to automate actions, allow access, and facilitate, for example, the management of the lights. The monitoring of people within defined environments can be performed using different technologies. Making an informed decision about what monitoring system is most appropriate for the person concerned is very important. Here are some examples:
  - Simple monitoring: This is where simple sensors such as occupancy sensors, motion sensors, fall sensors, etc. can automatically trigger actions such as remote reporting.
  - Behavioural monitoring: This involves establishing a person's normal routines and patterns of behaviour during the day or night in order to identify abnormal behaviour which could indicate possible issues. Occupancy sensors, for example, can be used not merely to turn on the lights in certain environments, but also to give us information about the person that passes those lights; if a person goes to the bathroom every morning between 8 am and 8.30 am (the presence sensor turns on the light and gives us

this information), the breaking of this pattern may signal a possible danger. The same can be done with intelligent flooding, smoke and gas sensors and water flow meters. In the case of the latter, the reporting of continued water flow in the bathroom when the person concerned is in the kitchen would reveal that they have forgotten to turn off the tap and would trigger an alert notifying them. This type of monitoring is not very invasive; the person feels safe and not observed or controlled in any way.

- CCTV monitoring: Video surveillance systems can be more or less invasive depending on the type of camera used. Out of focus cameras provide a certain level of privacy in that the person concerned may not be recognisable while permitting their movements to be monitored and a fall or sudden crisis to be recognised and appropriately dealt with. When the cameras are in focus there is loss of privacy but there is the advantage that they can also be used for security against intruders. There is growing use of intelligent cameras capable of automatically detecting the passage of people or abnormal positions such as those caused by a fall. In this case there is a maximum level of privacy because the processing is automatic.
- **Standalone localisers** - These devices are used to locate the position of a person. They are divided into the systems for outdoor or indoor localisation:
  - GPS, GSM and GPRS systems: There are wearable devices using a GPS receiver for locating the user with position and alarm signals communicated via a GSM / GPRS network. In some cases there is voice communication with the person wearing the device. Running on batteries, their duration depends on how they are used (usually from 24 to 48 hours). Some devices can be programmed to send a position signal at regular intervals, some permit the creation of virtual areas so that if the user leaves a certain zone this is automatically reported, some incorporate an emergency call function with hands-free communication, some have integrated accelerometers or inclinometers and automatically send an alarm signal in the event of a fall.
  - The RF-ID (Radio Frequency Identification) systems are based on an RF-ID tag sewn on clothes or glued to personal items. Such systems can be very useful in sheltered housing. Together with radio-controlled entrances they can help in the monitoring of residents without necessarily closing doors, leaving freedom of movement in the communal areas while permitting help to be given to guests with cognitive limitations if they wander into an area unfamiliar to them.
  - Systems based on WiFi access points: In the case of people using smartphones and tablets connected to wifi networks, it is possible to identify which room they are in by means of the access point to which they are connected at any given time.
- **Software localisers** - These are the applications installed on smartphones and tablets that permit you, at the touch of an icon on the display, to send text messages or email messages with requests for help along with your location on an online map (e.g. Google maps). They are highly customisable: you can specify more than one mobile number as a destination for an SMS or more than one email address; you can specify a time interval before sending a new message to a new number or email address; in some more sophisticated versions you can specify whether the intervention of a doctor is necessary. In some cases they are also emulating the functions of standalone locators.



- **Navigation systems and access to databases** - In recent years, the increasingly widespread use of mobile devices has been accompanied by the development of applications for navigation of all kinds. Now a new family of applications is being developed based on access to databases which are constantly being updated, including by the users themselves, providing precise information on the accessibility of cities, districts, and even buildings. Some help with the planning of accessible routes, others give voice feedback for the blind during the exploration of the map itself, and others provide information on what services are accessible to people in wheelchairs.

### **3.5.5.2. Environmental control devices**

Here we are concerned primarily with electronic systems that enable someone with limited mobility to control various appliances, lights, telephones, and security systems in their room, home, or other surroundings. This category includes Environmental Control Units (ECU), electronic appliance switches, switch mounting systems, home automation systems, signalling and alerting devices, home alarms, television adaptations, smoke alarms, and telephone ringers, etc.

- **Simple electronic and ICT aids for sensory disabilities** - A variety of electronic and ICT devices are available on the market to help people with sensory disabilities perform the activities of daily living. For example, for people with a visual impairment there are devices such as talking watches, alarm clocks, thermometers, thermostats etc. that allow for information to be received via synthetic speech. Smartphone and tablet applications now offer similar functions and include some that can read barcodes and provide information on various products. For people with hearing difficulties there are many devices to convert sounds such as those produced by doorbells, alarms, telephone calls, etc. into visual information or vibrations.

### **3.5.5.3. Domotic and home automation solutions**

The following provides an overview of domotic and home automation solutions.

- **Integrated domotic/home automation systems** - An integrated home automation system is a structure in which all, or almost all, of the systems present in a house (electrical, water, alarm, doors/windows, etc.) communicate with one another through a system that can deal with complex requests. One system of this kind is based on a Bus systems technology, in other words on a data line that transmits control signals to the various devices in the home automation system, which resembles a network of computers in which the Bus represents the means for the transmission of commands. Integrated with an electrical system, Bus home automation systems provide improved performance and control of technological devices necessitating more complicated wiring. In Bus systems the user no longer has a direct relationship with the device they wants to use; instead their commands are filtered by the management software which transmits signals from an input interface to an output interface, which activates the desired device. This set up allows considerable freedom in choosing an input interface adapted to the needs of the user (wall buttons, highly accessible remote controls, computing devices, etc.). With a domotic system of this kind the activation of a single wall control or remote control (through PCs, smartphones, tablets) can trigger a series of events - the switching on and off of devices, the opening and closing of doors and windows, etc. - actions which would otherwise may require a great deal of effort on the part of someone with disabilities. The advantages include the ability to manage a large number of devices (even those situated in areas and on

levels away from your location), the possibility of using a single interface to control all the devices in the house, and the possibility of modifying the system over time without having to undertake building work.

- **Simple devices for environmental control** - The retail market now offers an increasing variety of products for environmental control which can be bought in supermarkets and used immediately without complicated installation work. Applied to switches, they permit them to be activated remotely via a radio or infrared command; presence sensors can be mounted on light bulbs so that once installed they can be turned on and off by someone passing them; spotlights, wall lights, etc. can also be controlled by presence sensors in the same way.
- **Special remote controls and other standalone human environment interfaces** - Remote controls for environmental monitoring designed to promote the domestic autonomy of persons with disabilities can manage many devices through a single interface because they can be programmed to respond to codes and signals from other commercially available remote controls. In this way it is possible to manage the television, multimedia devices, lighting and many other environmental functions with a single remote control. The dedicated remote control chosen in a specific case should be geared towards the capacities of the person with disabilities. Many remotes offer multiple methods of use to meet the needs of people with differing motor, sensory, and cognitive capacities. When it comes to remote controls for people with disabilities the following features may be useful: simplified controls, shields which provide hand support while preventing the possibility of buttons being pressed inadvertently, voice-controlled systems, systems with audible feedback or synthetic speech and access to scanning with external sensors. The technologies which are most commonly used are those with Infrared (IR) or radio frequency (RF) signalling. IR is easier to replicate on universal remotes and is the most widely used signal type in household electronics (TV, Satellite, DVD, etc.). The downside of IR is that the signal range is very limited (one room); with an optical signal, the transmitter and the receiver must be in the line of sight.  
RF signals have a wider range (the home) than IR signals; they can overcome obstacles and do not need the transmitter to be perfectly in the line of sight with the receiver. The one disadvantage is that they are difficult to replicate. In addition to direct programming, some types of remote controls allow for interfacing with a PC using special software. This offers the possibility of more sophisticated programming. Some have the ability to associate icons or text with buttons to identify the various functions they have memorised. In order to manage a large number of devices using a limited number of keys, some remotes use macro-areas or subtree structures. Some models can link customisable synthetic speech messages to single keys. Amongst the many solutions available for the customisation of modern electronic wheelchairs, control units which can control some devices in the environment are becoming increasingly common. In most cases, they come with a display that allows you to access the various functions via a menu or by means of icons. The most interesting aspect of this development is that it gives the user the ability to control everything using the same system that is used to control the wheelchair, be it a normal joystick, or an alternative system (mini-joystick, scanning, sensors of various types, etc.).
- **ICT based human environment interfaces** - Given that solutions are available to ensure effective and efficient access to PCs, tablets, and smartphones, even where the needs of the user are very specific due to their particularly disability, in some cases it can prove to be

advantageous to use these systems for the control of the environment, through specific software solutions, or in other cases a combination of specific hardware and software. An important consideration here is the fact that in some systems the connection may be bidirectional; in practice, the device cannot only send commands to the home automation system, but also receive information from the environment, such as the status of the controlled devices, alarm signals, images from cameras and video, etc.

- **Motors for doors, gates, windows, etc.** - The use of motors for gates, doors, windows, and other fixtures brings with it several advantages; they promote autonomy by creating access in a situation that would otherwise be difficult or impossible for people with mobility impairments, they reduce the need for assistance, and they allow for home automation.

How can we make the most of these devices? Most importantly, by installing them in positions identified as critical in the daily life of the person concerned, after carefully planning how the building can best be entered and left in full autonomy. They are usually installed on blinds and shutters inside, on the front door, the door to the building, and on the gate outside. It should be borne in mind that when an entrance is motorised, it can be controlled remotely from a distance in complete safety using devices such as remote controls and RFID electronic keys (the latter, which are also called transponders, are inexpensive devices which are safer than a traditional key; all the user has to do is wear one and once a door equipped with a receiver is approached by the user, the home's domotic system is activated and the door opened automatically).

### 3.6. Choosing ICT AT

The need to make an informed choice in choosing a technology is paramount. This involves the assessment of different factors, such as personal factors, including the needs and wishes of the user, technology related factors, and environmental factors. In this unit we will delve a little deeper into appropriate AT assessment procedures.

An Assistive Technology Assessment is a collaborative process whereby a team of experts discusses and identifies technologies that can improve an individual's performance, access, participation, and independence. The group may include certified technology specialists, an education team, and other related services professionals. This is an ongoing process – not a one-time event – designed to match particular individuals with assistive technology. Assessing a person's needs, strengths, abilities, and challenges increases the likelihood of specifying solutions that will improve performance. Finding the right tool for the job is crucial.

Generally, an initial assistive technology assessment has five phases:

1. **Defining the Problem or Challenge:** What task does a person struggle with due to their disability? If the person cannot adequately perform these tasks with mainstream solutions, consider whether assistive technology might help.
2. **Gather Relevant Data:** Using existing documentation/testing, observation, and interviews with both relevant professionals and family members, a person's strengths, present skills, barriers to task completion, learning environment, and current level of performance are gauged.
3. **Generate Potential Solutions:** Based on the information collected, begin to sketch out ideas where certain tools, strategies, and supporting services can be identified which may improve performance and increase participation and independence.

4. Conduct AT Trials: An AT trial plan is developed and implemented that includes criteria and timelines for determining success and the collection of measurable data on the impact to the person's performance.
5. Integrate Successful Tools and Strategies: Analyse results, determine most appropriate tools and strategies based on AT trials (or confirm whether additional trials are needed), and develop a plan to implement the recommended technology.

A less formal approach can also be applied, especially where such formal assessment is not available. In both cases, it is recommended that individuals familiar with the area are asked to facilitate the discussion. Assistance may be available from a local occupational therapist, assistive technology service, or a school/college disability service. The process of selecting AT is ideally made with the support of an experienced AT resource person or occupational therapist. They will involve the person in every aspect of the decision process and may include any relevant stakeholders such as family members, teachers or employers. They can assist the user in identifying and considering all the relevant factors regarding their capabilities and preferences, the environment factors where the technology will be used, and the characteristics of the technology. They may also be able to instigate trials of AT equipment or organise training around specific products.

Here are some guidelines<sup>71</sup>:

- Using the AT Tool in Different Settings: AT can help a person to function more effectively in various settings such as school, home, work, social gatherings, and recreational events. Here are some questions to consider:
  - **In what settings will the AT tool be used** (e.g. home, school, work and/or social settings)? The right technology in one setting may be wrong for another. Think about where it will be used, how it will be stored, and if the right furniture and electrical/electronic support is available.
  - If the AT tool will be used in more than one place, **how portable is it**? Fortunately, hand-held, pocket-sized and mobile tools are often as useful as larger systems. A pocket-sized spell checker may work just as well as a computer with a spell-check program, and it's much easier to carry around.
- Product Usability and Reliability: As with any device or piece of equipment, you will want to know how user-friendly and reliable an AT tool is before you invest in it. Here are some questions to ask about a product's reliability, usability and quality:
  - **How easy is it to learn about and operate?** How user-friendly is the AT tool? Instructions should be brief and easy to read. Commands for operating should be clear and simple. Directions should include a logical, step-by-step process for setting up and installing the technology, basic and advanced operating instructions and tips for what to do when things go wrong.
  - **What is the quality of its visual display and/or auditory output (if applicable)?** Make sure the visual display and audio output are clear and easy for the user to see and/or hear.

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<sup>71</sup> <http://www.greatschools.org/special-education/assistive-technology/783-evaluating-consumer-AT-products.gs> & <http://www.enableireland.ie/content/selecting-assistive-technology>

- **How reliable is it?** Ask past and present users how well the product performs and about its durability. Does it always seem to be breaking down or need frequent repairs? You may find it helpful to have a local technical-support system of people who are familiar with this AT tool or a similar one. This might include other users, parents, carers, local support groups, teachers, technical support staff and tutors. An internet search of customer reviews may also help answer your questions.
- **Does it need to work with other technologies?** Make sure that the AT product is compatible with related technologies. For example, software designed to work on a personal computer may not operate on a Mac at home, in the classroom, or at work. Ensure that any accessory items, such as a microphone, are readily available. Consider the AT product's compatibility with the internet; for example, does a text-to-speech tool read certain websites aloud?
- **What technical support is available?** Even with the most comprehensive and easily understood instructions, you may need technical support. Select products that offer online and toll-free support, readily available field representatives, and convenient service locations. Check the length, cost, and limitations of product warranties should you decide to buy one.

### 3.6.1. Activities

The implementation of a guided interactive learning process that involves the learner, the tutor/trainer and, if appropriate, a carer.

- Every user conducts a self-assessment, using the following guidelines (in question format) to consider the selection and purchase of equipment:
  - Does the device meet my needs?
  - Is the technology easy to use and set up?
  - Is the size and weight of the device manageable?
  - Would I be comfortable or self-conscious when using the product?
  - Will it suit the environment where I intend to use it; will I need to adapt the environment?
  - Do I need training on the product?
  - Is training available?
  - Will I be able to get support?
  - Have I considered all the alternatives?
- discuss the barriers that people may encounter in accessing opportunities available to all and identify the general areas of need
- Identify areas of need (and wishes) relevant for the learner and categories of AT solutions
- Focus on the solutions identified and see how they are composed (components). Look at and learn the names of the various ICT AT components and how to describe them
- Discuss the functioning of the device/solution and, in the case of different components, how these interrelate and interact with one another
- Identify parts of the device that need maintenance
- Explore the use of the ATLEC mobile app to demonstrate appropriate solutions for the learner and other personas
- Self-directed consultation of information materials, websites, catalogues of companies.

- Visit to fairs, exhibitions
- As a team, analyse and assess a “case study”, sharing independent ideas and opinions regarding ICT AT, correct ICT AT use, and related training needs
- As a team, analyse and assess a “case study”, demonstrating understanding of the limitations of your knowledge base and skills.

### **3.6.2. Additional reading**

- Lewthwaite, Sarah (2011) *Disability 2.0, student dis/connections: a study of student experiences of disability and social networks on campus in higher education*. PhD thesis, University of Nottingham. <http://etheses.nottingham.ac.uk/archive/00002406/>

## **3.7. What are the opportunities offered by assistive technology?**

### **3.7.1. The concept of autonomy/independence related to the personal situation**

Autonomy and inclusion. Choice and control. Dignity and equality. Most people take these for granted as part of their everyday lives. However, for many people with disabilities, these are often everyday dreams, everyday challenges, and everyday struggles.

In the last decade disability rights has risen up the political agenda; problems were identified, data was collected and, most significantly, an international legal framework was put in place. The UN Convention on the Rights of People with Disabilities (CRPD) came into force in 2008. It is the first international human rights treaty signed by the EU itself. The EU as well as those Member States that have ratified the Convention are now bound to respect the rights enshrined in the Convention at both EU and at national level.

The right to independent living signifies the following for persons with disabilities<sup>72</sup>:

- First, it represents increased autonomy and inclusion:
  - Being able to make decisions about one’s own life is fundamental
  - Equally important is to be part of the community, to feel accepted
- Second, it also represents increased choice and control:
  - Being able to choose where to live and with whom
- Third, it represents respect towards an individual’s dignity and equality:
  - Being given the same opportunity as others or having their voice heard so that specific issues are presented by them
  - Having a say in how to be treated

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<sup>72</sup> <http://fra.europa.eu/en/speech/2012/autonomy-and-inclusion-people-disabilities>



### **3.7.2. Deficits in current policies and programs**

Assistive Technology supports the self-management of health, wellbeing, and independent living for people with disabilities. Whilst AT has evolved tremendously in recent years, there is still much to be done to improve the education and awareness that surrounds AT, and improve product design and performance to reduce the likelihood of product abandonment<sup>73</sup>.

It must also be noted, however, that there are still significant shortfalls in promoting policies and programs in ensuring that essential services are accessible to persons with disabilities around the world. For example<sup>74</sup>:

- 50 percent of countries<sup>75</sup> (31 percent in 2012) now have a definition of accessibility which includes ICTs or electronic media in their laws or regulations in compliance with the definition of accessibility in CRPD Article 9, but only 25 percent define, promote, and monitor accessibility standards for ICTs.
- In 2013, about 73 percent of countries have a process whereby persons with disabilities are consulted in the development of disability-related policies and programs, but only 12 percent have a systematic mechanism to involve Disabled Persons Organisations (DPOs) working in the field of ICT accessibility for the drafting, designing, implementation, and evaluation of laws/policies.
- Only 31 percent of countries have government funds allocated to programs in support of ICT accessibility in both 2012 and 2013, indicating a lack of development.
- In 2013, only 31 percent of countries report that they have public procurement policies promoting ICT accessibility, suggesting that a majority of countries continue to buy equipment or services which may be inaccessible to its intended users with disabilities.
- In relation to the above, only 35.6 percent of countries in 2012 provided services to the general public, including through the internet, in accessible and usable formats for persons with disabilities, while 40 percent of countries report providing such services in 2013.

The accessibility of the information infrastructure, a vital area of ICT accessibility with the greatest impact on the largest population of users, is falling behind ratifying countries' general commitments to the CRPD: More than 80 percent of countries in 2013 report no or minimum levels of implementation of policies or programs promoting accessibility in critical areas such as mobile telephony, fixed telephony, website, transportation public address systems, television or Automatic Teller Machines (ATMs).

Whilst most countries are generally aware of their basic obligation to implement ICT accessibility, they have not: (1) translated essential CRPD dispositions into actual policies or programs and (2) included

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<sup>73</sup> As reported on extensively in "Analysis of the context of ICT use" report from the FP7 AEGIS project. Available at [http://www.aegis-project.eu/images/Deliverables/D1.1.2\\_Final.rar](http://www.aegis-project.eu/images/Deliverables/D1.1.2_Final.rar).

<sup>74</sup> Preliminary findings of the third edition of the CRPD Progress Report on ICT Accessibility, by G3ict – the Global Initiative for Inclusive Information and Communication Technologies, in cooperation with DPI – Disabled People's International, as was presented on the occasion of the General Assembly's High-Level Meeting on Disability and Development at United Nations Headquarters in New York on 23 September 2013.

<sup>75</sup> Entire list of countries surveyed: [http://g3ict.org/resource\\_center/CRPD\\_2013\\_countries](http://g3ict.org/resource_center/CRPD_2013_countries)

persons with disabilities in the foundation of countrywide policy development processes and capacity-building necessary to achieve valued outcomes. As a result, more than one-fifth of the world's population may be vulnerable to a digital divide.

The following table clearly illustrates that there is still a lot of progress to be made.

**Table 12: Accessibility Policies for Specific ICT Technologies, Products and Services by Level of Implementation**

Are there any dispositions among Country laws, regulations and government supported programs promoting digital accessibility, the use of ATs or provisions from reasonable accommodations in the following areas of ICT?	No	Minimum	Partial	Substantial	Full
<b>Copyright Exceptions</b>	84%	7%	6%	3%	0%
<b>ATM or Kiosks</b>	69%	21%	7%	0%	3%
<b>Fixed line Telephony</b>	65%	14%	13%	6%	1%
<b>Wireless Telephony</b>	65%	18%	9%	4%	4%
<b>Public Building Displays</b>	64%	26%	7%	1%	1%
<b>Digital Talking Books</b>	64%	17%	14%	3%	1%
<b>Transportation Public Address Systems and Services</b>	59%	25%	12%	4%	0%
<b>Websites</b>	54%	29%	10%	7%	0%
<b>Television</b>	29%	51%	15%	4%	0%

More data can be found in the "[Third edition of the CRPD Progress Report on ICT Accessibility](#)".

### 3.7.3. Personal needs related to a specific context

Being able to do things independently is important to every individual, but especially for those with disabilities as they can so often face barriers to everyday tasks. They want to be in control of their own lives and an active member of their community. Personalised technology can take many forms, whether it's in a gadget that reminds you to close the fridge door, or a mobile phone application to show you where to catch the bus without any other assistance. The following sections provide examples of such context-related AT.

#### 3.7.3.1. Personal needs related to educational tasks during provided lectures and class courses

Participating in education is a crucial element for people with disabilities and this can be made possible in a variety of ways:

- A student with hearing difficulties may wish to have access to the hearing loop/infrared system or for the lecturer to use a micro link to their radio aid.
- A blind student or someone who deals with vision challenges may require handouts and course presentations in Braille/electronic/audio or large print format, or even use magnifying equipment.
- Students with learning disabilities may need to record lectures and obtain official consent for this.
- Some students could also use captioning/transcripts of video presentation (i.e. use closed or open captioned videos or have transcripts available) or FM systems with certain receivers (e.g.

neckloop, ear bud) which allow direct sound from the microphone to the student without extraneous noises.

- Adjustable computer settings and peripherals for those with physical and mobility disabilities in order to access course materials, school/university announcements, lab material, etc.

### **3.7.3.2. Personal needs related to implementation of tasks in working environments**

Employees with disabilities are responsible for initiating the process of identifying appropriate AT. They have to identify their disability to their employer when requesting AT as an accommodation on the job and negotiate it with their supervisor. It is also important to remember that the need to find the right environment and set of job duties must match the individual's interests, work habits, and skills in order to be productive and creative in relation to their strengths and limitations. There are many AT devices (also some portable ones) that can enhance a personal workstation and satisfy individualised needs:

- Portable spell checkers and word processors can take notes with the support of various editing features.
- Talking calculators can assist with ordinary calculations with the addition of reading the numbers and functions aloud.
- Smartphones have features such as alarms, calendars, calculators or global positioning systems. Tech support from the vendor is usually required to help customise the features and to demonstrate how to use them.
- If experiencing difficulty typing or writing there is text-to-speech software that reads electronic text and even proofreads an individual's writing, as well as speech recognition software that converts dictation to text and/or word prediction programs that provide assistance in spelling and typing with a list of predicted words after a few letters have been typed.
- Information management and communication software is useful in organising e-mail messages, schedules, tasks and contact information, and for alerting an individual to a meeting, appointment, or message received.
- In order for the computer accessibility features to fit an individual's daily work needs, they may have to adjust the contrast and enlarge print and graphics on the screen, adjust the contrast and background colour schemes and/or adjust keystroke and mouse controls settings.

### **3.7.3.3. Personal needs related to daily living**

Assistive technology is highly valued by users with various disabilities in performing daily tasks (from accessing a computer independently to using environments control systems). Additionally, it supports and reassures the carers, as they can be easily alerted by the user when their assistance is needed.

- Access to computers and laptops whilst in a wheelchair or lying in bed, via adjusted keyboards, mice, trackballs, switches, and eye-tracking systems for those with severe physical and multiple disabilities in order to communicate, socialise, and/or work from home.
- AT systems, like timers, remind the user to take their medication at the right time, help locate a lost item, or even orientate the person that it is day time or night time.
- Quick calls via pre-programmed numbers or even a family member's picture assists users with disabilities to phone a relative or friend.

- Getting up at night time can be frustrating if the user's disability doesn't allow them to get out of bed without assistance; environmental control systems or devices with built in "wake-up" commands and speech recognition systems allows for the lights to be switched on or the curtains to be opened automatically.
- Telecare assistive programs can also monitor the environment of the user and keep them safe by enabling immediate communication between the person with disability and the family or the telecare provider centre.
- Hand-held GPS devices (or smartphones) help people with visual difficulties navigate busy city streets and use public transportation independently.

### **3.7.4. Activities enabled by the AT solution**

Depending on the users' needs and limitations, the most common daily activities requiring AT equipment and support are:

- Communication with family, friends, classmates, and colleagues
- Enhanced educational experiences
- Note-taking and reminders (for work deadlines, appointments, meetings, medication, etc.)
- Delivering work tasks
- Converting any type of material into an accessible format (e-text, audio, visual, Braille, etc.)
- Entertainment (computer/video/online games, etc.)

### **3.7.5. Personal training needs and wishes**

There are many AT products on the market today. The first step to narrowing down the search for appropriate AT tools is to analyse key factors, such as the individual needs, the specific tasks that must be delivered, and the type of AT equipment that will enhance the existing skills (given the disability's nature and the limitations of the physical environment).

Most users are interested in the quality, usability, and reliability of the AT tools and they want to know how user-friendly and reliable an AT tool is before they invest in it.

The best way to test the AT equipment's functions is by using it in different settings. For example, AT can help a student with a physical disability participate in activities at school/college as well as in other settings such as home, work, and social gatherings. Portability has to be considered, as hand-held, pocket-sized and mobile tools are often very useful and light-weight. However, you need to remember that the right technology in one setting may be wrong for another.

### **3.7.6. Limitations to the given AT solution**

Do assistive technologies have limitations? The truth is that AT may not be the answer for everybody. People with disabilities have different needs, skills, desires, habits, challenges, and insecurities. AT can be ineffective and even cause additional distress if it does not meet individual needs and preferences. For example, AT may not be useful when:

- It is not user-friendly (e.g. the number of keystrokes and mouse clicks necessary to operate the software/hardware can be extremely burdensome);

- there has been a “mismatch” between the user’s needs and the AT tool’s capabilities during the assessment phase;
- the user switches off or unplugs the devices (in cases of mental or cognitive disabilities);
- the user is confused or panicked by any alarm sounds, lights, or synthesised voices;
- there is need for single keystrokes to enter complex text (e.g. print page reference number formats, foreign language sentences and phrases, mathematical operations) which are not available on a standard keyboard;
- assistive technology is expected to replace human contact and personal care. AT can only act as a helpful addition to social life, not as a “remedy” for loneliness and social isolation.

### **3.7.7. Examples of other people in similar situations and their strategies of using AT**

#### **3.7.7.1. Case Study 1 - AT accommodations for learning disabilities**

**Situation:** Young adult with a learning disability (dyslexia and dysgraphia). He can read but it takes him a very long time; he can write but writing is extremely slow and exhausting. Skills in reading print material and expressing himself in writing or using a keyboard are very slow.

**AT solution:** He uses taped texts and electronic text, as well as word prediction programs that suggest words based on the first few letters of a word and its context.

#### **3.7.7.2. Case Study 2 – AT accommodations for upper limbs’ limited function**

**Situation:** A woman with quadriplegia that uses a power wheelchair and has very limited functional use of her arms and hands. Her new work position requires more typing which is exhausting and may cause chronic fatigue problems in the future.

**AT solution:** Her computer system was set up with trackballs and mouth pointers to make using a keyboard much easier, while she also tried a speech recognition system. This system was a highly developed, user-friendly speech-to-text program that recognised her speech patterns and stored vocabulary already input by her. The longer she uses the system, the more quickly and accurately it recognises her speech and word use. She was able to master the system with approximately two weeks of training.

#### **3.7.7.3. Case Study 3 – AT accommodations for daily communication (combined speech and mobility disabilities)**

**Situation:** A middle-aged man with severe Amyotrophic Lateral Sclerosis (ALS) who receives assistance for most movement, uses a power wheelchair and he is unable to speak without the aid of a computer.

**AT solutions:** He uses a thumb switch and a blink-switch attached to his glasses to control the computer. When he blinks an infra-red switch is activated and he is able to scan and select characters on the screen in order to compose a URL and access the internet. He “speaks” through a voice synthesiser.

#### **3.7.7.4. Case Study 4 – AT accommodations for hard of hearing**

**Situation:** Young woman hard of hearing with hearing aids in both ears who needs to participate in discussions during an educational workshop. She is unable to hear most of the discussion and the background noise reduces the effectiveness of her hearing aids.

**AT solutions:** She uses an FM amplification system during workshops to eliminate the background noise. With this system, the speaker is provided with a microphone, and the sound is transmitted through a receiver directly to her hearing aid. Whoever wears the transmitter unit repeats any question/answer taking place by others so she can hear it.

#### **3.7.7.5. Case Study 5 – AT accommodations for deafness**

**Situation:** Young student with a severe to profound bilateral hearing loss; he uses hearing aids and lip-reading to maximise his communication skills and has some knowledge of English Sign Language but not enough to effectively use a sign language interpreter as an accommodation.

**AT solutions:** He usually uses an FM amplification system (via a microphone and transmitter worn by the instructor his or her words are sent directly to his hearing aid), but also real-time captioning which involves a stenographer who has a steno machine and laptop with stenography software sitting next to him so he can see the monitor. Alternatively, the stenographer can be at a remote site; in this situation, the instructor wears a wireless microphone that transmits the voice back over the same phone line that is used to instantly send back the real-time captions to the student with a laptop in the classroom.

#### **3.7.7.6. Case Study 6 – AT accommodations for chronic fatigue syndrome**

**Situation:** Journalist with chronic fatigue syndrome that affects her writing assignments and requires the use of a computer keyboard; she has chronic physical exhaustion and widespread muscle and joint/wrists pain.

**AT solutions:** She was introduced to speech input software which allows her to bypass the keyboard and participated in training sessions that provided her with extra skills on speech recognition systems and effortless computer access options.



### **3.7.7.7. Case Study 7 – AT accommodations for low vision**

**Situation:** Student with Stargardt's disease (legally blind, but with some peripheral vision). He is able to read some print material but for longer readings he needs a closed-circuit TV (CCTV) monitor that uses a camera to enlarge regular print material.

**AT solutions:** Since he can use CCTVs and monitors effectively, he used a video camera with a very powerful camera lens, with tripod and monitor, through which he can see the blackboard, overheads, and other visual aids used by his professors.

### **3.7.7.8. Case Study 8 - Web Access for Student who is Blind**

**Situation:** Blind scientist uses a refreshable Braille display to access text that appears on a computer screen. Some data she uses for her research is available on web pages that include plots of various graphical models that are not accessible to her, since neither refreshable Braille displays nor speech synthesisers are capable of reproducing graphics.

**AT solution:** Including short text descriptions of the plots; each description appears directly above or below the plot to which it applies and the student can access this text with her Braille output system, which is part of the standard computer configuration that she uses.

### **3.7.7.9. Case Study 9 – AT accommodations for employee with obsessive-compulsive disorder (OCD)**

**Situation:** Man with OCD with particular problems receiving, processing, and recalling information, especially during times of stress. The episodic and unpredictable onset and recurrence of OCD can also interrupt the working tasks due to an inability to block out sights and sounds, the limited ability to tolerate noise and crowds, and the difficulty in understanding or remembering verbal directions.

**AT solution:** The user preferred to run his browsers using special plug-ins like pop-up and animation blockers. He uses alarm notifications on timer devices that improve his ability to transition between tasks.

### **3.7.7.10. Case Study 10 - AT accommodations for a person with Autism**

**Situation:** Young autistic man with severe communication difficulties and language and developmental delays.

**AT solution:** Installation of the Board Maker, an assistive computer program which creates visual pictures that the user can use for communication, as well as the Picture Exchange Communication Systems (PECS) which creates symbol pictures and cards (and labels for them).

### **3.7.8. Activities**

The implementation of a guided interactive learning process that involves the learner, the tutor/trainer and, if appropriate, a carer.

- Discuss in detail personal needs in a given context
- Reflect on what led to the use of ICT AT
- Reflect on the challenges faced before the device was utilised and what difficulties might recur if the devices are not used
- Learn to identify and name the various functions that the device can help me with
- Identify the various tasks (activities) that the device allows me to perform
- Explore what the learner can do autonomously with the device or identify where support is still needed
- Discuss the advantages and disadvantages of using the device/solution
- Discuss what the learner hopes to learn in the training, specifically with regards to the opportunities offered by the device/solution
- Discuss further expectations concerning AT and autonomy
- Look at those individuals who have successfully adopted AT solutions and see how they have been doing

### **3.7.9. Additional reading**

- Handbook of Research on Personal Autonomy Technologies and Disability Informatics, Javier Pereira (University of A Coruna, Spain), October 2010
- Handbook of Research on Personal Autonomy Technologies and Disability Informatics (1 Vol), Javier Pereira, Idea Group Inc (IGI), 30 September 2010
- Everyday Technology for Independence and Care: AAATE 2011, Gert Jan Gelderblom, Mathijs Soede, Leon Adriaens, Klaus Miesenberger, IOS Press, Incorporated, 2011
- Assistive Technology from Adapted Equipment to Inclusive Environments: AAATE 2009, Pier Luigi Emiliani, L. Burzagli, Andrea Como, Francesco Gabbanini, Anna-Liisa Salminen, OS Press, 2009
- Improving the Quality of Life for the European Citizen: Technology for Inclusive Design and Equality, I. Placencia Porrero, E. Ballabio, IOS Press, 01 Jan 1998

## **3.8. What is the impact of assistive technology?**

### **3.8.1. Social and medical model of disability**

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 themselves. For example, if a wheelchair user 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.

The **social model** of disability, in contrast, would view the steps as the disabling barrier to the wheelchair user entering the building. 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. The social model identifies that there is a great deal that society can do to reduce, and ultimately

remove, some of these disabling barriers and that this responsibility lies with society rather than the individual.

A more holistic view of disability, in short, is one that synthesises what is true in both the medical and social models, without attempting to mould the complex notion of disability to suit one model alone. This more constructive 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.<sup>76</sup> Please refer to 3.8.3 ICF: principles and constructs.

### 3.8.2. Autonomy and independent living

Proponents of the independent living movement claim that preconceived notions and a predominantly medical view of disability contribute to negative attitudes towards people with disabilities, portraying them as sick, defective and deviant persons, as objects of professional intervention, as a burden for themselves and their families, dependent on other people's charity. This has consequences for disabled people's opportunities for raising families of their own, achieving their potential in education and employment which, in turn, results in persons with disabilities constituting a large proportion of the poor in any country.

On the contrary, the right to independent living signifies the following for persons with disabilities<sup>77</sup>:

- Increased autonomy and inclusion:
  - Being able to make decisions about one's own life is fundamental.
  - Equally important is to be part of the community, to feel accepted, and not to be scared to be in public.
- Increased choice and control:
  - Being able to choose where to live and with whom.
- Respect towards an individual's dignity and equality:
  - Being given the same opportunity as others to have their voice heard so that specific issues are presented by them.
  - Having a say in how to be treated.

With the right support and facilities, leading an independent life with a physical or learning disability is now more achievable than ever. Living independently doesn't mean that you're not entitled to support from social services and it doesn't mean that family and friends are no longer important. When a person chooses to live independently, it's still important to have support from family and friends who live nearby for company and in cases of emergency.

The European representative organisation, ENIL - The European Network on Independent Living, includes members from the European Union and its neighbours and promotes Independent Living at the European level but also at national and regional levels.

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<sup>76</sup> <http://www.who.int/classifications/icf/training/icfbeginnersguide.pdf>

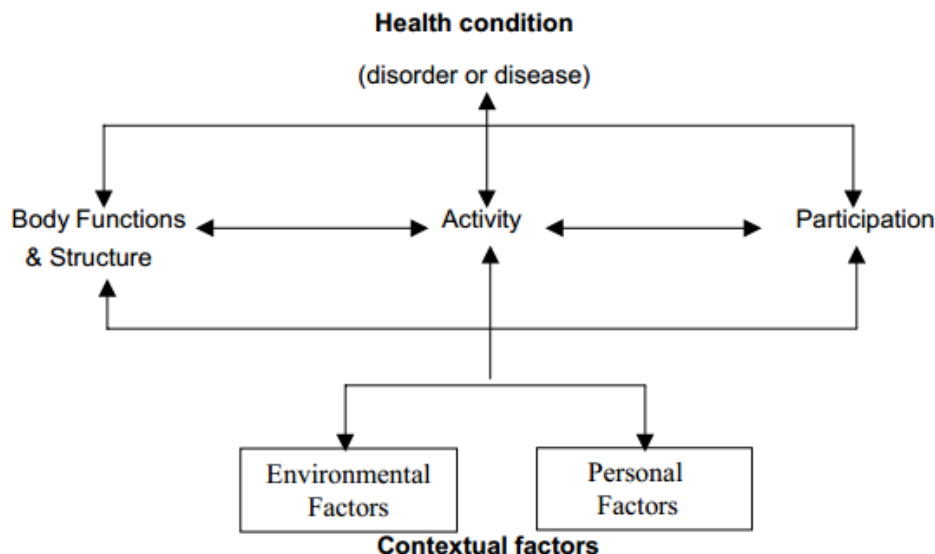
<sup>77</sup> <http://fra.europa.eu/en/speech/2012/autonomy-and-inclusion-people-disabilities>

### 3.8.3. ICF: principles and constructs

The International Classification of Functioning, Disability, and Health (ICF) provides a standard language and framework for the description of health and health-related states. ICF is a multipurpose classification intended for a wide range of uses in different sectors. It is a classification of health and health-related domains that help us to describe changes in body function and structure, what a person with a health condition can do in a standard environment (their level of capacity), as well as what they actually do in their usual environment (their level of performance).

These domains are classified from body, individual, and societal perspectives by means of two lists: a list of body functions and structure and a list of domains of activity and participation. In ICF, the term functioning refers to all body functions, activities, and participation, while disability is similarly an umbrella term for impairments, activity limitations, and participation restrictions. ICF also lists environmental factors that interact with all these components.<sup>78</sup>

The following diagram is one representation of the model of disability that is the basis for ICF.



**Figure 52: Model of disability that is the basis for ICF**

The diagram identifies the three levels of human functioning classified by ICF: functioning at the level of body or body part, the whole person, and the whole person in a social context. Disability therefore involves dysfunction at one or more of these same levels: impairments, activity limitations, and participation restrictions. The formal definitions of these components of ICF are provided below.

- Body Functions are physiological functions of body systems (including psychological functions).
- Body Structures are anatomical parts of the body such as organs, limbs, and their components.
- Impairments are problems in body function or structure such as a significant deviation or loss.
- Activity is the execution of a task or action by an individual.
- Participation is involvement in a life situation.
- Activity Limitations are difficulties an individual may have in performing activities.

<sup>78</sup> <http://www.who.int/classifications/icf/training/icfbeginnersguide.pdf>

- Participation Restrictions are problems an individual may experience in involvement in life situations.
- Environmental Factors make up the physical, social, and attitudinal environment in which people live their lives.

The following examples of disabilities have been associated with the three levels of functioning linked to a health condition:

- **Health condition:** Spinal Injury
  - **Impairment:** Paralysis
    - **Activity limitation:** Incapable of using public transportation
      - **Participation restriction:** Lack of accommodations in public transportation leads to no participation in sport activities
- **Health condition:** Vitiligo
  - **Impairment:** Facial disfigurement
    - **Activity limitation:** None
      - **Participation restriction:** No participation in social relations owing to fears of contagion

Please refer to 3.3 The ICF based approach to technology and functioning.

### **3.8.4. Types of disabilities**

The following sections define the different types of disabilities. We should highlight that, as indicated in the personas earlier, an individual may often have a mixture of disabilities. ATLEC follows this cross-disability approach.

Each disability is shortly explained below. Please note that this is not an exhaustive list.

#### **3.8.4.1. Intellectual disabilities**

An intellectual disability is a disability affecting cognition. Individuals may have difficulties with learning, communication, daily living skills, information processing, social functioning, and problem solving. Intellectual disabilities are permanent. Examples of intellectual disabilities include Down's Syndrome, Fragile X Syndrome, Prader-Willi Syndrome, Angelman Syndrome.

- ADD/ADHD (Attention deficit/hyperactivity disorder): ADHD is a neurobiological, genetic disorder, characterised by difficulty sustaining focus and attention, hyperactivity, and /or difficulty controlling behaviour. Although ADHD appears in childhood, the disorder is often lifelong.
- Asperger's Syndrome: Asperger's is a neuro-developmental disorder that is classified as an autistic spectrum disorder (ASD). Three main areas of development are affected: social interaction, behaviour, and communication.
- Autism: Autism spectrum disorders are lifelong developmental disabilities. They are characterised by difficulties in: social interaction, communication, restricted and repetitive interests, activities, and behaviours. People with autism spectrum disorder may also have sensory sensitivities, intellectual, or learning disabilities. Types of autism spectrum disorders include: Autistic disorder, Asperger's syndrome, Atypical autism.

- Down syndrome: Every person that has Down syndrome has a full or partial extra copy of a chromosome—chromosome 21—and they can share other similarities. Over 100 features have been described in Down syndrome, but generally people with the syndrome have far fewer (often less than 10) of these features. People with Down syndrome have a higher incidence of respiratory and heart conditions and may have intellectual disabilities to varying degrees.

**Most frequently occurring deployment of ICT-AT for people who have difficulty taking in or processing information:**

- Use of pictorial links which are small images (on web browsers, browser plug-ins, websites) of the link targets instead of the addresses or names (e.g. back and forward buttons in web browsers).
- Alternative communication aids and augmentative devices that support the user in communicating and may include portable speech output devices or equipment directly connected to a computer or telephone.
- Development of routines for login, opening and saving files, and using applications in computer or tablet.
- Timers or electronic organisers for organising work and reminders to do different tasks.
- Usage of supplement text with auditory information like screen reading programs read text while highlighting it for multi-modal presentation, usually displayed with simplified menus.

### 3.8.4.2. Learning disabilities

Learning disabilities are a varied group of conditions which impact on the development and use of listening, spelling, reading, writing, reasoning, or mathematical skills. It has a significant effect on learning but is not an indicator of intelligence.

- Dyslexia: Dyslexia is characterised by difficulty with learning to read fluently and with accurate comprehension despite normal intelligence.
- Dyspraxia: Developmental dyspraxia is an impairment or immaturity of the organisation of movement. It is an immaturity in the way that the brain processes information, which results in messages not being properly or fully transmitted. Dyspraxia affects the planning of what to do and how to do it. It is associated with problems of perception, language, and thought.<sup>79</sup>
- Dysgraphia: Dysgraphia is a deficiency in the ability to write primarily in terms of handwriting, but also in terms of coherence. Dysgraphia is a transcription disability, meaning that it is a writing disorder associated with impaired handwriting, orthographic coding (orthography, the storing process of written words and processing the letters in those words), and finger sequencing (the movement of muscles required to write).
- Visual processing disorder: People with visual processing disorder have difficulties learning visual information due to the deficits in the visual control system in their brains. They struggle in the following 3 areas in reading and writing: visual word memory problems, letter and symbol reversal problems, and contrast sensitivity problems.
- Auditory processing disorder: This is an umbrella term for a variety of disorders that affect the way the brain processes auditory information. People with this disorder cannot process the

<sup>79</sup> [http://www.dyspraxiafoundation.org.uk/services/dys\\_dyspraxia.php](http://www.dyspraxiafoundation.org.uk/services/dys_dyspraxia.php)



information they hear in the same way as others do, which leads to difficulties in recognising and interpreting sounds, especially the sounds composing speech. It has also been referred to as dyslexia for the ears.

- **Dyscalculia:** Dyscalculia is difficulty in learning or comprehending arithmetic, such as difficulty in understanding numbers, learning how to manipulate numbers, and learning maths facts. It is generally seen as a specific developmental disorder like dyslexia.

**Most frequently occurring deployment of ICT-AT for people with moderate or severe learning disabilities:**

- Spell checking and grammar checking programs that display a short list of options with clear explanations for changes.
- Word prediction programs that suggest words or phrases based on the first few letters of a word and its context.
- Adjustable reading speed of synthesised speech output device, highlighted words in contrasting colour for easier tracking, electronic dictionary for definition of new or unfamiliar words.
- Speech recognition software for dictation of reports and other documents, sending emails and work on the Internet. When sentences are dictated into a computer, users do not need to remember how to spell every word. Additional words can usually be added to the voice input software.
- Speech output systems and scan/read software packages that combine scanning/OCR and synthesised speech output increase reading speed and comprehension. An individual can read virtually any scanned document or other electronic file on their computer or the internet using synthesised speech.

### **3.8.4.3. Cognitive Disabilities**

Mental disabilities are a varied group of conditions that significantly affect how a person feels, thinks, behaves, and interacts with other people. They are diagnosed according to standardised criteria. They are different from temporary mental health issues that may be experienced following stressful life events.

- **Alzheimer's Disease:** Dementia is a neurocognitive disorder that is characterised by loss of brain function that occurs with certain diseases. Alzheimer's disease is one form of dementia that gradually gets worse over time. It affects memory, thinking, and behaviour. It is the most common form of dementia amongst older people.
- **Anxiety Disorder**
  - **Post Traumatic Stress Disorder:** Post traumatic Stress Disorder (PTSD) is a mental health issue that can occur after a traumatic event like war, assault, or a disaster.
  - **Generalised Anxiety Disorder:** People with generalised anxiety disorder (GAD) are extremely worried about all manner of things even when there is little or no reason to worry about them. They are very anxious about just getting through the day. They worry that events will take a turn for the worse. At times, this persistent anxiety keeps people with GAD from doing everyday tasks.
  - **Social Phobia:** Social Phobia (Social Anxiety Disorder) is a strong fear of being judged by others and of being embarrassed. This fear can be so strong that they feel they cannot

leave the house and attend school or go to work. It may prohibit them from performing everyday tasks.

- Obsessive Compulsive Disorder: Obsessive-compulsive disorder (OCD) is an anxiety disorder characterised by intrusive thoughts that produce uneasiness, apprehension, fear, or worry; by repetitive behaviours aimed at reducing the associated anxiety; or by a combination of such obsessions and compulsions.
- Bipolar Disorder: Bipolar disorder or manic-depressive illness is a disorder characterised by abnormal mood shifts (severe fluctuations in mood (poles) - from depression to mania), as well as fluctuations in energy, activity levels, and the ability to complete everyday tasks. Usually, moods are normal in between the peaks and troughs.
- Depression: Depression is a state of low mood and aversion to activity that can affect a person's thoughts, behaviour, feelings, and sense of wellbeing.
- Phobia
  - Acrophobia: This is an extreme fear of heights.
  - Agoraphobia: This is an intense fear of being in crowds, public places, or open areas, sometimes accompanied by anxiety attacks.
- Schizophrenia: this is a mental health issue characterised by a breakdown of thought processes and by a deficit of typical emotional responses. Common symptoms include auditory hallucinations, paranoid or bizarre delusions, or disorganised speech and thinking, and it is accompanied by significant social or occupational dysfunction.

**Most frequently occurring deployment of ICT-AT for people with mental disabilities:**

- It's usually important to develop routines and habitual patterns for login, opening and saving files, and using applications while operating one's computer or mobile phone or tablet.
- Customisation of the standard toolbars and ribbons with other frequently used commands to provide a simplified list of commands.
- Usage of pop-up and animations blockers (e.g. browser plug-ins) that stop automatic pop-up windows and redirection.
- Timer devices that improve ability to transition between tasks, with various alarm settings (i.e. work for a specified length of time, work until a certain time of day, or work until completion of task) to further independence in the workplace and at home.
- Volume control options (separate from the overall system settings) that adjust the volume of audio content being played, including options to turn off the sound completely.
- Reading assistants software that changes the presentation of content and helps to make it more readable (e.g. customising the font type, size, spacing, background colours, scanning the text for complex words and phrases and linking them to glossaries, highlighting the text as it is being read aloud).

### 3.8.4.4. Physical Disabilities

Physical disabilities affect a person's physical functioning, mobility, dexterity or stamina. A person may be born with a physical disability or acquire it later in life.

- **Visual Impairment:** refers to some degree of sight loss. A person is considered legally blind if they cannot see at six metres what someone with normal vision can see at 60 metres, or their field of vision is less than 20 degrees in diameter (normal vision 180 degrees). If there is no

light perception at all, then a person is considered totally blind. A person may be born with a visual impairment, or acquire it through an accident, disease, or the aging process.

- Blindness: Blindness is the condition of lacking visual perception due to physiological or neurological factors. Total blindness is the complete lack of form and visual light perception and is clinically recorded as NLP, an abbreviation for "no light perception".
- Blurred Vision: the vision is blurred and this can have many causes.
- Cataract: A cataract is a clouding of the lens inside the eye which leads to a decrease in vision. It is the most common cause of blindness and is conventionally treated with surgery.
- Colour Blindness: There are several types of colour blindness.<sup>80</sup>
  - Trichromacy: Normal colour vision which uses all three types of light cones correctly is known as trichromacy and people with normal colour vision are known as trichromats.
  - Anomalous Trichromacy: People with 'faulty' trichromatic vision will be colour blind to some degree and are known as anomalous trichromats. All 3 light cones are able to perceive colour but one of these perceives light slightly out of alignment. There are three different types of effect produced depending upon which cone type is 'faulty'. The different anomalous conditions are protanomaly, a reduced sensitivity to red; deuteranomaly, a reduced sensitivity to green (most common); and tritanomaly, a reduced sensitivity to blue (extremely rare).
  - Dichromacy: People with dichromatic colour vision have only two types of cones which are able to perceive colour i.e. they have a total absence of one colour. People with protanopia are unable to perceive red; those with deuteranopia are unable to perceive green; and those with tritanopia are unable to perceive blue.
  - Monochromacy (achromatopsia): People with monochromatic vision can see no colour at all and their world consists of different shades of grey ranging from black to white, rather like only seeing the world on an old-fashioned black and white television set.
- Glaucoma: damage to the optic nerve associated with (fluid) pressure in the eye. It can lead to blindness if left untreated.
- Macular Degeneration: Age-related macular degeneration (AMD) is a medical condition which usually affects older adults and results in a loss of vision in the centre of the visual field (the macula) because of damage to the retina. It is a major cause of blindness and visual impairment in older adults (>50 years). Macular degeneration can make it difficult or impossible to read or recognise faces, although enough peripheral vision remains, permitting other activities of daily life.
- Retinitis Pigmentosa: This is a genetic condition which causes the retina to progressively degenerate.

**Most frequently occurring deployment of ICT-AT for people who are blind or unable to see details such as newspaper print or obstacles in their path:**

- People with visual impairments are usually studying or working in adjustable workspaces,

<sup>80</sup> <http://www.colourblindawareness.org/colour-blindness/types-of-colour-blindness/>

assisted by alternate formats and computer output or (voice) input devices.

- Refreshable braille displays (mechanical terminals) connected to the PC or laptop that display braille characters by raising and lowering the dots dynamically. Some are incorporated into portable braille devices with capabilities of small computers (used to take notes, calculate numbers, interface with other devices, etc).
- Screen reading software that enables text to be converted into computer synthesised speech and braille. Screen readers process content on the desktop or Web and communicate it to the user using various formats.
- Computer screen with magnification for those with minimal light perception to magnify both the text and graphics on their computer screen.
- Audio description features that provide descriptive narration of key visual elements in a video or multimedia product (narrators typically describe actions, gestures, scene changes, and other visual information, as well as titles, speaker names, and other text that may appear on the screen).
- Closed circuit television system (CCTV) for viewing written bank material, for example, with split screen technology that allows the image to be viewed from the CCTV on one half of the screen and from the PC display on the other.
- Dual telephone headset for employees who need to hear the customer/co-worker in one ear, and the talking computer in the other.

- **Hearing Impairment:** this ranges from mild hearing loss to profound deafness and can be caused by a genetic condition, illness, trauma, or natural ageing. People with a hearing impairment may use hearing aids, lip-reading, sign language, or a combination to assist with communication. The most common categories of hearing loss are mild hearing loss, moderate hearing loss, severe hearing loss, and profound hearing loss.<sup>81</sup>
  - Mild hearing loss: On average, the most quiet sounds that people can hear with their better ear are between 25 and 40 dB. People who experience mild hearing loss have some difficulties keeping up with conversations, especially in noisy surroundings.
  - Moderate hearing loss: On average, the quietest sounds heard by people with their better ear are between 40 and 70 dB. People who experience moderate hearing loss have difficulty keeping up with conversations when not using a hearing aid.
  - Severe hearing loss: On average, the quietest sounds heard by people with their better ear are between 70 and 95 dB. People who experience severe hearing loss will benefit from powerful hearing aids, but often they rely heavily on lip-reading even when they are using hearing aids. Some also use sign language.
  - Profound hearing loss: On average, the most quiet sounds heard by people with their better ear are from 95 dB or more. People who experience profound hearing loss are extremely hard of hearing and rely mostly on lip-reading and/or sign language

**Most frequently occurring deployment of ICT-AT for people with partial hearing loss or those who are deaf:**

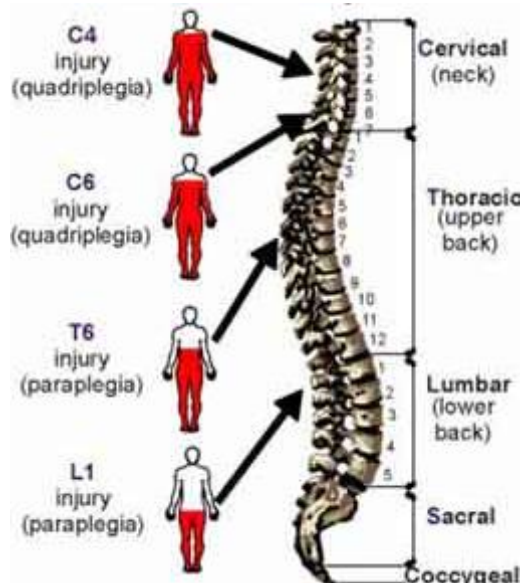
<sup>81</sup> European Group on genetics of hearing impairment. Martini A (Ed.), European Commission Directorate, Biomedical and Health Research Programme (HEAR) Infoletter 2, November 1996, 8.

- Assistive listening devices, e.g. an induction loop device
- Supplement audio cues with visual cues such as flashing the screen or displaying text. Operating systems have a setting to flash the computer screen or display text when an audio cue is presented.
- Multimedia presentations that provide captions (i.e. text version of the audio content that is synchronized with the multimedia presentation).
- Alphanumeric pager which allows the receipt of brief text messages from friends/co-workers without delay.
- In-line amplifier for the office phone.
- FM wireless microphones that carry sound from the transmitter to the receiver and personal amplification systems that are used both in work and personal settings for one-on-one communication and home media use.

- **Mobility Impairment:** a wide variety of impairments are observed in this category.
  - Arthritis: Arthritis refers to a group of more than 100 types of rheumatic diseases and related conditions that can cause pain, stiffness, and swelling in the joints. There are two major types of arthritis -- osteoarthritis, which is the "wear and tear" arthritis, and rheumatoid arthritis, an inflammatory type of arthritis that happens when the body's immune system does not work properly. Gout, which is caused by crystals that collect in the joints, is another common type of arthritis. Psoriatic arthritis, lupus, and septic arthritis are other types of the condition. Most people born with this condition have Rheumatoid Arthritis.
  - Cerebral Palsy: Cerebral palsy (CP) is an umbrella term denoting a group of non-progressive, non-contagious motor conditions that cause physical disability in human development, chiefly in the various areas of body movement. Cerebral palsy (CP) is divided into four major classifications to describe different movement impairments. These classifications also reflect the areas of the brain that are damaged. The four major classifications are: spastic, ataxic, athetoid/dyskinetic and mixed.
    - Spastic cerebral palsy, or cerebral palsy where spasticity (muscle tightness) is the exclusive or almost-exclusive impairment present, is by far the most common type of cerebral palsy, occurring in upwards of 70% of all cases.
    - Ataxia-type symptoms can be caused by damage to the cerebellum (little brain). Ataxia is a less common type of cerebral palsy, occurring in between 5 and 10% of all cases.
    - Athetoid cerebral palsy or dyskinetic cerebral palsy is mixed muscle tone – both hypertonia (abnormal increase in muscle tension and a reduced ability of a muscle to stretch) and hypotonia (low muscle tone, often involving reduced muscle strength) mixed with involuntary motions.
    - Mixed cerebral palsy is symptoms of spastic, ataxic, and athetoid CP appearing simultaneously, each to varying degrees, and both with and without certain symptoms of each.
  - Multiple Sclerosis (MS): MS occurs when myelin, a protective material around nerve fibres in the body, becomes damaged, causing random patches or scars. These scars usually disrupt the messages that are sent through the central nervous system, affecting

the brain, optic nerves, and spinal cord at different locations. Although rarely fatal, MS can cause paralysis and blindness. It can also limit a person's productivity. MS is unpredictable and progressive, with no two people experiencing the same symptoms. Common symptoms include:

- blurred or double vision
  - numbness or pins and needles
  - weakness in the arms or legs
  - loss of balance
  - loss of mobility
  - hand tremors
  - poor coordination
  - chronic fatigue
- Muscular Dystrophy (MD): is a group of muscle diseases that weaken the musculoskeletal system and hamper locomotion. Muscular dystrophies are characterised by progressive skeletal muscle weakness, defects in muscle proteins, and the death of muscle cells and tissue.
  - Paralysis: Spinal cord injury usually results in the area of the body below the injury site being partially or completely unable to communicate with the brain. The messages between the brain and the body are blocked by the damaged spinal cord which results in the patient experiencing either Paraplegia or Quadriplegia. Any nerves above the level of the injury site which remain undamaged will continue to function as normal.



**Figure 53: Levels of injury and extent of paralysis<sup>82</sup>**

- Quadriplegia / Tetraplegia: this is when a person has a spinal cord injury above the first thoracic vertebra; paralysis in this case usually affects the cervical spinal nerves resulting in paralysis of all four limbs. In addition to the arms and legs being paralysed, the abdominal and chest muscles will also be affected resulting in

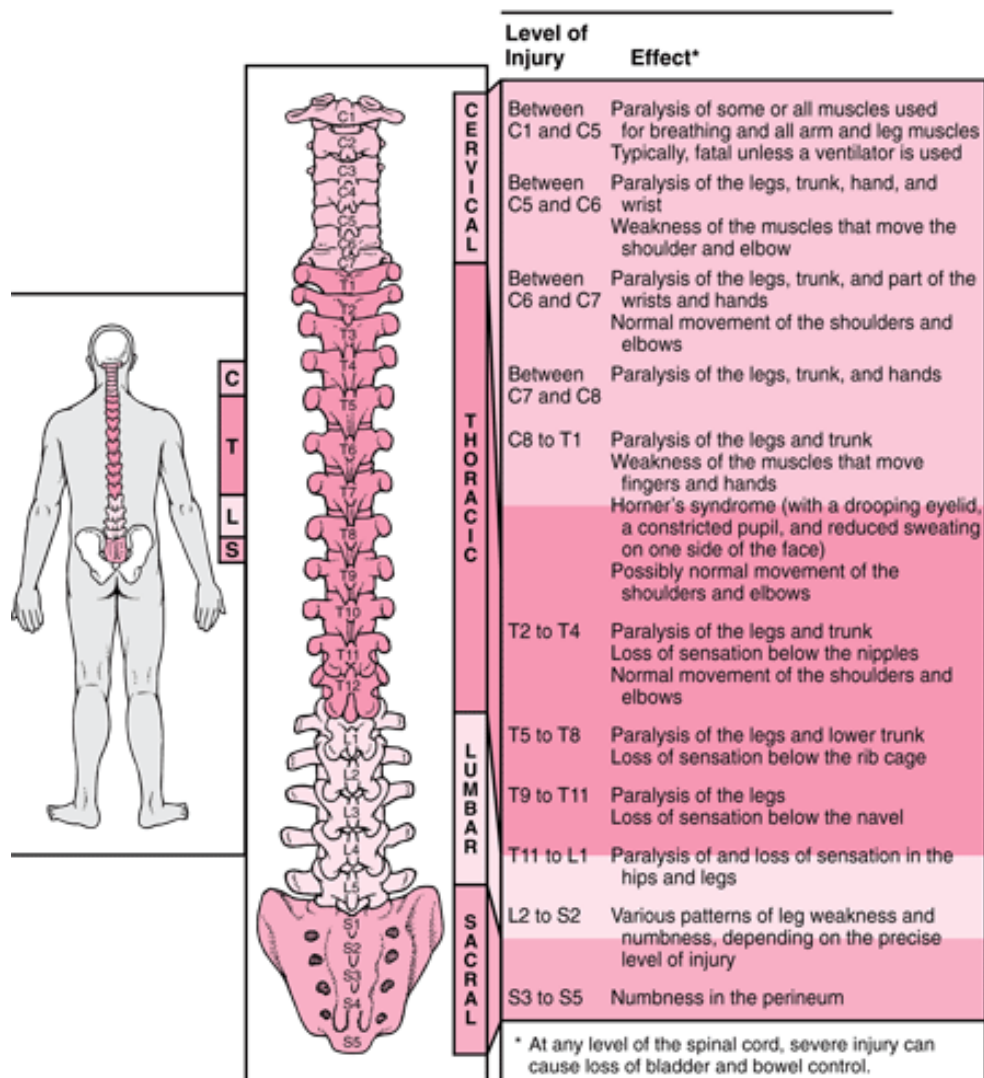
<sup>82</sup> <http://www.spinal.com.au/wp-content/uploads/2009/03/spinal.jpg>



weakened breathing and the inability to properly cough and clear the chest. People with this type of paralysis are referred to as Quadriplegic or Tetraplegic. The term Quadraplegic or Quadraplegia is used mainly in the UK.

- Paraplegia: this is when the level of spinal cord injury occurs below the first thoracic spinal nerve. The degree to which the person is paralysed can vary from the impairment of leg movement, to complete paralysis of the legs and abdomen up to the nipple line. Paraplegics have full use of their arms and hands.

#### Effects of Spinal Injury



Level of Injury	Effect*
<b>CERVICAL</b>	
Between C1 and C5	Paralysis of some or all muscles used for breathing and all arm and leg muscles. Typically, fatal unless a ventilator is used.
Between C5 and C6	Paralysis of the legs, trunk, hand, and wrist. Weakness of the muscles that move the shoulder and elbow.
Between C6 and C7	Paralysis of the legs, trunk, and part of the wrists and hands. Normal movement of the shoulders and elbows.
Between C7 and C8	Paralysis of the legs, trunk, and hands.
<b>THORACIC</b>	
C8 to T1	Paralysis of the legs and trunk. Weakness of the muscles that move fingers and hands. Horner's syndrome (with a drooping eyelid, a constricted pupil, and reduced sweating on one side of the face). Possibly normal movement of the shoulders and elbows.
T2 to T4	Paralysis of the legs and trunk. Loss of sensation below the nipples. Normal movement of the shoulders and elbows.
<b>LUMBAR</b>	
T5 to T8	Paralysis of the legs and lower trunk. Loss of sensation below the rib cage.
T9 to T11	Paralysis of the legs. Loss of sensation below the navel.
T11 to L1	Paralysis of and loss of sensation in the hips and legs.
<b>SACRAL</b>	
L2 to S2	Various patterns of leg weakness and numbness, depending on the precise level of injury.
S3 to S5	Numbness in the perineum.

\* At any level of the spinal cord, severe injury can cause loss of bladder and bowel control.

**Figure 54: Effects of spinal cord injury<sup>83</sup>**

- Cauda Equina Syndrome: The Cauda Equina is the mass of nerves which fan out of the spinal cord between the first and second Lumbar region of the spine. The spinal cord ends at L1 and L2 at which point a bundle of nerves travel downwards through the Lumbar and Sacral vertebrae. Injury to these nerves will cause partial

<sup>83</sup> [http://alexwillwalkagain.com/wp-content/uploads/2008/11/mmhe\\_06\\_093\\_01\\_eps.gif](http://alexwillwalkagain.com/wp-content/uploads/2008/11/mmhe_06_093_01_eps.gif)

or complete loss of movement and sensation. It is possible, if the nerves are not too badly damaged, for them to grow again and for the recovery of function. The resultant paralysis results in paraplegia, but this is commonly known as a Cauda Equina Syndrome injury.

- Incomplete Spinal Cord Injuries
  - Anterior Cord Syndrome: is when the damage is towards the front of the spinal cord; this can leave a person with the loss or impaired ability to sense pain, temperature, and touch sensations below their level of injury. Pressure and joint sensation may be preserved. It is possible for some people with this injury to recover some movement over time.
  - Central Cord Syndrome: is when the damage is in the centre of the spinal cord. This typically results in the loss of function in the arms, but some leg function may be preserved. There may also be some control over the bowel and bladder. It is possible for some recovery from this type of injury, usually in the legs, gradually progressing upwards.
  - Posterior Cord Syndrome: is when the damage is towards the back of the spinal cord. This type of injury may leave the person with good muscle power, pain, and temperature sensation; however, they may experience difficulty in coordinating movement of their limbs.
  - Brown Sequard Syndrome: is when damage is towards one side of the spinal cord. This results in impaired or loss of movement to the injured side, but pain and temperature sensation may be preserved. The opposite side of injury will have normal movement, but pain and temperature sensation will be impaired or lost.
- Parkinson's Disease: Parkinson's disease (PD) is a chronic and progressive movement disorder with symptoms worsening over time. The specific group of symptoms that an individual experiences varies from person to person. Primary motor signs of Parkinson's disease include the following: tremor of the hands, arms, legs, jaw and face; bradykinesia or slowness of movement; rigidity or stiffness of the limbs and trunk; postural instability or impaired balance and coordination.<sup>84</sup>
- Polio: Paralysis caused by inflammation of the spinal cord's grey matter. A severe infection can extend into the brainstem and even higher structures, resulting in polioencephalitis which causes apnea (suspension of external breathing) that requires mechanical assistance such as an iron lung.
- Stroke: A stroke is the rapid loss of brain function due to disturbance in the blood supply to the brain. This may be due to lack of blood flow caused by a blockage or a haemorrhage (profuse internal or external bleeding from the blood vessels).
- Head Injury: The effects of an acquired brain injury can be minor, occurring over a short period of time, or can be severe and lifelong. This may be caused by an accident, a stroke, lack of oxygen, and degenerative neurological disease. This type of disability can affect cognitive, physical, emotional, and sensory functioning. A traumatic brain injury occurs when an external force traumatically injures the brain.

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<sup>84</sup> [http://www.pdf.org/about\\_pd](http://www.pdf.org/about_pd)

**Most frequently occurring deployment of ICT-AT for people with mobility disabilities or/and wheelchair users with full or limited upper extremity fine motor control or people who can walk, but have difficulty bending, sitting, standing, or climbing stairs:**

- Alternative hardware and software systems:
  - eye tracking/eye-gaze system that monitors eye movement to control the mouse pointer and blinking to initiate clicking
  - keyboard customisation that changes the mapping of keys, assigns shortcut keys to functions, sets filters, and sets "sticky keys" to support single-handed typing
  - keyboard and mouse filters that recognise and compensate for tremors or spasms
  - mouse customisation that changes the mapping of buttons and the sensitivity of the mouse towards movement, as well as the size and appearance of the mouse pointer
  - use of on-screen keyboard program as a substitute for voice recognition during periods when there is too much background noise.
- Various types of touch screens depending on their touch sensor technology:
  - Resistive touch screens (pressure sensitive, operated with any input device, including a gloved hand or stylus)
  - Capacitive touch screens (higher clarity and more durable, but they do not respond to gloved hands or most styluses)
  - Infrared touch screens (operated by either human touch or stylus, high clarity and durability, do not respond well to users whose fingers hover before pressing a control)
  - Surface acoustic wave – SAW (high clarity and durability, operated by either human touch or stylus, more expensive).
- Desktop computers and laptops with voice recognition and voice operated office software.
- For people with limited upper extremity fine motor control that need to enhance their job performance and increase their data entry speed while using their computer, it is common to use software that can isolate single keys, while for cursor control, trackballs are usually the best option.
- Programs that provide abbreviation expansion and macro capabilities help eliminate steps and allow for fewer keystrokes.
- For people with swallowing and speech difficulties - due to dystonia and dysarthria - who wish to increase their education/employment options and need equipment or assistive technology (AT) to enable them to communicate effectively, there are dynamic systems that allow to quickly change overlays, communicate pre-programmed messages, and access spelling, word prediction, letter encoding, and text-to-speech options.
- Voice-activated tape recorder into a phone or computer where a job includes customer interaction and recording phone conversations is required.
- Keyboard layout adjustments in the operating system to allow one-hand typing and keyboarding (right- or left-handed use).
- Web navigation via keyboard; by moving through the content using keyboard, i.e. using the tab key to jump from one structural item such as link, header, or list item, to the next.

- Chronic Illnesses: A wide range of medical conditions may impact on a person's work and require reasonable adjustments to be made. Chronic medical conditions are long term – they may last for months or years, or be lifelong.
  - Asthma
  - Cancer
  - Chronic Fatigue Syndrome
  - Diabetes
  - Hypoglycemia
  - HIV AIDS
  - Renal Failure
  - Tuberculosis (TB)

**Most frequently occurring deployment of ICT-AT for people with chronic illnesses:**

- Assistive listening devices emphasise communication and de-emphasize other noises as they amplify the voice of the speaker so that it more prominent in a noisy environment.
- Usage of a phone with voice dialling or stored numbers, so that the phone numbers do not need to be memorised.
- Alternative keyboard and mouse (hardware and software):
  - keyboards with larger keys, key labels, illuminated keys and ergonomic layout to relieve strain on hands and arms
  - on-screen keyboards, touch-screens, sip-and-puff switches
  - trackballs, joysticks, touch-pads, specially designed mice
  - voice recognition, eye tracking, other hands-free interaction.
- Wireless keyboards and mice allows a person to use a computer without getting as close to the workstation, reducing effort, extra movements, and physical pain.
- Voice recognition / speech input / voice command software that recognises the human voice and can be used to dictate text or operate the computer rather than to type.
- Word prediction software that presents selections of matching words, phrases, or sentences based on the current input to save typing.
- Keyword search using web browser functions to search for text within a web page and to search for web pages by keyword.
- Help remember pages and quickly locate addresses of previously visited pages via bookmarks and history browser functions.
- Simplified website navigation via page maps that make the browser display a small image of the entire web page with an indicator highlighting the portion within the web page that is being currently viewed.
- Web browser with keyboard support to use websites without a mouse.

### **3.8.4.5. Speech and Language Disabilities**

Speech and language disabilities may result from hearing loss, cerebral palsy, learning disabilities, and/or physical conditions. There may be a range of difficulties from issues with articulation or voice strength to complete absence of voice. There may be difficulties in projection, in articulating particular words or terms, and fluency problems such as stuttering and stammering.

- A **speech impairment** affects spoken language. Examples of this include stuttering (repeating syllables or words, prolonging sounds, or “blocking” on a word or sound), phonological or articulation disorders (inability to say sounds properly), speech in the hearing impaired (speech may be difficult to understand, nasal-sounding, unusual in pitch or rhythm), apraxia (facial grimaces or unusual movements may accompany speech, such as groping to produce sounds, syllables, and words; difficulty planning and sequencing movements for speech within the brain; speech may be unintelligible), etc.
- **Voice disorders** affect the sound of the voice itself (i.e. hoarseness, breathy voice, strained/tense voice). Such disorders are often caused by changes in the shape of the vocal cords (e.g., swelling of the vocal cords or growths on the vocal cords such as vocal nodules).
- A **language impairment** affects the understanding of language (receptive language disorder), the formulation of a word or sentence (expressive language disorder), or both. Receptive and expressive abilities may be impaired together such as in a disorder called developmental language delay in toddlers and pre-schoolers or language learning disability in school-aged children. Reading/writing disabilities (e.g., dyslexia) are also types of language disorders. Individuals with learning disabilities may also exhibit difficulties in comprehending language or expressing themselves with language.

**Most frequently occurring deployment of ICT-AT for people with speech and language disabilities:**

- Usage of a fluency device to reduce stuttering as some people find that they are less likely to stutter if they speak in unison.
- For those with breathing difficulties and weak voices there are personal voice amplifiers, microphones, or voice amplified telephones that may be used.
- Text-based communication is the most common solution; emails, text pager, etc. Sharing important discussion details in text will help avoid misunderstandings.
- Speech generating devices, speech output software, keyboards, or notebooks could be used as an alternative communication method.
- Usage of TTY (teletype) / relay systems for telephone communications allows two people to type messages back and forth over a phone line.
- Usage of speech to speech (STS) relay services assists people who have difficulty being understood on the phone (i.e. a communications assistant, trained to be familiar with different speech patterns and language recognition skill, repeats the desired message to the other party on the phone line).
- Mobile devices with special integrated software - by touching sequences of symbols that are available onscreen, users are able to create sentences which they can use in a variety of settings in their daily routine.

### 3.8.4.6. Other Disabilities

Substance Abuse / Addictions: This is the dependence on alcohol or a drug, leading to problems at work or home, and/or causing damage to health.

- Alcohol Addiction
- Drug Addiction
- Nicotine Addiction

### 3.8.5. The AT implementation Plan

Effective implementation of assistive technology can be a very complex process that may take place over the person's entire lifespan. The implementation process is actually independent of the specific technologies being put into place. Truly successful implementation of the technology does not depend on what software and hardware is introduced but, instead, depends on the careful and thoughtful attention to the various implementation steps.

The following points outline the actors involved and the various phases.

#### 3.8.5.1. Types of assessment

A wide range of assessments exist that focus on various aspects of the person's activities and in what environment these activities will take place:

- A **mobility assessment** looks at skills and lifestyle as they relate to a person's ability to move around as independently as possible.
  - Examples: wheelchairs, walkers, motorised carts, scooters, electric mobility devices, canes, and crutches.
- A **seating/positioning assessment** fits a seating system to best suit a person's shape or disability, making the most of all physical capabilities and preventing skin breakdown caused by pressure sores. Improper positioning could prevent a person from operating switches to access a computer or communication device.
  - Examples: standing tables, seat belts, braces, and cushions and wedges to maintain posture.
- **Communication assessment** includes speaking, hearing, and writing. It could involve many different kinds of devices.
  - Examples: communication boards, speech synthesisers, modified typewriters, head pointers, voice-to-text software, telecommunication devices for the deaf, and text telephones.
- A **computer access assessment** determines the best input device or method of access to a computer.
  - Examples: headsticks, light pointers, modified or alternate keyboards, switches activated by pressure, sound, or voice, touch screen, voice to text software, special software, and sketch and graphics pads.
- A **switch-access assessment** may be necessary to help a person with a disability access a computer. It determines which of many possible switches will be most effective and considers the placement or positioning of switches for greatest control and/or access.
  - Examples: leaf switch, jellybean switch, light touch switch, sip and puff switch, and sound-activated switches.
- An **assessment of aids for daily living** identifies adaptive aids to help perform daily living tasks more independently. Many of these devices can be bought commercially in discount and department stores. Modification or custom fabrication may be required to adapt devices to individual needs and environments.
  - Examples: modified eating utensils, adapted books, pencil holders, page turners, dressing aids, and adapted personal hygiene aids.



- A **work-site modification assessment** compares job requirement activities to a person's specific needs, recommending reasonable accommodations to help a person meet the established productivity levels or goals.
  - Examples: adjustable table/desk, bright lighting, adapted telephone receivers, and adjustable telephone volume.
- A **home modification assessment** evaluates building barriers to a person's mobility and independence or a person's ability to activate appliances.
  - Examples: ramps, lifts, automatic door openers, expanded doorways.
- A **recreational assessment** can help select assistive technology that allows participation in many leisure activities depending on a person's interests.
  - Examples: audio description for movies, sip-and-puff controlled joysticks for video games, cuffs for grasping paddles or racquets, and seating for canoes or sailboats.

### 3.8.5.2. Actors involved

To carry out a successful assessment, the most appropriate assessment team should be identified and assembled. This will consist of an interdisciplinary team of individuals from multiple disciplines who work towards a common goal through a person-centred approach. For some funding sources, there may be formal requirements that certain professionals be involved and certain documents be obtained.

The actors will differ from the environment for which AT assessment is performed:

- School: The AT assessment should consider devices that address the following areas of need (non-exhaustive):
  - Writing
  - Spelling
  - Reading
  - Maths
  - Study/Organisational Skills
  - Listening
  - Communication
  - Activities of Daily Living
  - Recreation, Leisure, and Adaptive Play
  - Positioning, Seating, and Mobility
  - Computer Access

In a school environment, the following people should be represented among these actors<sup>85</sup>:

- A person knowledgeable about the student. That may be the **student and/or parents or other family members and/or carer/personal assistant**. Parents are the most important influence in the lives of their children. Parents often provide the most important information regarding the assistive technology user's functioning in the real world environment. Their responsibilities are to:
  - Provide input on current levels of functioning in the home and school environments.

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<sup>85</sup> Based on "Reed, P., & Lahm, E. (Eds.). (2004). Assessing students' needs for assistive technology: A resource manual for school district teams. Oshkosh, WI: Wisconsin Assistive Technology Initiative" and the UKAT Toolkit; 6.14.02.

- Provide information on needs in the home and school environments that may be supported by AT devices and services.
- Provide information on preferences in types of equipment and history of AT strategies used.
- Provide evaluative information on success of AT strategies which have been employed.
- Participate in AT training opportunities as appropriate.
- Provide information to the AT team regarding use of resources in the home.
- Facilitate the use of AT in the student's acquisition of real world knowledge.
- Act as an advocate for the student when AT decisions are being made.
- Assist in student's development of confidence, self-esteem, and independence.
- Facilitate the use of AT in the home environment where appropriate.
- Evaluate the use of AT in the home environment.

Students can often be their own advocates in relation to developmental and educational needs. It is important that the information they provide be considered in development of educational plans. The student provides authentic and real world feedback and recommendations regarding their use of assistive technology. Their responsibilities are to:

- Express preferences for selecting AT devices when options are available.
  - Provide information on the functionality of AT devices.
  - Provide feedback to the team regarding motivational, social, emotional, and related issues associated with their use of AT.
  - Participate in the evaluation of their use of AT.
- A person knowledgeable in the area of curriculum, usually a **special education teacher**. The role of the special education teacher in providing assistive technology services is varied. It includes planning for AT integration into the curriculum, using AT for instruction, assessing for potential AT uses, and evaluating student progress and continued eligibility for special education services. Their responsibilities are to:
- Provide clear and continual communication regarding AT issues with parents, student, and others.
  - Oversee the student's total educational plan.
  - Collaborate with family and other professionals to facilitate the educational plan.
  - Collaborate with AT support personnel in implementing the AT provisions of the student's individual education plan (IEP).
  - Identify academic, social, behavioural, emotional, and physical needs in the classroom that relate to IEP objectives associated with the AT plan.
  - Collect evaluation data on AT use.
  - Report progress, concerns, and required modifications to the AT team.
  - Manage student time and activities during the school day to facilitate the educational plan.
  - Develop and implement educational strategies, promoting participation in classroom activities for AT users in order to accomplish functional academic and social goals.
  - Modify curriculum goals and educational materials to accommodate AT use.

- Provide resource support related to AT use.
- Maintain up-to-date classroom AT inventory.
- Notify the school's AT coordinator on equipment needs and maintenance requirements.
- Request AT technical support from dedicated school personnel.

In addition, the **general education teacher** is responsible for integration of the special education student into the regular classroom. This includes adaptation of curriculum, instruction, and the classroom environment to facilitate learning and development. The general education teacher provides important information to the AT team regarding the student's functioning in the classroom and collaborates with those who are involved in delivering special education and related services. Their responsibilities are to:

- Provide information regarding the student's academic, physical, and social functioning levels.
  - Identify academic, physical, and social needs in the classroom as related to IEP objectives.
  - Collect evaluation data on AT use.
  - Develop and implement educational strategies, promoting participation in classroom activities for AT users in order to accomplish student goals.
  - Collaborate with family and other professionals to facilitate the educational plan.
  - Manage student time and activities during the school day to facilitate the educational plan.
  - Consult with the special education teachers and related services personnel.
  - Maintain up-to-date classroom AT inventory.
  - Notify the school AT coordinator on equipment needs and maintenance requirements.
  - Request AT technical support from dedicated school personnel.
  - Integrate students who use AT into the classroom.
  - Assist AT users in the classroom.
  - Familiarise all students in class about the AT being used.
- The **vision and hearing specialists** provide the interdisciplinary team with highly specialised information about the student's vision and auditory functioning. Vision and hearing specialists may specify vision and/or hearing evaluations, special equipment, and referral for additional assessment. Their responsibilities are to:
- Evaluate student's ability to see and hear as needed for learning in the classroom.
  - Identify specific environmental demands that impact on vision and/or hearing.
  - Suggest ways to maximise student's visual and auditory abilities in order to function in the home and educational environments.
  - Assist in development of instructional activities that relate to visual perception and auditory skill.
  - Assist in designing and developing visual and auditory aids and suggest strategies for facilitating their use.
  - Facilitate integration of vision and hearing development into educational curriculum.

- A person knowledgeable in the area of language, usually a **speech/language pathologist**. Their responsibilities are to:
  - Evaluate student's ability to use speech and language.
  - Identify specific environmental demands that impact on communication.
  - Suggest ways to maximise student's speech, language, and communication.
  - Assist in designing and developing communication aids and suggest strategies for facilitating their use.
  - Facilitate integration of speech and language development into educational curriculum.
  - Recommend augmentative communication devices as appropriate.
- A person knowledgeable in the area of motor development, often an **occupational or physical therapist**. The occupational therapist provides services to enhance fine motor development, self-help skill acquisition, eating/feeding skill development, sensory processing, positioning, splinting, and seating, augmentative communication/computer access, cognitive, behavioural and interpersonal skill development, and community living skills. As a member of the AT team, the occupational therapist shares expertise regarding such activities as daily living skills, environmental control, writing, and keyboarding. The occupational therapist is trained to provide information and resources on design, development, and clinical application of assistive technology devices. Their responsibilities are to:
  - Evaluate fine motor and gross motor skills in relation to AT devices, including range of motion, keyboarding, and handwriting.
  - Assist in determining most reliable motor response for switch placement.
  - Complete fine motor sections of AT assessments.
  - Assist in adapting and customising AT equipment to facilitate fine motor abilities and increased response.
  - Evaluate student's posture and mobility as related to daily living activities.
  - Recommend and implement student positioning procedures and devices which will meet seating and mobility needs.
  - Assist in determining devices and strategies for student to access other technologies for learning, communication, and mobility.
  - Fabricate low-tech adaptations as appropriate.
  - Recommend environmental control solutions or other environmental adaptations
  - Assist in student's achievement of independence in daily living skills.

Physical therapists work directly with the student to maintain or enhance range of motion, improve muscle strength, and increase physical functioning for students who exhibit physical limitations. As a member of the AT team, the physical therapist provides information, consultation, training, and resources regarding the student's gross motor, travel, and mobility needs. Their responsibilities are to:

- Evaluate gross motor abilities.
- Identify optimum positioning of student and equipment for optimal use of assistive technology.
- Assist in adapting and customising AT equipment.
- Complete gross motor sections of AT assessments.

- Identify any existing physical conditions, which impact student's performance.
- Evaluate student's posture and mobility.
- Recommend and implement techniques, devices, and strategies for appropriate positioning of student for comfort, development, safety, and increased mobility.
- The **school psychologist** administers and interprets assessment instruments, measuring intellectual, social, emotional, and behavioural functioning. The school psychologist provides recommendations having implications for the educational placement of students. As a member of the AT team, the school psychologist provides information on the student's functioning level, limitations, potentials, and motivations that impact AT decisions. Their responsibilities are to:
  - Assess student's intellectual abilities.
  - Assess student's preferences for learning.
  - Provide academic assessment of student as appropriate.
  - Provide information to AT team on student's emotional, behavioural and psychological needs.
  - Provide recommendations on support of student's mental health.
  - Provide consultation with student's family and peers regarding emotional and psychological support.
  - Consult with teachers regarding discipline and adjustment problems.
  - Provide information and recommendations about how all of the prior assessment might impact on the selection and use of AT devices and services.
  - Provide training regarding psychological and emotional factors that might impact on AT use.
- A person who can provide specialised expertise and services related to assistive technology. Services may include performing assessments to determine the need for assistive and adaptive devices and services. This is usually conducted by an **assistive technology specialist**. The AT specialist may also provide consultative services to personnel who are involved in the direct delivery of AT services to students. AT specialists also train students, teachers, families, and others in the use of technologies. AT specialists may monitor all AT activities in a given school and coordinate the AT referral, screening, and assessment system within the district. Often, the assistive technology specialist serves as the coordinator for the AT team. Their responsibilities are to:
  - Provide training to team members and distribute information on training opportunities as available.
  - Provide AT technical support to facilitate implementation of the AT plan.
  - Coordinate student AT assessments.
  - Suggest appropriate matches between AT user and device features.
  - Provide information to AT Team on acquisition and purchase of AT devices.
  - Assist in procuring, designing, fitting, and maintaining equipment.
  - Set up and maintain AT systems.
  - Facilitate follow-up of student AT goals.
  - Maintain an inventory of available AT for use across environments.

- A person who can commit the required resources, not only for purchase of devices, but to authorise staff training and guarantee implementation in various educational settings, usually a **school administrator**. Their responsibilities are to:
  - Provide leadership and ongoing support to the team.
  - Interpret policies and procedures related to the delivery of AT services and ensure that they are followed.
  - Allocate, support, and implement staff resources for participation in AT activities.
  - Provide support for planning and implementing AT services.
  - Provide appropriate budget planning, supervision, submission, and implementation for assistive technology services.
  - Obtain necessary resources for the delivery of AT devices and services.
  - Monitor progress of the AT program.

In addition, other people might be involved as well (non-exhaustive):

- Audiologist
- Computer Specialist
- Counsellor
- Early Intervention Specialist
- Instructional Assistant
- Nurse
- Physician
- Rehabilitation Engineer
- Social Worker
- Teacher of Hearing Impaired
- Teacher of Visually Impaired
- Vocational Counsellor
- University: at university, this team will be fairly similar.
  - Coordinators of Adjustments are key contacts responsible for ensuring that student support is implemented.
  - Mental health mentor service for students who have long term mental health issues who also provides advice on how to help distressed students.
  - Information services staff for students needing help with assistive technology, or having issues accessing University IT resources. They provide training and advice on:
    - Learning to use the specialist software and hardware on accessible PCs.
    - Using assistive software to access computing resources (e.g. email, Library website, eJournals, etc).
    - Configuring the accessibility features of students' own computers.
  - Alternative document formats (e.g. large print, on coloured paper, Braille, etc.) can be provided.
  - Student disability services experts implement specialist IT adjustments that have been requested for disabled students' exams:
    - organise the necessary equipment
    - meet with the student to test the setup
    - remain on-call throughout exams in order to quickly resolve any issues that arise

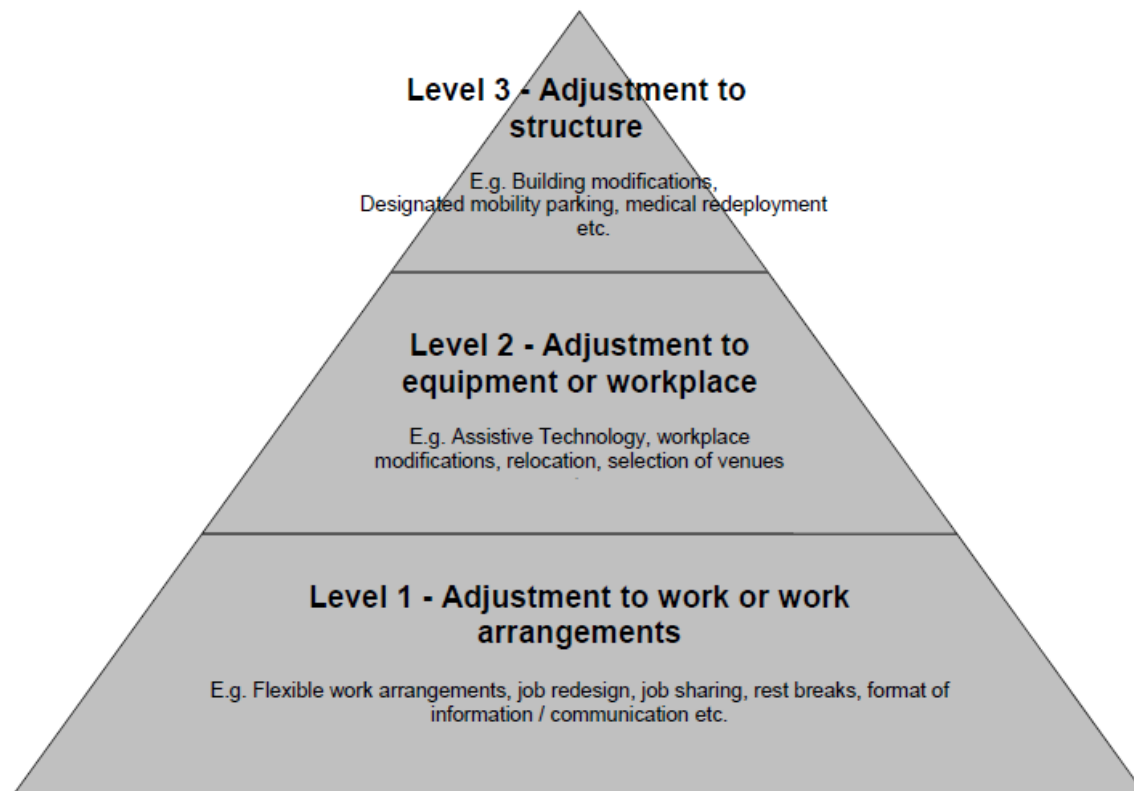


- Working environment: Every person's situation is different and an assessment by a qualified accessibility professional is the first stage in identifying individual needs and recommending adjustments. It involves:
  - Close observation of the person with disability at work and their direct environment.
  - Confidential discussions focusing on the person's job remit, relevant history, and current circumstances.
  - An understanding of what is required and what the person would like to achieve.
  - An opportunity to trial the recommended hardware and software solutions using equipment by an AT centre.
  - An in-depth discussion of the assessor's conclusions.

In many countries, employers are legally responsible for ensuring their employees are adequately equipped to do their job, which includes making "reasonable adjustments" to their workstation environment. A reasonable adjustment is an adjustment to the workplace or work practices that is effective for the employee without being too disruptive, costly, or impractical for the employer to provide. These reasonable adjustments might be physical adjustments (new computer hardware or software, ergonomic furniture or specialist office equipment) or non-physical recommendations (changes to hours or conditions, a phased return to work or re-allocation of duties; job sharing or home-working).

The types of reasonable adjustments are categorised into a hierarchy consisting of three levels:

- Level 1 - Adjustments to work or work arrangements;
- Level 2 - Adjustment to equipment of workplace; and
- Level 3 - Adjustment to structure, referring to physical structures and organisational structure.



**Figure 55: Hierarchy of reasonable adjustments<sup>86</sup>**

We focus here on level 2, assistive technology for employees with a disability. This refers to specialist ICT equipment required to assist employees with a disability to meet the requirements of their role. This process also involves the HR manager, as along with the direct supervisor of the person for whom the accessibility assessment is performed.

Some examples of workplace adjustments:

- Provide or adapt equipment to suit particular needs: providing wrists rests if an employee has difficulties typing for any length of time or a CCTV for an employee with sight issues. If the employee is deaf or hearing-impaired, s/he may be able to use a work telephone modified with an amplifier or a text telephone.
- Most people with epilepsy use computers with no risk of them triggering a seizure. Very occasionally, some older types of computer monitor may trigger seizures in people who have photosensitive epilepsy. This is a type of epilepsy where seizures are triggered by flashing or flickering lights. A newer type of monitor should be made available to the employee in this instance.
- For people with dyslexia, having access to a custom set up computer with a word processing application can improve their performance. The possibility of editing and spellchecking can make a significant difference to writing ability. A laptop is often appropriate so that notes can be taken anywhere and work completed at home or whilst

<sup>86</sup> <http://www.defence.gov.au/fr/rr/disability/Hierarchy%20of%20reasonable%20adjustment.pdf>

travelling. For proofreading and for reading text on the computer, the use of text-to-speech software can be invaluable. A scanner and optical character recognition software (OCR) can be used for converting print into a listenable electronic version. Speech recognition software can be easier than typing and reduces spelling mistakes. Many people with dyslexia do not like organising information and ideas in a linear fashion. Concept mapping software allows this person to use his/her visual skills to organise existing knowledge and ideas and to plan new writing and projects.

The table below gives an overview of many reasonable adjustments, both ICT and non-ICT based:

**Table 13: Examples of reasonable adjustments (ICT and non-ICT based)<sup>87</sup>**

Impairment	Task/difficulty	Adjustment
Hearing impairment	Taking part in a meeting	Provide communication support - palantypist or BSL interpreter.
Hearing impairment	Making a phone call (in the office)	Provide a videophone or text phone
Hearing impairment	Contacting the office (for example, to find out the time and location of their next meeting)	Provide a mobile text phone that can be used with the Text Relay Service - e.g. a Nokia communicator
Visual impairment	New employee arriving at work	Colleague meets them at the bus stop
Visual impairment	Taking part in a meeting	Provide minutes and papers in advance, identify what format the employee requires (e.g. Braille, large print)
Dyslexia	Taking part in a meeting	Provide minutes and papers in advance and in a user friendly format
Dyslexia	Writing a report	Provide mind mapping software
Dyslexia or learning difficulty	Taking minutes at a meeting	Provide a Dictaphone and allow extra time to type up minutes
Severe asthma	Travelling to a meeting using public transport	Provide taxis to and from the nearest public transport
Epilepsy	Long meetings, long days	Frequent breaks, cold drinks, and a fan available
Lupus	Attending work full time all year	Allow flexible working such as compressed hours
Work related upper limb disorder	Long day working on a PC	Allow rest breaks; provide timing software which will remind the employee to take rest breaks at regular intervals
Stammer	Taking part in a meeting	Provide awareness training for other staff
Severe back pain	Operating a checkout	Full ergonomic assessment and regular rest breaks
Autism	Starting a new job, fitting into a new team	Assign a 'buddy' to assist and explain office culture
Depression	Reception duties from 8am	Adjust shift to best part of day – after 11am
Anxiety	New employee arriving at work	Colleague meets them at the bus stop
Anxiety	Travel in rush hour	Allow flexible working so they can avoid rush hour

<sup>87</sup>

[http://www.equalityhumanrights.com/uploaded\\_files/YourRights/examples\\_of\\_reasonable\\_adjustments\\_new.doc](http://www.equalityhumanrights.com/uploaded_files/YourRights/examples_of_reasonable_adjustments_new.doc)

- Home: usually a team of architects and occupational therapists, along with the support of experienced users, provide an assessment that determines the limiting factors to accessibility in the home, and then provide safe and cost effective solutions. Some examples are:
  - A smart home is one that has been astutely designed to suit particular needs. Access to enter the home is crucial, as are controls for the environment in terms of home automation (thermostats designed to be operable for persons with hand limitations, outside carriage lights that are motion activated and light sensitive to automatically turn on at dusk, a motion sensor for the porch light that easily screws into the light fixture, overhead fans with remote controls so pulling the chain is not necessary, timers to activate lights, specialised environmental control devices such as voice-activated telephones, an automatic door opener, a hydraulic door closer).
  - Certain domotic solutions have a touch screen interface and app for the user's smartphone or tablet, so that it can easily switch lights and equipment in their home on or off.

### **3.8.5.3. Phases**

The following phases<sup>88</sup> can be recognised:

- **Gather Relevant Information**: The first step in the effective implementation of assistive technology is the gathering of relevant information or data that will help determine if assistive technology should be pursued as a possible support or solution. Once the information or data is collected, a multidisciplinary team should discuss the practicality and sustainability of an assistive technology solution. The methods applied for gathering data are many and varied:
  - Information forms/checklists
  - Work samples
  - Client observation
  - Photographs and video
  - Interviews (first and third party)
  - Review of the relevant research
  - Professional assessments by Speech Language Pathologists, Occupational and Physical Therapists, Physicians, etc.
- **Establish Goals**:
  - Identify priorities for the person
  - Determine long-term objectives from these priorities
  - Set short-term goals within the above objectives
  - Determine what strategies will be used and what resources will be required to support the person to achieve the objectives
  - Establish ways of assessing the person's progress and dates for review.
- **Conduct Assistive Technology Trials**:
  - Extended trials may be useful in the information and gathering stage to provide information on whether AT will improve the person's performance in a particular environment (school, work, or home). They may provide information on which technology

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<sup>88</sup> [http://www.setbc.org/setbc/topics/effective\\_implementation\\_of\\_assistive\\_technology.html](http://www.setbc.org/setbc/topics/effective_implementation_of_assistive_technology.html)

is most appropriate for the person's abilities/needs and their environments - either initially or for ongoing AT planning.

- Any extended assistive technology trial should:
  - have a plan for the trial including a person identified for trial coordination
  - be consistent with the set goals
  - have clear criteria for success
  - have a clear documentation process for gathering and recording data during the trial
  - have a definitive and stated time period
  - have a review of the data to support decision making
  - be reflected in the final decision.
- Identify Assistive Technology Solutions: a three step process can be applied when selecting an AT solution
  - Discuss and devise all possible solutions that would appear to meet the person's needs, as well as those of the environment the person is in.
  - Narrow the list by identifying the various features of each solution and eliminating those that do not have the necessary features.
  - Consider these additional questions and select the best solution:
    - Will the technology work in all necessary settings or environments?
    - If it will be moved regularly, how portable is it?
    - How easy is it to learn and operate?
    - How reliable is it under different conditions?
    - Does it need to work with other technologies?
    - Are there sufficient resources available to support the technology?
- Develop an Assistive Technology Implementation Plan
  - Effective assistive technology implementation is only as good as the plan that guides the implementation. Successful implementation plans address four main areas:
    - equipment support tasks: To use technology effectively, it must be set up correctly and maintained efficiently. The implementation plan should have a clear indication of who is responsible for each equipment support task
    - training: No assistive technology implementation plan would be complete without outlining plans for training those involved in this process
    - methods for integrating technology into the person's working/education/home environment
    - techniques for assessing the effectiveness of the AT implementation.
- Adapt working/school/home environments for Technology Integration: the implementation plan should contain specific plans for the initial tasks or activities that will be supported by the technology and what methods will be used to integrate technology into those tasks or activities.
- Follow Up and Plan Transition: the implementation plan should also contain a description of the techniques that will be used to assess the overall effectiveness of the AT implementation.

#### **3.8.5.4. Useful guides**

The following guides may be useful when addressing AT needs:

- Home

- E-ssential Guide to Assistive Technology – A Parent’s guide:  
[http://www.disabilityrightsca.org/pubs/Assistive\\_Technology\\_Parents\\_Guide.pdf](http://www.disabilityrightsca.org/pubs/Assistive_Technology_Parents_Guide.pdf)
- A Guide to Implementing Assistive Technology for People with Learning Disabilities:  
[http://www.learningdisabilitywales.org.uk/pdfs/implementing\\_atandt.pdf](http://www.learningdisabilitywales.org.uk/pdfs/implementing_atandt.pdf)
- Family Guide to Assistive Technology:  
[http://www.pluk.org/Pubs/PLUK\\_ATguide\\_269K.pdf](http://www.pluk.org/Pubs/PLUK_ATguide_269K.pdf)
- Family Information Guide to Assistive Technology and Transition Planning:  
[http://www.autismspeaks.org/docs/family\\_services\\_docs/Technology.pdf](http://www.autismspeaks.org/docs/family_services_docs/Technology.pdf)
- School
  - A Resource Guide For Teachers and Administrators About Assistive Technology:  
<http://www.wati.org/content/supports/free/pdf/ATResourceGuideDec08.pdf>
  - Guide to Assistive Technology in Schools:  
<http://mada.org.qa/resourcecenter/en/downloads/guides/Assistive%20Technology%20in%20Schools%20-%20english.pdf>
  - A Resource Guide on Assistive Technology for Students with Disabilities:  
[http://www.maepd.org/NHRDsamples/Finalproductsfromrochelle7-29-11/11\\_ResourceGuideonAT.pdf](http://www.maepd.org/NHRDsamples/Finalproductsfromrochelle7-29-11/11_ResourceGuideonAT.pdf)
- Work
  - Employers Guide to Assistive Technology:  
<http://mada.org.qa/resourcecenter/en/downloads/guides/Employers%20Guide%20Qatar%20Edition%20Final%20Qatar%20Saongroup%20v2.pdf>

### 3.8.6. Factors for success in implementing AT

#### 3.8.6.1. A functional approach versus a holistic approach

Human beings live and move in various social and physical contexts, interacting with many people and in many different environments. The process of adopting assistive technology in the case of disability could be approached from different cultural perspectives. These perspectives are often referred to as “models” as they reflect a wider perspective with regards to disability. The following models are the most relevant for AT: the medical model, the social model, and the consumer model (please refer to 3.8.1 Social and medical model of disability).

The **medical model** views disability principally as a feature of the person. This disability is directly caused by disease, trauma, or other health conditions and requires medical care provided in the form of individual treatment by professionals to ‘correct’ the problem within the individual. This rather “obsolete” way to consider disability facilitates a “functional” approach to the adaptation of AT as it directly links the technology to the condition of the person in relation to the functions to perform. The functions can be broken down in sub-functions, each with their difficulties and barriers to overcome, thus leading to the design of an overall AT solution that integrates different technologies.

The **social model** considers the disability as a socially created problem and not simply an attribute of the individual; according to this model, people with disabilities are disabled both *in* their environments and *by* their environments.

The **consumer model** considers the person with a disability as a “consumer”, a well-informed protagonist on the market place for AT. This model also gives the market the position to guarantee the



availability of information and quality of the products and to persons with disabilities the ability to make appropriate choices between the various solutions offered.

### **3.8.6.2. The holistic approach**

ICF (see also 3.3 The ICF based approach to technology and functioning and 3.8.3 ICF: principles and constructs) represents an innovative view on disability that is based on different perspectives and a multi-dimensional framework, embracing both the medical and social models of disability. On its own, neither the medical or social model captures the comprehensive needs of individuals, although both are partially valid. The ICF sees disability as a complex phenomenon that is both at the level of a person's body and as a complex and primarily social phenomenon. Disability is always an interaction between features of the person and features of the environment in which the person lives. This more complete model of disability is called the biopsychosocial model. The ICF is based on this model and provides a coherent view that includes different perspectives: a biological, individual, and social perspective. It therefore broadens the range of issues to be considered when reflecting on disability and when contemplating the role of technology in lessening the impact of health conditions in different environments. Education and training in AT should reflect this biopsychosocial model.

Based on these assumptions the ultimate objective of AT could be defined as: '... to contribute to the effective enhancement of the lives of people with disabilities and older people people, helping to overcome and solve their functional problems, reducing dependence on others, and contributing to the integration into their families and society ...'<sup>89</sup>.

AT intervention must therefore utilise the holistic approach when considering those with a disability; this will incorporate their environment, their current needs, how these needs may change over time, and the current and changing perspectives and needs of all the stakeholders, significant individuals, and organisations in their life. Only AT solutions that result from an integrated and comprehensive approach to disability can really "make a difference".

### **3.8.6.3. The context and environments**

The context and environments in which the activities with ICT-AT take place must be carefully considered as social circumstances and ongoing changes affect them. Factors to be considered may include; expectations, quality of life, family (such as caregiving practices, routines, and economic resources), educational or work needs, and the physical layout of all environments. In many cases, it is important that the individual's care environment is determined by the individual themselves. Effective AT use can be an important driver for an improved functioning person-family-context system.

Attention to these factors is important because an AT device can affect the quality of life of the family as well as the individual. It must also be borne in mind that an appropriate AT solution for one setting must not cause difficulties in other settings. If professionals fail to examine the many elements that

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<sup>89</sup> Azevedo, L., Féria, H., Nunes Da Ponte, M., Wänn, I., Recellado, J. G. Z., in Assistive Technology Training in Europe, Azevedo, L. (ed.), (HEART: Brussels, 1994) p. 4.

make up a person's life<sup>90</sup>, the effectiveness of their work will be undermined, the cost of the solution will be inefficient, and the desired outcome for the individual will not be achieved.<sup>91</sup>

#### **3.8.6.4. Multi/ interdisciplinary**

A holistic approach to the identification of appropriate AT often involves expertise and experience from different disciplines, not just technological competence. At the international level, there is a discussion regarding the prospect of one person combining such a considerable amount of knowledge and expertise in their role as an AT consultant. However, whether or not the term "Assistive Technologist" or "AT Specialist" is logical in this sense, it will always be necessary to incorporate skills and knowledge from distinct disciplines into the AT assessment and implementation process. These thoughts, applied to service delivery systems, form the basis of the most common models of "AT-Teams" and "Assistive Technology Centres".

The path for the adoption of a complex AT solution requires multidisciplinary team work. In general, the disciplines involved in an AT-Team are: health/rehabilitation, psycho-social / educational, and technology. Those within the team are called to work as individual professionals but their involvement in the process is in step with one another. Here is a representative example of an assessment of assistive technology needs: the rehabilitation therapist, educator, and AT technician are asked to work with the individual to identify the most suitable solution, sharing thoughts, feelings, and observations from different points of view. It is important that the protagonist of the AT adoption process is the individual. They may wish to be involved in the assessment alone or with support from their family. They are at the centre of the process and significant others such as carers and family members are also part of the team.

#### **3.8.6.5. Time and Timing**

A critical element in adopting ICT-AT solutions is the importance of both time and timing, particularly in the following respects:<sup>92</sup>

- the timing of the intervention in relation to the person's life development – this is particularly relevant for children;
- the length of time needed for the evaluation and decisional process;
- the length of time for the ICT-AT delivery and funding;
- the timing and the availability of the follow-up, such as the personalisation, the upgrading of the AT solution, the monitoring of the effectiveness, and the person's satisfaction with the devices within the environment.

#### **3.8.6.6. Independent advice centres and other resources**

The importance of ICT AT is growing rapidly and the biopsychosocial approach has allowed for a contemporary focus on innovative perspectives for specialised services to support the AT adoption process. The information provided by the market players, mainly via the internet today, is insufficient

<sup>90</sup> Mendelsohn, S. B., *Assistive Technology: Public Policy and Financing Technology and Disability*, 6 (1997) p. 29-48.

<sup>91</sup> Spencer, J.C., *Tools or Baggage? Alternative Meanings of Assistive Technology* in Gray, D.B., Quatrano, L.A., Lieberman, M.L. (eds). *Designing and Using Assistive Technology: The Human Perspective*. (Paul H Brookes Publishing Co, Baltimore, USA 1998) pp. 89-97.

<sup>92</sup> See also: Ger Craddock, *Key Factors for Successful Implementation of Assistive Technology in Education*, <http://www.nda.ie/cntmgmtnew.nsf/0/8019CCA62FED21158025706600506DFC>

when it comes to choosing a product. For the large majority of consumers of AT, it is important to be able to both view the products and trial them in their intended environment. The individual may also want to reflect on independent advice from a competent person. In addition, the aid must often be customised and persons with disabilities and/or their caregivers often need support and training to ensure AT solutions are being used most effectively. Unfortunately most health and social care professionals are not sufficiently trained to manage all of these issues.

There are not many other resources in the field that can combine proven field experience with the opportunity to try the AT solutions. The companies in the market can offer, through showrooms and trained personnel, support for trialling a certain product; however, there are important issues to consider:

- An ethical issue; conflict of interest
- A practical issue; even if the company has a high professional ethos it can only demonstrate the devices in its catalogue. In the case of ICT-AT solutions this is particularly disadvantageous, since the majority of solutions are complete "systems" with multiple components often distributed by different companies.

A solution could be provided by independent AT Centres. Unfortunately they are not widespread across Europe (e.g. Modem in Antwerp). Typically AT Centres have teams reflecting this multidisciplinary expertise: they are "mediators" between those who require ICT AT (people, services) and the players on the market and in ICT AT research. They are a resource centre for persons with disabilities and their families, the AT companies, the prescriber (when the technology provision is funded with public money), and institutions and authorities who may find relevant answers and support in dealing with situations of disability and ICT-AT. They also provide training for professionals and can support policy makers in developing policy and administrative procedures.

It is fundamental that commercial interests are exempt from the decision-making process as this represents a conflict of interest in discussions regarding best possible AT solutions.

The GLIC association, the Italian network of ICT AT Centres, has attempted to design a profile of an independent AT Centre. It includes the following characteristics:

- Being a stable point of reference for persons with disabilities and professionals;
- Being free from commercial interests related to the AT devices and their distribution and selling;
- Having a multidisciplinary team working and with a large sample of ICT AT at their disposal;
- Providing information, evaluation, consulting, support, training, and research.

In conclusion, the choice for appropriate ICT AT transpires through the joint efforts of different actors and resources: health, social, educational services and their professionals, AT teams, formal and informal carers such as family members, volunteers, friends, associations, etc. Ideally the process is driven by the person and their needs and projects. Finally, the proposal must be in harmony with systems of public financing and the economic resources available.

### **3.8.6.7. Case management**

The choice of ICT-AT is not an isolated instance, but a process that consists of several steps and decisions that involve multiple actors (the person, family, services). The role of the case manager is therefore extremely important. Their input and organisation is all the more necessary when complex AT cases arise.

The Case Manager may be a member of the AT-team or an external professional heavily involved in the case. Their tasks are to:

- amalgamate the contributions from various professionals involved in the process;
- coordinate and support the demand for public funding;
- follow all phases of the process:
  - advice/information to the person and their team;
  - evaluation of needs and projects;
  - intervention;
  - training of people with disabilities and/or care giver to the effective use of AT;
  - activation of the resources needed for the adaptation of AT and the workplace.

### **3.8.6.8. Legislation and appropriate funding**

Although there is a widespread recognition of the fact that AT offers valued opportunities for people with disabilities, policies are often fragmented and not coordinated between institutions. This is reflected in the ways in which services are organised and operate. For the public, it is often unclear who to speak to regarding AT provision.<sup>93</sup>

Although there is a tendency in many countries towards decentralisation of service delivery in areas such as health, education, and employment, our experience suggests that decentralised models of provision struggle to function adequately where services are not evenly distributed and where networks of AT centre peer support are not properly established. Fragmentation in AT service delivery weakens its efficiency.

### **3.8.7. Principles and tools to assess**

The evaluation of the benefits of the AT intervention both for the user and the AT stakeholders is a complex task. In general, this process is termed outcome assessment. In the specific case of AT interventions, outcomes refer to<sup>94</sup>:

*[...] the changes that are produced by AT in the lives of users and their environments. Those changes may range from improvements in delimited aspects of users' motor, sensory, and cognitive functioning to enhancement of their social participation, vocational productivity, and sense of control over their own lives. The cascade of outcomes may extend to individuals' environments as well and include, for example, a reduction in caregivers' assistance and decreased costs to insurers and social welfare agencies.*

What is clear from this definition is that assessing the outcomes of an AT intervention means measuring the impact of any device, not only in relation to the specific functions which are supposed to be replaced or compensated by the AT, but also, and equally important, in relation to psychosocial and environmental dimensions. Indeed, measuring AT related outcomes is a complex process which goes far beyond the evaluation of the usability of an AT device. Once AT professionals and the user have identified a possible AT solution that appears to suit the user's needs, the technology (or set of technologies) has to be trialled and often modified over an extended period of time within the context

<sup>93</sup> BITELLI C., HOOGERWERF E.J., LESLEY A., a cura di, BRIDGE-Ausili tecnologici contro l'esclusione sociale, pubblicato nell'ambito del progetto BRIDGE, (U.E., D.G. Occupazione e Affari Sociali), Bologna sett. 2002

<sup>94</sup> Fuhrer MJ, Jutai JW, Scherer MJ, DeRuyter F (2003). A framework for the conceptual modelling of assistive technology device outcomes. *Disab Rehab*, 25:1243–51.

of the user's everyday life. The duration of this process cannot be predetermined at inception as it should continue until the technology becomes an integral part of the user's life.

During this phase in the AT provision process, the role of the AT professionals is to collaborate with the user in order answer the following questions:

- What is considered a successful use of AT by the particular user?
- What factors (individual characteristics of the user, family environment, training opportunities) influence outcomes and to what extent?
- Is the aid becoming an integral part of the person's life?

In order to answer to these questions and avoid non-use or abandonment of AT devices, AT professionals have started to develop instruments based on evidence for measuring the effects of AT solutions on factors related to the user's experience which seem to affect the user's acceptability of an AT device<sup>95</sup>. In particular, the user attitudes and user satisfaction are significant factors that should be considered in any outcomes evaluation process. Three evidence-based instruments which can help AT professionals to assess the outcomes of an AT intervention are reviewed below:

- The **Matching Person and Technology** (MPT)<sup>96</sup> is a model which offers a wide range of tools both for clinical and research purposes. The MPT is the most widely validated person-centred approach to AT provision. Central to the model is the idea that both the use and the non-use of any AT solution is mainly influenced by three interrelated factors: (i) the environment(s) in which the user interacts with the technology; (ii) personal factors unique to any user, like preferences, predisposition to use the AT solution, and his/her needs; (iii) the characteristics of the technology. Please refer to chapter 2.1 "Which ICT AT solutions are needed? Matching person and " for more information.
- The **Individual Prioritised Problem Assessment** (IPPA)<sup>97</sup> is a simple instrument that measures the effectiveness of the AT intervention from a user's perspective. IPPA defines effectiveness as "the degree to which activities have become less difficult to perform" for the user. At the start of the service delivery, the user is asked to list up to 7 problematic activities and to rate each of them on a 1-7 scale both in relation to the importance of the problem and in relation to the difficulty of performing the related activity. "Importance scores and difficulty scores are multiplied, resulting in a baseline score of between 1 and 49 for each problem. These can then be added up and divided by the number of problems, ultimately resulting in the total IPPA baseline score. A follow- up assessment, carried out a few months after the respondent has

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<sup>95</sup> Federici S, Scherer MJ, Meloni F, Corradi M, Adya D, Samant M, Morris M, Stella, A (2012) Assessing Individual Functioning and Disability. In: Federici S, Scherer MJ (Eds) Assistive technology assessment handbook, 1st edn. CRC Press, Boca Raton, p 11-24

<sup>96</sup> Scherer MJ (1998) Matching person & technology: A series of assessments for evaluating predispositions to and outcomes of technology use in rehabilitation, education, the workplace & other settings. Rev. ed. Webster, NY: Institute for Matching Person & Technology.

<sup>97</sup> Wessels, R. D., de Witte, L. P., Jedeloo, S., van den Heuvel, W. P. M., & van den Heuvel, W. J. a. (2004). Effectiveness of provision of outdoor mobility services and devices in The Netherlands. Clinical rehabilitation, 18(4), 371–8. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/15180120>

received the new assistive device, asks the individual to repeat this rating in relation to the difficulty of performing the same activities. Follow-up scores for each of the problems are calculated by multiplying this difficulty rating with the baseline importance rating, likewise resulting in a score of between 1 and 49. Again, these can be added up and divided by the number of problems, resulting in the total IPPA follow-up score. Changes can be calculated by subtracting the follow-up score from the baseline score, either per problem or per total score.”

- User’s satisfaction with an AT solution represents another important dimension which should be measured during the outcomes assessment process. A definition of user’s satisfaction with any AT solution is provided by Demers and colleagues<sup>98</sup> and refers to a person’s critical evaluation of several aspects of a device and may be influenced by expectations, perceptions, attitudes, and personal values. These authors developed ‘Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0)’, an instrument that collects data regarding the user’s satisfaction rate with an AT device. Please [click here to access an example](#). The questionnaire consists of 12 items divided into two scales. In the first scale, 8 items focus on the device itself (comfort, dimensions, simplicity of use, effectiveness, durability, adjustments, safety and weight) while in the second scale, 4 items focus on the quality of service (professional service, follow-up services, repairs/servicing, and service delivery).

### **3.8.8. Activities**

- Guided learning based on literature and case reports.
- Internship in an AT centre
- Visit to workshops and conferences
- Participation in discussions and forums with AT experts and other expert AT users.
- Case studies: students will investigate possible solutions to a real situation and report to the AT assessment team. Cases may involve different disabilities and different contexts.
- Literature study and reports.
- Use the ATLEC mobile application to guide the search for relevant AT.
- Access and research the internet for assessment / evaluation materials / ideas / solutions WHO ICF model

## **3.9. How is assistive technology acquired?**

### **3.9.1. The local, national, and international AT market: The characteristics of the AT market compared to the market of other sectors of technology**

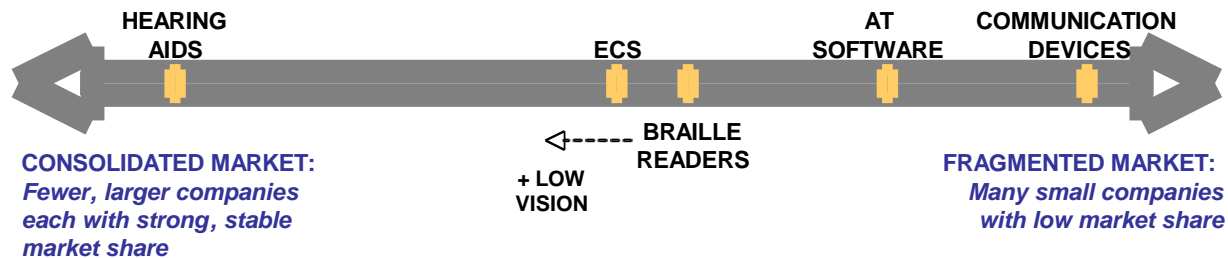
The AT industry in Europe is characterised by a large number of products, a significant number of SMEs, many different service provider systems (public health systems, public social systems, private organisations, and associations dedicated to the AT sector) that are used to get AT ICT products to the users with disabilities, and various reimbursement schemes in different national and local authorities.

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<sup>98</sup> Demers L, Weiss-Lambrou R and Ska B (2002) The Quebec user evaluation of satisfaction with assistive technology (QUEST 2.0): an overview and recent progress. *Technology and Disability* 14:101–105



### 3.9.1.1. Fragmented AT market with a complex buying process



**Figure 56: AT ICT Product group summary comparison on fragmentation<sup>99</sup>**

The fragmentation of the AT market is largely explained by the fact that local legislation necessitates a customised approach (e.g. many different national and local reimbursement schemes) and the fact that AT ICT is often developed in a local language; this is the most significant barrier between the different country markets within the EU ICT AT industry. As a result, AT software products providers are often very small in size with both a limited product range and geographical scope.<sup>100</sup>

This fragmentation is different per AT application area (see Figure 56), with the greatest degree appearing in the AT software area (due to the language customisation issue that is necessary for each geographical market) and communication devices solutions (due to mainly individual solutions which result in few economies of scale for companies). Braille reader companies often diversify into low-vision products which are used by a wider and larger market, and hearing aids are mostly made by big sized companies such as Philips and Siemens. Environmental Control Systems (ECS) are using both mainstream solutions (consolidated market) and adjust them to the specific needs of end-users (fragmented market).

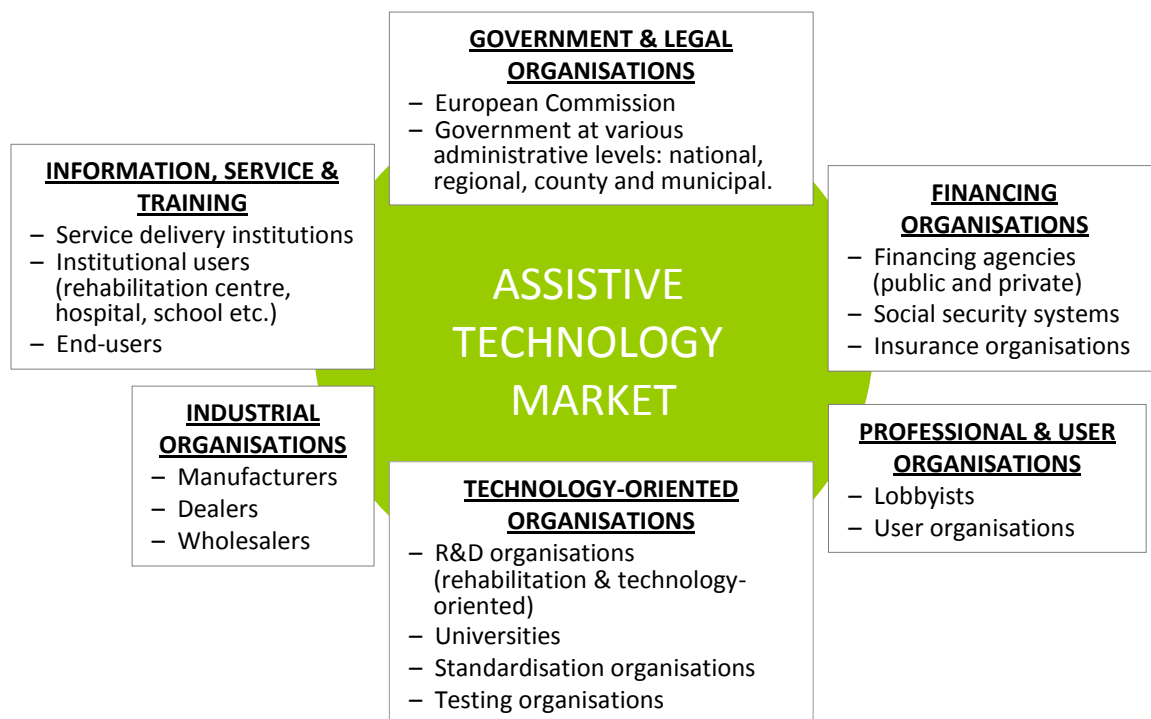
Buying AT is usually a complex decision, involving actors from various sectors (see Figure 57). While the person with disability often plays (or should at least play) a core role, many other individuals are frequently involved in the selection and purchase of a product (family members, nursing staff, therapists, physicians, case workers, funding agencies and companies, other rehabilitation engineering personnel, and an assortment of other interested care providers). The 2009 European assistive technology ICT industry survey pinpointed each of these actors with their main role in the EU AT market. Comments by the author are recorded in *italics*:

- **Governmental and legal organisations:** their objective is to create policy and legal frameworks for determining what products are considered AT, as well as considering how these products are financed and provided to users – *the applied policies are highly heterogeneous (see various different reimbursement schemes across the EU), directly linked to the different purchasing models.*

<sup>99</sup> Analysing and federating the European assistive technology ICT industry, Final Report, March 2009

<sup>100</sup> Analysing and federating the European assistive technology ICT industry, Final Report, March 2009, Jennifer Stack, Leire Zarate, Carmen Pastor, Niels-Erik Mathiassen, Ricard Barberà, Harry Knops, Hugo Kornsten

- **Information service and training organisations and providers:** they add knowledge to the value chain in order to make informed decisions and support professional and user development and competences – *such establishments are not always well organised, often lacking well trained personnel with only a few having undergone appropriate AT training.*
- **Financing organisations:** they finance AT products and their related services on national, regional, and local government levels – *this is again very heterogeneous as illustrated by the various different reimbursement schemes across the EU.*
- **Technology orientated organisations:** AT research is largely dependent on the fundamental research and development from other technology sectors whilst at the same time being led by the specific needs of the disabled and older people populations.
- **Professional and user organisations:** They are advocates for their user members and also act as lobbyists, involved in the policy making process.
- **AT ICT industry organisations:** They are mostly composed of SMEs (Small and Medium sized Enterprises) due to smaller national markets, fragmented by language. A European umbrella organisation grouping the entire AT industry is lacking, although recommendations have been made in this direction (see the 2009 European assistive technology ICT industry survey).



**Figure 57: The variety of actors who participate – directly or indirectly – in the ICT AT industry<sup>101</sup>**

<sup>101</sup> Analysing and federating the European assistive technology ICT industry, Final Report, March 2009

### **3.9.1.2. Supportive legislation**

The European AT industry has – like its counterparts in the USA and Japan – benefited from recent legislation supporting the uptake of AT by a large number of public service providers. The main EU legislations affecting AT and accessibility in general are:

- the legislation to directly subsidise or otherwise support the purchases of assistive technology for disabled users (see national and local reimbursements schemes),
- EU legislation ensuring that all public procurement purchases of goods and services must be accessible (EC Public Procurement Directive 2004 / 18 / EC ('the Directive') on the coordination of procedures for the award of public works contracts, public supply contracts, and public service contracts)<sup>102</sup>,
- anti-discrimination laws that protect the rights of people with disabilities, especially in terms of their access to goods and services (the Treaty of Amsterdam amended the EC Treaty by introducing a new anti-discrimination provision in Article 13 in the EC Treaty, addressing among others to combat discrimination based on disability, while the Framework directive outlaws discrimination on the grounds of disability)<sup>103</sup>.

### **3.9.1.3. AT databases**

Providing an overview of all produced AT software solutions and communication devices is outside the scope of this document. However, a good reference point is the EASTIN database (<http://www.eastin.info>), a network of resources related to assistive technologies that combines the assistive technology resource databases of 7 European countries. According to EASTIN, almost 40.000 assistive products are available in the EU.

Below is an overview of some European AT databases<sup>104</sup>. The Danish, German, Italian, Dutch, Spanish, UK, and Belgian databases have been consolidated into EASTIN but most of them remain members of the International Alliance of Assistive Technology Information Providers (<http://www.ati-alliance.net>).

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<sup>102</sup> Important in this ongoing work is also ETSI's Specialist Task Force 333: European Accessibility Requirements for Public Procurement of Products and Services in the ICT Domain (EC Standardization Mandate M 376, Phase 1), [http://portal.etsi.org/STFs/STF\\_HomePages/STF333/STF333.asp](http://portal.etsi.org/STFs/STF_HomePages/STF333/STF333.asp). The outcome of this is the ETSI Technical Report 102 612 (downloadable via [http://portal.etsi.org/STFs/STF\\_HomePages/STF333/tr\\_102612v010101p.doc](http://portal.etsi.org/STFs/STF_HomePages/STF333/tr_102612v010101p.doc)); this sets out the results of the ETSI part of Phase I of the M 376 work and characterises the public procurement of ICT products and services; provides a listing of existing functional accessibility requirements; identifies gaps where no accessibility requirements exist; provides a list of relevant existing national, European and international standards and technical specifications; and gives proposals for standardisation work for the development of requirements and award criteria that still do not exist or that are not yet standardised.

<sup>103</sup> EU ANTI-DISCRIMINATION LAW, General Editor: F. G. Jacobs. Advocate General, The Court of Justice of the European Communities, 2005

<sup>104</sup> In the USA, similar databases have been established, such as ABLEDATA's database of over 33.000 assistive products from over 4.000 companies.

**Table 14: National databases with AT information<sup>105</sup>**

Country (* <i>participates in EASTIN</i> )	National databases	
Austria	HANDYNET	<a href="http://handynet-oesterreich.bmask.gv.at">http://handynet-oesterreich.bmask.gv.at</a>
Belgium*	Kenniscentrum Hulpmiddelen	<a href="http://www.koc.be">http://www.koc.be</a>
Denmark*	Hjælpeinstitut	<a href="http://hmi.dk/">http://hmi.dk/</a>
France	Handicat – Handicaps et aides techniques	<a href="http://handicat.com">http://handicat.com</a>
Germany*	Rehadat	<a href="http://www.rehadat.de">http://www.rehadat.de</a>
Ireland	Assist Ireland	<a href="http://www.assistireland.ie">http://www.assistireland.ie</a>
Italy*	Siva - Servizio Informazione e Valutazione Ausili	<a href="http://www.portale.siva.it">http://www.portale.siva.it</a>
Netherlands*	HANDY-WIJZER	<a href="http://www.handy-wijzer.nl">http://www.handy-wijzer.nl</a>
Portugal	Catálogo Nacional de Ajudas Técnicas	<a href="http://www.ajudastecnicas.gov.pt">http://www.ajudastecnicas.gov.pt</a>
Spain*	CEAPAT - Centro Estatal de Autonomía Personal y Ayudas Técnicas	<a href="http://ceapat.org">http://ceapat.org</a>
Sweden	Sök i Webb-HIDA	<a href="http://80.80.24.87/">http://80.80.24.87/</a>
UK*	DLF – Disabled Living Foundation	<a href="http://www.dlf.org.uk">http://www.dlf.org.uk</a>

### 3.9.1.4. Purchase of AT by end-users

How AT is being purchased by, or “prescribed” to people with disabilities is an important consideration for the satisfaction of AT usage. The various delivery models are as follows:

- The **medical orientated model**: starting point is the disability where the physician initiates necessary procedures and must approve the need for listed and reimbursed AT based on medical arguments.
- The **social oriented model**: This system is based upon national legislation and local and decentralised execution.
- The **consumer oriented model**: The user has direct contact with a retailer in order to obtain their chosen AT product.

These procurement models are also balanced with different reimbursement schemes applied by every country as depicted in the table below. Where there are strong rules and regulations, the social orientated model comes to the fore (e.g. Belgium) but where there is a lack of regulation, the consumer orientated model can be observed as the user has to undertake all the necessary actions (e.g. Greece).

<sup>105</sup> Analysing and federating the European assistive technology ICT industry, Final Report, March 2009

**Table 15: Procurement models by country for the five ICT AT product groups selected<sup>106</sup>**

	HEARING AIDS	BRAILLE READERS	APPLS FOR VOICE COMMUNICATION	SOFTWARE FOR COMMUNICATION	ENVIRONMENTAL CONTROL SYSTEMS
AUSTRIA	medical	social	social	social	social
BELGIUM	medical	social	social	social	social
DENMARK	social	social	social	social	social
FINLAND	medical	medical	medical	medical	medical
FRANCE	medical	social	consumer	social + consumer	social + consumer
GERMANY	medical	social	social	social	social
GREECE	medical	consumer	consumer	consumer	consumer
HUNGARY	medical	consumer	consumer	consumer	consumer
IRELAND	medical + consumer	medical + consumer	medical + consumer	medical + consumer	medical + consumer
ITALY	medical	medical	medical	medical	social
NETHERLANDS	medical	social	social	social	social
PORTUGAL	medical	consumer	medical + social	social + consumer	consumer
SLOVAKIA	medical	social	social	social	consumer
SLOVENIA	medical	medical	medical	social + consumer	social + consumer
SPAIN	medical *	consumer	social + consumer	social + consumer	social
SWEDEN	medical	medical	medical	medical	medical
UK	medical	social	social	consumer	social

These national and even regional legislations regarding the reimbursement of AT (and in some cases with training as in The Netherlands) and the resulting different delivery models are the root cause for the lack of a common EU market. This gives rise to the establishment of small companies that sell locally rather than EU wide. A salient example is the case of Austria<sup>107</sup> with its many different regulations determined by the purpose of the assistive technology (at work, at school, or in everyday life, etc.). The assessment and procurement process for assistive technologies is the responsibility of local authorities, provinces, or institutions (Fond Soziales Wien) whilst there are also federal regulations (Federal Social Office- Bundessozialamt). The result is that in an individual case, access to AT is regulated by different institutions.

### 3.9.1.5. Barriers for the AT industry and its end-users

In conclusion, there are a number of barriers linked to AT software that have been identified in recent studies on the European AT ICT industry<sup>108</sup>. These are summarised below:

- About 80% of the software available for AT applications is only in English whilst a majority is also only in the local language of the manufacturer. However, language differences also necessitate that a local presence is necessary for the training or installation phase of AT by the wholesalers, dealers, importers, or retailers;

<sup>106</sup> Analysing and federating the European assistive technology ICT industry, Final Report, March 2009

<sup>107</sup> Measuring Progress of eAccessibility in Europe (MeAC), as mentioned in Report on policy and DfA, DfA@eInclusion deliverable D2.2b, 2008

<sup>108</sup> Access to Assistive Technology in the European Union, A study prepared by Deloitte & Touche, EC, Directorate-General for Employment and Social Affairs, Unit E. 4, June 2003; Analysing and federating the European assistive technology ICT industry, Final Report, March 2009, Jennifer Stack, Leire Zarate, Carmen Pastor, Niels-Erik Mathiassen, Ricard Barberà, Harry Knops, Hugo Kornsten; MeAC - Measuring Progress of eAccessibility in Europe, Assessment of the Status of eAccessibility in Europe, Main Report, Bonn, October 2007

- A lack of a coherent social policy for subsidising/reimbursing assistive technology products;
- Users are largely unaware of the available AT solutions and this is also identified by the aforementioned European AT ICT industry survey as an important barrier to the development of the AT business in the EU;
- There are some countries where specialised agencies exist to support people with disabilities in selecting appropriate AT (e.g. Danish Centre for technical aids for rehabilitation and education, MODEM for communication devices in Belgium, Kenniscentrum Hulpmiddelen in Flanders, Belgium). However, in the majority of EU countries, this is lacking or poorly organised (experience of the staff members and the possibilities for trialling AT prior to purchase differs greatly);
- The different interpretations of national service provider systems at the regional level create barriers as the national market is further fragmented into regional markets. This then results in different price-settings, within the same country;
- Distribution of AT still usually goes through the traditional rehabilitation centre channel and related care sector, as well as specialised AT entities (for example the ONCE Foundation);
- There is a lack of dedicated training for Assistive Technology products and their capabilities (e.g. for both technical experts and users). In addition, there is a need to promote e-learning for training purposes (including the development of learning materials that can be used across borders);
- European research and innovation on Assistive Technology is rather poor, mainly due to the insufficient size and fragmented nature of the national markets. These prevent a sufficient return on investment for manufacturers or research institutes active in AT development;
- Assistive devices are often purchased through tendering. These (often hard to obtain) procedures are hard to follow for foreign producers or distributors who have no local distributor;
- High purchasing costs for end users are reported as a major barrier for wider deployment by disability organisations;
- Whilst most countries have regulations which safeguard partial or full funding for the costs of workplace adaptations for people with disabilities, little use has been made of these opportunities. Some do not know what is available to them plus there is the ever-present administrative burden.

### **3.9.2. Associations or federations of ICT AT producing and supplying companies**

The main representative organisation of the ICT AT industry in Europe is the Association for the **Advancement of Assistive Technology in Europe (AAATE)** which endeavours “to stimulate the advancement of assistive technology for the benefit of people with disabilities, including older people”<sup>109</sup>. Over 250 members from all over Europe and throughout the world currently take part in the AAATE.

#### Areas of Action

- To create awareness on assistive technology

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<sup>109</sup> <http://www.aaate.net/>



- To promote research and development of assistive technology
- To facilitate the exchange of knowledge within the field
- To disseminate information about assistive technology and related issues

**Main activities**

- A major international conference - held every 2 years - on all aspects of assistive technology
- Special Interest Groups (SIGs) on various topics
- "Technology and Disability", the official Scientific Journal of AAATE
- Seminars, Workshops and Information events
- A regular Newsletter reserved to members, along with various networking services through the AAATE website
- A network of national contacts throughout Europe
- Co-operation on wider international level with key organisations in the field, especially the other three "sister organisations" in North America (RESNA), Australia (ARATA), and Japan (RESJA)

### **3.9.3. Information vs. independent information on ICT AT**

In today's technology-infused world, most information on ICT AT is retrieved from the internet. There are various types of information providers.

- AT selling companies:
  - Sites providing commercial information which are made available by the companies that produce and distribute aids. There are no checks on the quality of this information which refers mostly to the company's products and only in rare cases includes methodological guidance as to how the aids are used most effectively. In recent years, there has been a notable increase in the number of sites offering online sales of ICT AT solutions. On the one hand, there is the potential for reducing prices of AT devices as companies engage in commercial competition; on the other hand, the increase in online companies simply favours the development of a purely commercial logic and it therefore fails to facilitate the important choices in the more complex cases, i.e. choices regarding the most appropriate complete AT system .
- Non-commercial organisations:
  - Databases and specialised portals for research purposes; such sites are developed and maintained with public funds at national and European level. They provide information organised in non-commercial formats, search criteria, methodological suggestions, and user experiences. The European Assistive Technology Information Network (EASTIN) web portal (<http://www.eastin.eu>) is the most comprehensive information service on AT in the EU. EASTIN allows users to analyse, compare, and then choose the most appropriate and up-to-date solutions for their needs.
  - Sites providing information for the general public, mainly developed by associations, public, and private bodies; for the most part concerned with disability, with sections devoted to aids, the information found here is focused on product experiences and innovations. It tends to follow a journalistic approach.
  - Sites of a technical and scientific character created by research institutes, AT Centres, and AT Institutions: here there is highly specialised information such as project reports, the analysis of products, and innovative designs etc.
- Social networks serve as a vehicle for information and provide a place where all those involved in the world of AT can contribute their thoughts, feelings, and experiences (users) and current

improvement or product innovations (companies in the market). The penetration and effectiveness of these knowledge sharing tools are increasing. Amongst them are:

- The European Thematic Network on Assistive Information Technologies (ETNA) represents one of the most active communities in the field of ICT AT in Europe. ETNA (<http://www.etna-project.eu>) involves 23 leading Institutions in 13 EU Countries.
- ATIS4all collaborative portal is an open and collaborative portal that hosts an active community of AT professionals. The website is available here: <http://collaborativeportal.atis4all.eu/en-GB/default.aspx>.

### **3.9.4. Activities**

- Online consultation of resources regarding:
  - Local, national, and international legislative framework for ICT AT and opportunities for reimbursement, funding and support (public and private sector). A good source is <http://www.disability-europe.net/>. The Academic Network of European Disability (ANED) was created by the European Commission in December 2007. ANED established and maintains a pan-European academic network in the disability field to support policy development in collaboration with the Commission's Disability Unit. Various EU country reports are published by the ANED network and address the following themes: EU law and policy, data and indicators, monitoring rights, employment, social inclusion, independent living, education and training, and benefits / entitlements.
- Online research of
  - Product catalogues, such as the one provided by EASTIN - <http://www.eastin.eu/en-GB/searches/products/index>.
  - Recent developments on the market for ICT AT.
  - Different types of companies/suppliers of ICT AT.
  - The main ICT AT producing companies that address ICT AT in your language.
  - The main ICT AT distributing companies in your area.
- It is advised to visit fairs and participate in seminars, workshops, conferences, etc.
- An active participation in online forums and social networks on ICT AT is recommended. "The power of social media to promote assistive and learning technologies" ([http://www.nationaltechcenter.org/documents/power\\_of\\_social\\_media.pdf](http://www.nationaltechcenter.org/documents/power_of_social_media.pdf)) is recommended as further reading.
- The participation in project demonstrations on behalf of companies can be invaluable.
- Write a critical review of the process of purchasing and funding of ICT AT in your country.
- Outline the different ICT AT solutions for persons with different disabilities and needs.
- Possible source: [http://www.nationaltechcenter.org/documents/power\\_of\\_social\\_media.pdf](http://www.nationaltechcenter.org/documents/power_of_social_media.pdf)
- See "Europe with Free Choice of Assistive Technology The provision of assistive devices in specific European countries" - <http://www.hi.se/Global/Dokument/fritt-val-av-hjalpmedel/Europe%20with%20Free%20Choice%20of%20Assistive%20Technology%20-%20publ-10395.pdf>

## **3.10. Using ICT-AT**

### **3.10.1. Starting to use an ICT AT**

In most cases, the first stage in the use of a device concerns the installation of the input system and **checking its compatibility with the system already in use**: the hardware, such as alternative systems of pointing, may not be compatible with the PC (it might not run on the operating system installed on the machine) or associated software (drivers or virtual keyboard software).

Once possible issues regarding the installation of the input system have been resolved, the next step is **personalisation**. This involves maximising the usability of the device and ensuring it suits the needs of the user. The adjustments made at this point range from optimising the positioning of the hardware to the customisation of operating parameters; for example, increasing or lowering the speed of the pointing system or the scanning system or considering the modification of graphic features and the spatial organisation of menu elements.

Generally, with the help of experts and experience in using the AT device(s), there is a **process of ongoing customisation with a rising curve of operational efficiency**.

It is often necessary to find solutions in situations in which the popular software on the non-specialist market cannot be accessed using the chosen input system. **Adaptations of existing software products** are then required. In cases like these, simple solutions for the user are usually identified involving, for example, the creation of a customised virtual keyboard with key functions capable of performing operations that would otherwise be too complex.

The **support of experts** (e.g. an AT Centre team) is essential. They can contribute to the evaluation of the individual case and commence a programme of support over time in order to guarantee the efficacy and real utility of the proposed solution. The primary aim of such an intervention is to guarantee the autonomy of the user, check the correct use of the assistive technology, and institute a process of progressive customisation of the aid. Family members and professionals are also involved: they are offered guidance on methods, in-depth training on the aid concerned, and given access to online resources and user experiences.

**Professionals of various kinds** (educational, technical, health) are usually **involved in the process of actuating the chosen solution**. They each have their specific tasks both at the AT centre and in the everyday life contexts of the user, such as their school, home, and place of work.

**External support** can be valuable even after the user has started to use the aid, particularly in cases where:

- the user's original caregivers are replaced by new staff members who require support and training in each AT aid within its environment ;
- additional needs emerge which make it necessary to "review" the original evaluation and make changes and adjustments as appropriate. These additional needs may arise from the work--school transition, a change of employer, or the need to use new equipment etc.);
- the progressive development of a disease leads to difficulties in the use of the chosen aid and makes changes necessary;
- the aid becomes obsolete; this can occur quite frequently as the technological market is characterised by continuous improvement and innovation.

### **3.10.2. ICT AT at work**

The first step in using ICT AT technology is to identify a suitable workstation in a familiar environment and then to customise it so that it can be used in complete autonomy and comfort.

- Adjustable chair: this is the most important element in the workplace because it has a significant impact on posture. The ideal configuration varies from individual to individual depending on their physical characteristics, the existence of functional limitations, personality, socio-cultural factors, etc. The ideal sitting posture is the one that meets the following requirements as far as possible:
  - comfort
  - functionality
  - stability
  - ergonomics
  - taste
- Optional footrest: it should be stable and wide enough to allow the legs to change position;
- The height of the work table should be between 60 and 85 cm if adjustable but between 70 and 75 cm if fixed;
- The monitor should be positioned about 50-70 cm in front of the user. Any support should be solid and easily adjustable;
- The upper part of the screen should be at eye-level;
- Reflections caused by an inappropriate position with respect to a window or other light source can strain the eyes and cause headaches. Reposition the monitor if necessary and adjust the size of the characters and their colours;
- Lighting should never be direct or too strong, otherwise you risk the onset of severe visual disturbances. It should be sufficient to illuminate printed or handwritten documents without causing glare, shadows, or an excessive level of contrast,
- In the case of impaired vision, it is necessary to choose an intensity and direction of light commensurate with your visual capacity and field of vision;
- Document supports / lecterns should be stable and adjustable and should be positioned to minimise the movements of the head and eyes. They should be positioned at approximately the same distance and angle as the monitor;
- Use of an arm rest may be necessary to ensure greater stability during the course of activities;
- Fix the various tools used (e.g. trackball, joystick) to the workstation using adhesive material;
- Position all devices at the correct height and distance for optimal use.
- If a PC is shared with others, create an individual profile and password.
- Personalise the various elements of the system:
  - Enlarge the elements on the screen;
  - Adjust the velocity of the mouse;
  - Adjust the timing of the double click or replace it with a single click;
  - Make it easier to use the keyboard by customising it in various ways: for example, create sticky keys and filter keys to prevent unwanted key presses and make writing easier;
  - Install appropriate software related to the technology (e.g. the smart nav system or scanning);
  - Download a virtual keyboard and configure it (size, font);
  - Use the autolock feature;

- Add interesting internet websites to the “my favourites” list.

### **3.10.2.1. Activities**

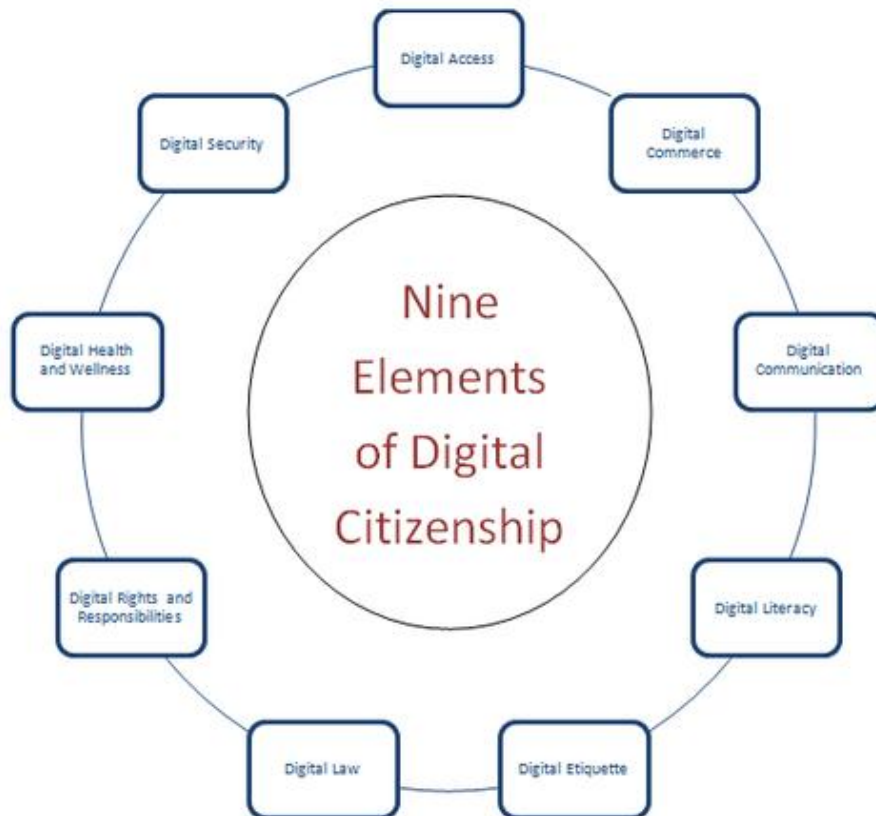
- To complete a complex baseline assessment task (In UK linked to National Curriculum Levels as appropriate. Other countries will have national levels).
- To independently:
  - a) Use the technology proficiently on request.
  - b) Begin to design and produce activities that can be used for teaching at the advanced level – task / interactive work sheets, crossword, handout / guides.
  - c) Create a short video on how to use your ICT AT device.
  - d) Record audio instructions – voice, screen reader etc.
  - e) Create an informative and instructional PowerPoint on how to use the ICT AT device.
- To independently:
  - a) Create an informative PowerPoint presentation on where best to use your ICT AT device in a room taking into account environmental factors and equipment.
  - b) Create a room plan.
  - c) Send e-mails to the appropriate sources – ICT technician, Occupational Therapist, Physiotherapist, Speech and Language Therapist etc, – to request the necessary support / equipment / software etc.
- Internet use / misuse:
  - a) List in bullet points the potential benefits and dangers of social media.
  - b) Make a leaflet and distribute through the use of e-mail.
  - c) Create a quiz / mini-exam.
- Purchasing Equipment
  - a) Role play activity
  - b) Research in order to acquire / purchase potential ICT AT options
  - c) Feedback findings on task sheet
- To discuss how to apply knowledge and skills to create planning and resources for teaching a personalised curriculum.

## **3.11. Learn independent ICT AT based skills in the living/working and other environments**

### **3.11.1. Participate fully in the information and communication society**

Being a citizen is being a member of society. People are citizens of the country that they live in and good citizens follow the laws of the land (government legislation). In the same way, if people are part of an information and communication society, they are digital citizens and so should adhere to the rules and respect the standards of citizenship.

The Digital Citizenship website [www.digitalcitizenship.net](http://www.digitalcitizenship.net) maintains that digital citizenship can be defined as the norms of appropriate, responsible behaviour with regards to technology use. It puts forward 9 elements that constitute responsible digital citizenship:



**Figure 58: 9 elements of digital citizenship**

These elements are explained below:

- Digital access: full electronic participation in society. Technology users must be aware that not everyone has the same opportunities when it comes to technology. Working towards equal digital rights and supporting electronic access is the foundation of Digital Citizenship. Digital exclusion makes it difficult to grow as a society which increasingly uses these tools. Improving access to technology should be the ultimate goal of all digital citizens. Users need to bear in mind those individuals with limited access and help to provide additional resources where necessary. To become productive citizens, each person needs to be committed to the principle of digital accessibility.
- Digital commerce: electronic buying and selling of goods. Technology users need to understand that a large share of market economy is being controlled electronically. There are legitimate and legal exchanges but the buyer or seller needs to be aware of the issues associated with this. The mainstream availability of Internet purchases of toys, clothing, cars, food, etc. has become commonplace to many users. At the same time, a vast amount of goods and services which conflict with the laws of some countries are surfacing all the time, including illegal downloading, pornography, and gambling. Individuals need to learn how to be effective consumers in this new digital economy.
- Digital communication: electronic exchange of information. One of the significant changes within the digital revolution is a person's ability to communicate with other people. The expanding



digital communication options have changed everything as people are able to keep in constant communication with one another. Now everyone has the opportunity to communicate and collaborate with anyone, anywhere, anytime.

- **Digital literacy:** process of teaching and learning about technology and its uses. While schools have made great progress in the area of technology infusion, there is still a long way to go. There needs to be a renewed focus on what technologies ought to be taught and how it should be used in schools. New technologies are finding their way into the workplace that are not being used in schools (e.g., videoconferencing, online sharing spaces such as wikis). Learners must be taught how to realise their potential within a digital society. In other words, learners must be taught to learn anything, anywhere, anytime. As each new technology emerges, learners have to master its features quickly and appropriately. Digital Citizenship involves educating people in a new way and these individuals need a high degree of information literacy skills.
- **Digital etiquette:** electronic standards of conduct or procedure. Technology users often see this area as one of the most pressing problems when dealing with Digital Citizenship. Individuals can identify both appropriate and inappropriate behaviour and this understanding must be transferred into the digital world (actions and choices have consequences). Many people feel uncomfortable talking to others about their digital etiquette. Rules and regulations are established as a way of controlling unacceptable behaviour but sometimes the technology is simply banned altogether to prevent inappropriate use. Policies alone will not be fully able to foster responsibility in society's citizens; digital etiquette must be taught in schools at a grass roots level if this digital society is to thrive.
- **Digital law:** electronic responsibility for actions and deeds. Digital law deals with the ethics of technology within a society. Unethical use manifests itself in form of theft and/or crime. Ethical use manifests itself in the form of abiding by the laws of society. Users need to understand that stealing or causing damage to other people's work, identity, or property online is a crime. They need to be aware of certain laws that apply to anyone who works or plays online. Hacking, downloading illegal music, plagiarising, creating destructive worms, viruses, or creating Trojan Horses, sending spam, or stealing anyone's identity or property is unethical and unlawful.
- **Digital rights and responsibilities:** freedoms extended to everyone in a digital world. There is a fundamental set of rights extended to every digital citizen such as the right to privacy and the right to free speech. Digital rights must be addressed, discussed, and understood in the digital world. With these rights also comes a set of responsibilities. Users must help to define how the technology is to be used in an appropriate manner. In a digital society, these two areas must work together for everyone to be productive.
- **Digital health and wellness:** physical and psychological wellbeing in a digital technology world. Eye safety, repetitive strain injuries, and sound ergonomic practices are issues to be addressed in a new technological world. There are also a number of psychological issues that are becoming more prevalent in society such as internet and games addiction. Users need to be understand that there are dangers inherent in the technology they utilise. Digital Citizenship includes a culture where technology users are taught how to protect themselves through education and training.
- **Digital security (self-protection):** electronic precautions to guarantee safety. In any society, there are individuals who steal, deface, and disrupt. The same is true for the digital community. It is not enough to blindly trust members in the digital community. In households there are locks

on all external doors and alarm systems to protect against break-in and property theft. The same must be true for digital security Protection against data loss, viruses, and equipment surge are all essential. Responsible citizens safeguard their information from external forces looking to cause disruption or harm.

### **3.11.2. Rights to ICT AT (funding)**

The legislative/regulatory approaches underpinning AT provision across EU countries are relatively diverse. This includes the extent to which AT is explicitly referred to in primary legislation and/or the extent to which it is adopted into secondary legislation/regulations.

In the majority of countries, assistive devices are publicly financed. In the Netherlands, some assistive devices are financed by municipalities but a large proportion remain financed via insurance agreements, with some also financed via funding programs. In Germany, all assistive devices within the healthcare sector are financed via insurance agreements. In the UK, assistive devices are occasionally financed via charitable organisations. In most countries, the regions (municipalities etc.) are often afforded a high degree of self-determination, meaning that the assistive devices available vary within each country. In the Netherlands, there are also variations between the different insurance companies.

Within the framework of regular provision systems in the different countries, assistive devices are generally provided to users from a contractually purchased product range, often in list form. It is usually possible to obtain assistive devices outside of this range but only if the user has special requirements and not simply because they want it. This also applies in the Netherlands and Germany where the systems consist of insurance solutions. In some countries, namely Denmark, the Netherlands and Italy, users are presented with a number of options within the regular system framework where they can use their own funds to obtain a different device. In Italy, users have the option of choosing their supplier if the assistive device has not been purchased via contract agreement by the responsible authority.

With regards to the ownership issue, the assistive device generally remains the property of the responsible authority, even if the user pays extra. In Finland and in parts of Spain at least, the user becomes the owner of the assistive device if it is not reusable. In Italy, the user becomes the owner of the assistive device if they pay extra. It is worth mentioning that in Italy the healthcare services are usually responsible for training individuals to use self-purchased assistive devices. The user training is considered part of the individual training plan or care program.

AT policy and AT systems are not static but subject to transition or change. Whether as a result of the economic downturn, structural changes in responsibilities in the wider system, or other unknown factors, aspects of the AT provision systems in all countries are in transition. In the Netherlands, for example, there is an ongoing shift of aspects of AT provision from the medical insurance based system to the local authorities. In Denmark, the major reorganisation of local administration has had an impact on how AT expertise is organised. In Norway, changes to the unified system are being discussed, with the possibility of more responsibility for AT funding and procurement to transfer to local authorities. More generally, the implications of increased emphasis on universal design for systems that have

traditionally focused on AT as specialist devices, is beginning to be discussed in some countries such as Norway.

One of the key themes in the disability field over the past 20 years has been the shift from a medical model to a social model, with a major impetus towards rights-based approaches, emphasis on independent living, and promotion of self-determination in terms of how needs are met (e.g. personal budgets).

For an overview of how AT is funded throughout Europe, the following reading is recommended:

- “Europe with Free Choice of Assistive Technology - The provision of assistive devices in specific European countries, Swedish Institute of Assistive Technology (SIAT), 2010, Author: Martina Estreen” which can be downloaded [here](#).
- “Analysing and federating the European assistive technology ICT industry, Final Report, March 2009” which can be downloaded [here](#).
- “Research on the provision of Assistive Technology in Ireland and other countries to support independent living across the life cycle, Kevin Cullen, Donal McAnaney, Ciaran Dolphin, Sarah Delaney and Philomena Stapleton, Work Research Centre, Dublin, February, 2012” which can be downloaded [here](#).
- “Access to Assistive Technology in the European Union, A study prepared by Deloitte & Touche, European Commission, Directorate-General for Employment and Social Affairs, Unit E. 4, June 2003” which can be downloaded [here](#).

### **3.11.3. Disability discrimination**

Disability discrimination can occur in various forms:

- when a person is treated less favourably than another due to their disability (direct discrimination).
- when the same treatment applies to everyone but the impact of such treatment is to disadvantage or exclude people with a disability in a way which is unreasonable (indirect discrimination).
- when a person is treated less favourably because he or she uses an assistive device or is accompanied by an interpreter, reader, assistant, or carer, or by a guide dog, hearing dog, or other animal trained to provide assistance.
- Failure to make reasonable adjustments so that a person with a disability is able to access a public space, a shop, or a transportation facility is considered discriminatory.
- Harassment and victimisation of people with disabilities because of their disability are obvious cases of discrimination. Harassment can include, for example, offensive remarks about a person’s disability, and might create a hostile work environment or result in an adverse employment decision (such as the harassed person being fired or demoted). ‘Victimisation’ can arise if an individual has previously been involved in making a claim regarding disability discrimination. For example, a person brings a grievance for disability-related harassment and, as a result, is subsequently turned down for promotion.

### 3.11.4. Disability legislation in Europe

Whilst the European Community (EC) has adopted and implemented instruments of disability policy since the mid-1970s, it only acquired the power to address disability discrimination in 1999 when the Amsterdam Treaty came into force. The potential of the new Article 13 EC was quickly acted upon and the Employment Equality Directive, which prohibits employment related discrimination with regard to inter alia disability, was adopted in 2000. The Directive has had a significant impact on the level of protection provided to victims of disability discrimination in the EU Member States. Prior to the adoption of the Directive, only three Member States prohibited employment related disability discrimination in civil law; today all 27 Member States prohibit such discrimination, as does Norway.<sup>110</sup>

The European Union policy on disability is built on an explicit obligation to the social model of disability. As stated by the Head of the European Commission's Unit on the Integration of People with Disabilities:

*The EU perceives disability as the result of the dynamic interaction between a person and their environment, including social constructions, which lead to discrimination and stigmatisation. It is therefore the environment that should be adapted to each individual person, including people with disabilities, by removing these barriers. (Goelen 2005)*

This, in turn, leads to an individual, right-based approach for those with a disability.

*Disability is a right-based issue, discrimination should be eliminated. Disability policies should follow a socially inclusive and individualised approach: rights have to be supplemented by actions, which provide access to rights, that is to say with equal opportunities. (Goelen 2005)*

**The legal basis** for EU action in this area is provided by Article 13 of the European Treaty, dating from 1999, which permits the European Council to 'take appropriate action to combat discrimination based on sex, racial or ethnic origin, religion or belief, disability, age and sexual orientation' (Goelen 2005).

It has been expressed in a variety of forms, such as the Charter of Fundamental Rights and, for example, in the Commission communication 'Towards a barrier free Europe for people with disabilities'.

The European Commission Directive against discrimination on the grounds of religion or belief, disability, age, or sexual orientation prohibits discrimination by setting a minimum standard which applies across the European Union. National laws determine the exact form of implementation and member states can impose more demanding requirements if they wish, but this Directive sets a common foundation.

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<sup>110</sup> Disability and non-discrimination law in the European Union, An analysis of disability discrimination law within and beyond the employment field - European Network of Legal Experts in the non-discrimination field, Lisa Waddington and Anna Lawson, European Commission, Directorate-General for Employment, Social Affairs and Equal Opportunities, Unit G.2, July 2009, <http://www.migpolgroup.com/public/docs/Disabilitynon-discriminationlawEU.pdf>

The Directive (paralleling the UK Disability Discrimination Act (1995)) requires employers (and training providers) to provide 'reasonable accommodations' to meet the needs of disabled people. So the obligation on employers and training providers is not absolute: for example, they are not required to pay costs beyond those that the business could manage or accept severe disruption to overall training programmes. The Directive makes the correct assumption that most adjustments require only small-scale changes and that the requirement to make 'reasonable accommodations' will therefore considerably improve the labour-market position of disabled people.

In principle, existing member states of the European Union should have had anti-discrimination laws in place by December 2003, but in practice they were given the possibility of requesting an extension to this period until December 2006. Member states joining the EU in 2004 were required to have such legislation as a requirement for accession and Bulgaria and Romania faced the same requirements on accession in 2007.

Member states that fail to meet their obligations can be taken to the European Court of Justice by the European Commission. An individual who is unable to gain redress because a national government has failed to introduce legislation would have to seek compensation from that government. This whole, multi-stage process is expected to take years before practical policy comes to fruition.

For an in-depth overview, the following is recommended: "Annotated review of European Union law and policy with reference to disability, Prepared by Janina Arsenjeva on behalf of the Academic Network of European Disability experts (ANED), December 2009", which can be downloaded [here](#) (especially the annex of annotations to relevant instruments, page 36).

### **3.11.4.1. Activities**

- To be checked by every participant:
  - What funding is available for AT in your country?
  - What organisations can assist a user in his/her search for AT support?
  - What are the laws governing rights to AT in your country?
  - What modifications are users entitled to?
  - What is a "reasonable adjustment" in the workplace, at home, at school etc?
  - What sites/magazines are available to track the evolution of ICT AT?
- Review local technological development sites and media.
- Research the equality and anti-discrimination legislation in your country.
- Is there an equal opportunities policy for your organisation or learning centre? If not, draft one.
- Study examples of specifications for devices, including your own if possible, and evaluate them against best value principles.
- Choose a device and research and prepare peer product reviews.
- Write a critique of the process of acquiring your own current AT device. What considerations and criteria were important to you? What would you do differently next time?

## 4. Social and interpersonal skills<sup>111</sup>

Defending yourself and your rights requires knowledge of strengths and limitations and the willingness to learn from these. This section will help you to reflect on yourself in a structured and focused way. Take the time to explore your strengths and consider the challenges you face in social situations. It is important to gain strength from this in interacting with others, either when discussing something or during a formal job interview.

### 4.1. Social skills

Social skills are the skills we use to communicate and interact with each other. They are both verbal (speech) and non-verbal (gestures, body language, and personal appearance).

Human beings can be defined as “social animals” and we have developed many ways to communicate our thoughts, feelings, and opinions with others. What is said is influenced by both the words we say and how we say them - tone of voice, volume of speech, and the words we choose - as well as by more subtle cues such as body language, gestures, and other non-verbal communication methods.

The fact that some people are better ‘social interactors’ than others has led to detailed investigations into the nature and function of interpersonal interaction. Developing social skills is about being aware of how we communicate with others, the messages we send, and how methods of communication can be improved to make the way we communicate more effective.

There are distinct advantages to having well developed social skills. Here are five:

- **More (and healthier) Relationships:** identifying well with individuals leads to more relationships and, at times, friendships. By developing your social skills you become more charismatic, people are more interested in you since you are (or at least appear to be) more interested in them. Most people know you cannot advance far in life without interpersonal relationships. Focusing on relationships will help you get a job, get promoted, make new friends, and give you a better outlook on life. More relationships can also help to reduce the negative effects of stress.
- **Better Communication:** being able to relate to peers and work in large groups naturally develops communications skills. After all, you cannot have great social skills without good communication skills and being able to convey thoughts and ideas is one of the most important skills.
- **Greater Efficiency:** if you are good with people, you can more easily avoid being with the people you do not like as much as others. Some people dread social interactions because they do not wish to spend time with individuals who do not have similar interests and viewpoints. It is much easier to attend a meeting at work or a party in your personal life if you know at least some of the people who will be there. If you are in a social situation with ‘John’ and do not want to spend time with him because he cannot help you with a particular issue, a good set of social skills will allow you to politely convey that you need to spend your personal time with other people instead. See our pages regarding improving self-esteem and building confidence.
- **Advancing Career Prospects:** most worthwhile jobs have a ‘people component’ and the most lucrative positions often involve a large amount of time spent interacting with employees, the

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<sup>111</sup> <http://www.skillsyouneed.com>



media, and colleagues. It is rare that an individual can remain isolated in their office and still excel in their job. Most organisations are looking for individuals with a particular, tactical skill set: the ability to work well in a team and to influence and motivate people to get things done. See our page: Employability Skills for more information about the kind of skills that employers are looking for.

- Increased Overall Happiness: getting along with and understanding people will help to open many doors, both personally and professionally. Having the confidence to start a conversation at a work-related conference may lead to a new job offer with a higher salary. A smile and 'hello' in a social situation may lead to a friendship being formed. See our page: Personal Presentation Skills for more.

The characteristics of social skills can be summarised as follows:

- Social skills are goal-oriented;
- Socially skilled behaviours are interrelated in the sense that one person may use more than one kind of behaviour at the same time for the same goal;
- Social skills should be appropriate to the situation of communication. Different social skills will be used for professional and personal communication;
- Social skills can be identified as certain types of behaviour where an individual can be judged on how socially skilled they are;
- Social skills can be taught, learned, and then practised over time;
- Social skills should be under the cognitive control of the individual – this involves learning specific behaviours, identifying the social situations in which they should be used, and being clear on how to use them.

## **4.2. Interpersonal skills**

Interpersonal skills are the life skills we use every day to communicate and interact with other people, both individually and in groups. People who have worked on developing strong interpersonal skills are usually more successful in both their professional and personal lives.

Employers often seek to hire staff with 'strong interpersonal skills'– as they want people who will work well within a team and be able to communicate effectively with colleagues, customers, and clients.

Interpersonal skills are not just important in the workplace, our personal and social lives can also benefit. People with good interpersonal skills are usually perceived as optimistic, calm, confident, and charismatic, qualities which are often endearing or appealing to others.

Through awareness of how you interact with others, and with practice, you can improve your interpersonal skills.

Interpersonal skills include:

- Verbal Communication: what we say and how we say it;
- Non-Verbal Communication: what we communicate without words; for example, body language;
- Listening Skills: how we interpret both the verbal and non-verbal messages communicated by others;

- Negotiation: working with others to find a mutually agreeable outcome;
- Problem Solving: working with others to identify, define, and solve problems;
- Decision Making: exploring and analysing options to make informed decisions;
- Assertiveness: freely communicating our values, ideas, beliefs, opinions, needs, and wants.

We've all been developing our interpersonal skills since childhood, usually on a subconscious level.

Interpersonal skills become so natural that we may take them for granted, never thinking about how we communicate with other people. With a little time and effort you can develop these skills. Good interpersonal skills can improve many aspects of your life - professionally and personally – as they lead to an improved understanding of individuals, groups, and relationships.

Interpersonal skills are also sometimes referred to as: social skills, people skills, soft skills, communication skills, or life skills. Although these terms can include interpersonal skills they tend to be broader and therefore may also refer to other types of skills.

To improve and develop your interpersonal skills, the following will be of assistance:

- Learn to listen: listening is not the same as hearing. Take time to listen carefully to what others are saying through both their verbal and non-verbal communication.
- Choose your words: be aware of the words you are using when talking to others. Could you be misunderstood or confuse the issue? Reflect on the conversation and seek feedback to ensure your message has been understood. Encourage others to engage in communication and use appropriate questioning to develop your understanding.
- Understand why communication fails: communication is rarely perfect and can fail for a number of reasons. Learn about the various barriers to effective communication so that you can be aware of - and reduce the likelihood of - ineffective interpersonal communication and misunderstandings.
- Relax: when we are nervous we tend to talk more quickly and therefore less clearly. Being tense is also evident in our body language and other non-verbal communication. Instead, try to stay calm, make eye contact, and smile. Let your confidence shine.
- Clarify: show an interest in the people you speak with. Ask questions and seek clarification on any points that could easily be misunderstood.
- Be positive: try to remain positive and cheerful. People are much more likely to be drawn to you if you can maintain an optimistic attitude.
- Empathise: understand that other people may have different points of view. Try to see things from their perspective. You may learn something whilst gaining the respect and trust of others.
- Understand stress: learn to recognise, manage, and reduce stress in yourself and others. Although stress is not always bad, it can have a detrimental effect on your interpersonal communication. Learning how to recognise and manage stress, in yourself and others, is an important personal skill.
- Learn to be assertive: you should aim to be neither passive nor aggressive. Being assertive is about expressing your feelings and beliefs in a way that others can understand and respect. Assertiveness is fundamental to successful negotiation.

- Reflect and improve: think about previous conversations and other interpersonal interactions; learn from your mistakes and successes. Maintain a positive attitude but realise that you can always improve your communication skills.
- Negotiate: learn how to effectively negotiate with others; pave the way to mutual respect, trust, and lasting interpersonal relations.
- Working in groups: we often find ourselves in group situations, both professionally and personally. Learn all about the different types of groups and teams.

### 4.3. Verbal and non-verbal communication

**Effective verbal or spoken communication** is dependent on a number of factors and cannot be set apart from other important interpersonal skills such as non-verbal communication, listening skills, and clarification. Clarity of speech, remaining calm and focused, being polite, and following some basic rules of etiquette will all aid the process of verbal communication.

Interpersonal communication not only involves the explicit meaning of words, the information or message conveyed, but also refers to implicit messages, intentional or not, which are expressed through **non-verbal behaviours**. Non-verbal communications include facial expressions, the tone and pitch of the voice, gestures displayed through body language (kinesics), and the physical distance between the communicators (proxemics). These non-verbal signals can reveal more about your thoughts and/or feelings than the words being spoken

Non-verbal messages allow people to:

- Reinforce or modify what is said in words. For example, people may nod their heads vigorously when saying "Yes" to emphasise that they agree with the other person, but a shrug of the shoulders and a sad expression when saying "I'm fine thanks" may imply that things are not really fine at all!
- Convey information about their emotional state.
- Define or reinforce the relationship between people.
- Provide feedback to the other person.
- Regulate the flow of communication, for example by signalling to others that they have finished speaking or wish to say something.

The non-verbal communications include:

- Body movements (kinesics): Body movements include gestures, posture, head and hand movements, or whole body movements. Body movements can be used to reinforce or emphasise what a person is saying and also offer information about the emotions and attitudes of a person. However, it is also possible for body movements to conflict with what is being said. Research has identified several different categories of body movement. These are detailed below with each category describing the purpose they commonly serve:
  - Emblems: gestures that serve the same function as a word are called emblems. For example, the signals that mean 'OK', 'Come here!', or the hand movement used when hitch-hiking. However, be aware that whilst some emblems are internationally recognised, others may need to be interpreted in their cultural context.

- Illustrators: gestures which accompany words to illustrate a verbal message are known as illustrators. For example, the common circular hand movement which accompanies the phrase 'over and over again', or nodding the head in a particular direction when saying 'over there'.
- Affect displays: facial expressions or gestures which show the emotions we feel. These are often unintentional and can conflict with what is being said. Such expressions give strong clues as to the true emotional state of a person.
- Regulators: gestures used to give feedback when conversing are called regulators; for example, head nods, short sounds such as 'uh-huh' and 'mm-mm', and expressions of interest or boredom. Regulators allow the other person to adapt his or her speech to reflect the level of interest or agreement. Without receiving feedback, many people find it difficult to maintain a conversation.
- Adaptors: non-verbal behaviours which either satisfy some physical need such as scratching or adjusting uncomfortable glasses, or represent a psychological need such as biting fingernails when nervous. Although normally subconscious, adaptors are more likely to be restrained in public places than in the private world of individuals where they are less likely to be noticed. Adaptive behaviours often accompany feelings of anxiety or hostility.
- Posture: Posture can reflect people's emotions, attitudes, and intentions. Research has identified a wide range of postural signals and their meanings:
  - Open and Closed Posture: two forms of posture have been identified: 'open' and 'closed'. These may reflect an individual's degree of confidence, status, or receptivity to another person. Someone seated in a closed position might have their arms folded, legs crossed, or be positioned at a slight angle from the person with whom they are interacting. In an open posture you might expect to see someone directly facing you with hands apart on the arms of the chair. An open posture can be used to communicate openness or interest in someone and a readiness to listen, whereas the closed posture might imply discomfort or disinterest.
  - Mirroring: Notice the way a loving couple relate to each other. You might like to observe a close relationship in person or on television. You will see that the partners' postures will match, as if one partner is a mirror reflection of the other. For example, if one partner drapes an arm over the back of a chair this might be replicated in the other person's position. If one partner frowns, it could be reflected in the other partner's facial expression. This 'mirroring' indicates interest and approval between people and serves to reassure others of interest in them and what they are saying.
- Eye contact: Eye contact is an important aspect of non-verbal behaviour. In interpersonal interaction, it serves three main purposes:
  - to give and receive feedback; looking at someone lets them know that the receiver is focusing on the content of their speech. Not maintaining eye contact can indicate disinterest. Communication may not be a smooth process if a listener averts their eyes too frequently.
  - to let a partner know when it is their 'turn' to speak; this is related to the above point. Eye contact is more likely to be continuous when someone is listening rather than speaking. When a person has finished what they have to say, they will look directly at the

other person and this gives a signal that the arena is open. If someone does not want to be interrupted, eye contact may be avoided.

- to communicate something about a relationship between people; when you dislike someone, you tend to avoid eye contact and pupil size is often reduced. On the other hand, the maintenance of positive eye contact signals interest or attraction to a person.
- Para-language: Para-language relates to all aspects of the voice which are not strictly part of the verbal message, including the tone and pitch of the voice, the speed and volume at which a message is delivered, and pauses and hesitations between words. These signals may indicate feelings about what is being said. Emphasising particular words can imply whether feedback is required.
- Closeness or personal space (proxemics): Every culture has different levels of physical closeness appropriate to different types of relationship and individuals learn these distances from the society in which they grow up. In today's multicultural society, it is important to consider the range of non-verbal codes as expressed in different ethnic groups. When someone violates an 'appropriate' distance, people may feel uncomfortable or defensive. Their actions may well be open to misinterpretation. In western society, four distances have been defined according to the relationship between the people involved. The study of personal space is termed proxemics. The four main categories of proxemics are as follows and are associated with the four main types of a relationship – intimate, personal, social and public:
  - Intimate Distance (touching to 45cm)
  - Personal Distance (45cm to 1.2m)
  - Social Distance (1.2m to 3.6m)
  - Public Distance (3.7m to 4.5m)
- Facial expressions: Facial expressions are an important channel of non-verbal communication. The role of facial expressions in person-to-person interactions remains substantial. Facial cues that provide commentary and illustration about verbal communications are significant in themselves. For example, the facial behaviours related to emotion can reveal part of the feeling side of a person's private life. Such emotion indicators range from stereotyped, full-face expressions that are obvious to fleeting and partial-face movements that are hard to see.
- Physiological changes: These are the biological changes in body that occur when a person experiences an emotion. These can occur during many instances. Below are some examples:
  - **Stress** is an essentially normal response to feeling overwhelmed or threatened. Fight, flight, and freeze are survival responses that have developed to protect us from danger. In moments of stress, hormones release and, as our heart beat speeds up and blood pressure increases, we breathe quicker, move faster, hit harder, see better, hear more accurately, and jump higher than we could only seconds earlier. If we're nervously driving at high speed on the freeway at night, we can respond more effectively to unexpected hazards because we are exceptionally alert. These neurological and physiological changes enable us to protect ourselves in the moment. However, once the danger has passed, our nervous systems calm down and we return to a state of equilibrium or neurological balance. Positive stress can produce feelings of exhilaration and opportunity. Not all people experience stress in the same way. One person's exhilarating challenge may be another's terrifying experience.

- Perspiring, flushing, or paleness of the skin, an increased pulse rate, and the appearance of veins in the head, neck, and throat are all signs that an individual might **not be truthful** when being asked something. Equally, a person that stutters, appears to have a dry tongue or mouth, exhibits changes in breathing, licks their lips, and has thickening speech, might indicate that they are not telling the truth.
- **Smiling** triggers a neurophysiological activity in the brain to feel good.

#### 4.4. Self-esteem

Self-esteem is the result of how we view ourselves or the 'good' or 'bad' qualities we see in ourselves. Two main concepts that deal with that are **self-worthiness** and **confidence** in your own abilities. With regards to the former, you might think, "I am a valuable person and I deserve to receive love and care from other people." With regards to the latter, you might think "I am a capable and able person who is able to perform tasks to a high standard."

#### 4.5. Finding your strengths and weaknesses

If our confidence is low, it is often difficult to recognise our inherent strengths. We all have something positive to offer, and it is simply a question of realising what that is.

Knowing where your strengths lie and where you need assistance can help you stabilise your personal life and nurture your professional interactions. Here are some tips and tricks to identify your strengths and limitations, whether for a job or for personal reasons:

- During a job interview:
  - Throw away the "weaknesses" that are really just strengths in disguise. Potential employers are intelligent and experienced and can easily see right through this strategy. Sometimes they interview hundreds of people for a single position and the interviewee's first instinct is to use a strength and spin it as a limitation. "Strengths" that are commonly spun as "limitations" include:
    - "I'm a perfectionist and I can't stand to get things wrong."
    - "I'm stubborn and I don't let things go."
    - "I struggle to maintain a good work/life balance because I work so hard."
  - Instead, identify a real limitation. Limitations are human. There wouldn't be any point in asking the question if the answer is simply a summary of your strengths. The interviewer isn't looking for that kind of response as it appears artificial and insincere. They're looking for a real discussion of areas you can work on, some insight into yourself. Real limitations might include:
    - Being overly critical
    - Being suspicious (of authority, of peers)
    - Being too demanding
    - Procrastinating
    - Being too talkative
    - Being too sensitive
    - Exhibiting a lack of assertiveness
    - Exhibiting a lack of social tact



- Acknowledge your limitation(s) and how it might affect your performance at work. The employer may be impressed with the insight you have and your truthfulness. However, remain diplomatic in what you say.
- Show the interviewer how you strive to overcome your limitation. Again, being practical is better than being idealistic, because an idealistic response could seem unrealistic and unlikely.
- Talk about your strengths confidently, without being conceited or appearing over-assertive. Try to be confident while still staying humble about your achievements and skills. It is helpful to select the strengths that could be in line with the individual, business, or organisation to which you are applying. Real strengths fall into three main categories:
  - Knowledge-Based Skills: computer skills, languages, technical know-how, etc.
  - Transferable Skills: communication and people management skills, problem solving, etc.
  - Personal Traits: sociability, confidence, punctuality, etc.
- Provide examples when talking about your strengths. It is very easy to talk about your unrivalled people skills, but it's another thing to show it. Illustrate what your strengths by providing real life examples.
- For Personal Development
  - See beyond “strengths and limitations” as a mere interview technique. Each of us possesses certain strengths and certain limitations. They form the building blocks of our personality and shape how we approach life. Job interviewers ask this question to understand how well you may fit into their organisation; you need to ask it of yourself to know how well you know yourself and whether you're accomplishing goals and achieving your full potential. Strengths are considered to be the talents, innate abilities, and desires that “click” for you. In other words, this is when you'd be tempted to say something like: “It wasn't an effort, I've always had the ability to....” Strengths should not be confused with skills, which can be learned or improved. For example, confidence and assertiveness are skills, while a way with words is most likely a strength. Limitations are considered to be something about yourself that you have the capacity to improve. It might be professional or social skills or poor self-restraint when it comes to eating food. Often this aspect is about learning “life lessons” and not repeating mistakes made in the past; other times, it's about making the effort to overcome a lack of skills.
  - Consider how you respond in certain situations that require action, thought, and insight. Before doing anything more concrete, try to monitor your spontaneous reactions to experiences you've had in life already. Spontaneous reactions tell you a great deal about how you react in both ordinary and intense situations. Ask yourself the following series of questions on how you would respond — and use your gut instinct. Make this into a list. Don't spend a lot of time thinking about your responses.
  - Have a close friend or family member provide you with feedback. Although self-examination can lead to a few solutions, asking for and receiving an outside opinion will help you to corroborate your thoughts and observations or may make you aware of misconceptions you had about yourself.

- Choose someone who will be truthful and not disguise or dismiss your limitations. Find an external, neutral person, preferably a peer or a mentor, to give you honest and candid feedback.
- Reflect and determine how you feel about your identified strengths and limitations. Decide if you need or want to work on any of your limitations and contemplate what you will need to do to transform your limitations into strengths. Take care not to become hung up on limitations. Some of them are best accepted as an innate part of your personality and not worth a tireless effort towards change.. You can spend too much time working on a limitation at the expense of celebrating a strength that compensates for it.
- Don't deny "Eureka" moments in your life. These are the times when you do something you've never done before - it just ""clicks"" - and you find that you're a total natural. This might be sport, art, creative pursuits, interacting with animals, standing in for someone who is away and doing their job, etc. If you suddenly discover a passion and an ability to do something as if you were born to do it, it's highly likely that you've revealed a previously hidden strength. Not everyone will experience this amazing moment; if you do, work with it to enhance your life and reach your true potential.

#### **4.6. Self-confidence (job interview specific)**

Self-confidence is paramount to positive personal presentation. If you're not naturally self-confident in an interview situation, there are a few things you can do to facilitate this:

- Rehearse: remove the fear of being caught off-guard by practicing answers to common interview questions. It's a good idea to rehearse out loud in front of a mirror so you can see exactly how you appear to others. Memorise the contents of your CV including dates and job titles. This prevents uncomfortable silences during the interview should you be asked about a particular item on your CV.
- Research: take time to learn about your prospective employer. Read their website, know their competitors, and ensure you have, at a minimum, a broad understanding of their marketplace.
- Prepare: arrange your travel plans in advance. Verify the directions to the interview and be certain about who to ask for when you arrive. Print out any necessary documents at least 24 hours in advance, iron your clothes the night before, and have everything ready to go.
- Smile: smiling releases endorphins that make you feel more relaxed and at ease. Smiling will help you to calm your nerves and a natural, genuine smile will exude warmth as you meet your interviewer.
- Tell the truth: by exaggerating, lying, or telling half-truths you may be caught out or become confused and nervous. Avoid potential embarrassment by being truthful throughout.

#### **4.7. Self-presentation (job interview specific)**

It's a visual world, so it is essential that all jobseekers present a positive visual image of themselves as effectively as they can. Your personal appearance and how you portray yourself is the first opportunity you have to impress an interviewer. They may judge attitude, personality, and even ability in this moment so giving a good first impression is imperative. This section addresses the elements that affect person's appearance.

From the moment you make eye contact with your interviewer, to the moment you leave the room, you are on show. Don't let this intimidate you; instead, follow our personal presentation tips and put your best foot forward.

Although it may seem obvious to be neat and tidy for the interview, be sure to pay extra attention to your personal grooming. Small details count towards your overall impression, so don't neglect the following:

- Shoes: cleaned and polished; heels should be in good repair.
- Hair: neatly groomed; long hair should be tied back.
- Facial hair: clean shaven; beards should be trimmed and tidy.
- Nails: clean, cut short, or suitably manicured.
- Breath and body odour: fresh and pleasant; wear clean clothing and use deodorant but avoid using strong perfume; avoid smoking cigarettes before the interview; resist eating foods with garlic or spicy foods 24 hours beforehand.

In addition, if you're carrying a bag, document folder or laptop, make sure it's clean. Even the fairest interviewers subconsciously form opinions based on your appearance. This is especially true if you appear is unclean or unprofessional.

During the interview, there is a certain etiquette which should be respected. Good interview etiquette is essential to a good personal presentation. Being punctual, for example, demonstrates that you are organised, professional, and reliable. Other essential aspects of a winning interview etiquette are listed below:

- Handshake: be firm and confident; avoid clenching the interviewer's hand too tightly (you don't want to hurt them), but don't give a soft, meek handshake either.
- Eye contact: make good eye contact with your interviewer, especially during the initial greeting, final farewell, and as you acknowledge interview questions.
- Use the interviewer's name: a universal sign of respect, acknowledging the interviewer by name shows you are listening and involved; take care to be as natural as possible.
- Say 'thank you': as the interview ends, be sure to offer your thanks for the interviewer's time and the opportunity you've been given; in addition, mail or email a brief post-interview thank you note the same evening.
- Don't discredit others: if you are asked about previous employers or workmates, never speak negatively. If you don't have anything nice to say, it is the subject is best avoided.

A lack of interview etiquette will not go unnoticed. Forgetting any of the above will tarnish your personal presentation, making you appear rude or lazy. Your efforts at good interview etiquette should be unobtrusive, resulting in an easy, natural social interaction.

## **4.8. Activities**

The following activities can be carried out:

- Role play
- Mock debates
- Role swap

- Aural comprehension exercise (summarising other people's debate points)
- 'Ice breaker' activities
- Agenda building exercises
- Setting up and chairing a debate
- Literature and film studies relating to self-analysis and self-recognition
- Examples from philosophers and psychologists (Freud, Kant etc)
- Discuss the quote "O would some power the giftie gie us to see ourselves as others see us" (Burns)
- Team work - name 5 good things about x - swap over
- "If you were an animal, I think you would be..." Why? (ice breaker)
- Walking through fictional history - why do you think x did this, using television or film - what should they have done for an improved outcome
- Walking through actual history - re-examine major events in history - what behaviours affected the results? How does this relate to your own behaviour?

## **5. Becoming a go-to-person, an expert**

### **5.1. Peer support**

Many people with disabilities face intense emotional and psychological difficulties at some point in their lives. Professional help may be required but peer support can always act as a complementary aspect of the counselling procedure. Despite the severity of their disability, many people manage the stresses of a demanding daily routine given reasonable support from their peers.

Peer support is mostly referred to activities and initiatives that are directly connected to the independent living movement. It has been used extensively by people with disabilities across the world. During the peer support activities, people provide knowledge, experience, emotional and practical help to each other on a reciprocal basis. Peer supporters may have been trained (e.g. peer support specialists, peer counsellors) and the majority are volunteers with various self-help organisations and NGOs.

#### **5.1.1. Conditions to be a peer supporter**

Every peer supporter undertakes the following four basic tasks:

- Assistance in daily living: peer supporters use their own experiences in facing everyday challenges such as physical activities and wheelchair use, medication, medical complications, and health provision. They support people figure out how to manage their disability and identify key resources and “emergency exits” in their daily routine.
- Emotional support: staying motivated and being focus on goals may be challenging while living with a disability. Empathetic listening techniques can help people with disabilities overcome many social or emotional barriers and adopt a positive attitude towards life.
- Bridging the gap between people with disabilities and health professionals: it is more likely that a peer supporter can encourage and advise individuals to seek out medical and clinical assistance when required. Peer support counselling builds trust between the two parties and one can influence the other in many things.
- Extended ongoing support: peer support is usually ongoing as peers tend to bond with the person and then maintain a long-term follow-up.

##### **5.1.1.1. What do I need to know?**

Here are some guidelines / advices for peer supporters:

- It is very difficult to approach a person with a disability unless they want to be approached. Peer support can never be forced. It always starts as an inner need to talk to someone who has been through a similar, sometimes traumatic experience.
- The individual’s capabilities and preferences must be considered during the peer support procedure.
- The most important principle in meeting the needs of a person who has a disability is to ask how they would prefer educational or vocational training material to be provided.
- There are such a wide range of potential adjustments for people who have a disability depending upon its type and severity. It would therefore be quite misleading to make advance assumptions, such as: “he is quadriplegic, so he doesn’t move his fingers” or “she is deaf,

therefore she only communicates with sign language” or “he’s a wheelchair user, therefore he doesn’t move his legs”, etc.

- All the required adjustments that facilitate the learning procedure must be accepted in full by the peer supported person in order to be implemented. The peer supporter has to balance an honest conversation depending on the maturity and capability of the person, so that the outcome is realistic. Stereotyping solutions do not hold any ground in a peer-to-peer relationship. Creativity and sincere communication is the only way forward.

What a peer supporter must bear in mind:

- Provide help with motivation
- Enhance self-help and self-management skills
- Advice and support with learning strategies
- Support with study skills
- Time management and planning
- Provide stress management support and confidence building

Peer supporters must always ensure that:

- They have the time and/or skill within the context of their other commitments to do this
- It does not conflict with other aspects of their role
- They are able to:
  - listen to the person’s concerns
  - offer practical advice
  - provide reassurance
  - show their concern by following up their conversation at another time

**Note:** the peer supporter is not solely responsible for a trainee’s emotional condition.

### **5.1.1.2. What should I do?**

A peer supporter or peer support specialist has made sufficient progress in their own recovery that they feel able and willing to self-identify as a peer and assist other individuals with relevant conditions and/or experiences. It is commonly accepted that, due to their life experience, peer supporters have expertise that cannot be replicated by professional training.

There are many tasks performed by peer support specialists that may include assisting their peers in:

- articulating their goals for recovery;
- learning and practising new skills;
- monitoring their progress;
- assisting them in their treatment;
- modelling effective coping and self-help strategies based on the specialist’s own recovery experience.

A peer support specialist could also work with the person and others (trainers, educators, employers, etc.) to ensure that, for example, their learning or working requirements are appropriately assessed. They could also recommend support by reasonable adjustments that are appropriate to their needs. The



peer can advise the peer supported person of the available resources and provide information that may ease a long or particularly stressful daily routine. They are also in a good position to consider reasonable adjustments and any available funding to which the person is entitled

The most important virtues of a peer:

- Listening
- Providing the person time to talk
- Understanding the situation from their point of view
- Be sympathetic and not dismissive
- Helping the other feel supported
- Supporting independence

Dependencies have to be avoided since they can easily be created for the best of reasons. A peer should encourage the peer supported person(s) to try a wide range of solutions and strategies in order to maintain long-term independence and sustainability. Although establishing a daily routine is very important for the supported person, they must not be trapped in an environment or context where there is a danger to “lose” themselves. This also includes working conditions and routines (e.g. working with commercial tools on a laptop could put the person in a highly stressed situation if the need for a different working environment and workstation occurs; becoming familiar with (free) alternatives that run from a memory stick is important here).

Nevertheless, it is not only the supported person that has to learn how to enhance their independence in various directions. The peers also have to be flexible and willing to accommodate. For example, they need to extend the repertoire of resources they provide and also encourage people to discover varied strategies to, for example, work more efficiently.

What a peer cannot do:

- Solve all the peer supported person’s problems
- Take responsibility for their emotional condition or actions
- Engage in continuous “hand-holding” when there’s no sign of will for independence
- Take decisions on their behalf

### **5.1.1.3. Understand your peer**

It is completely normal for a peer to feel insecure while supporting another person as it is not always possible to know what the best source of support might be. There will be challenges throughout, especially when the peer supported person has to deal with multiple issues that may not be directly linked with their disability. Most of the time, persons with disabilities just need to talk things through with someone who will provide a listening ear. If extra professional help is required, the peer must refer the person to suitable resources (community services, specialists etc)

Understanding the peer you support is the ultimate goal. People with disabilities tend to hide their anxiety and underestimate the stress that is often caused to them by the inappropriate environment and the various obstacles in daily living. It is crucial for the peers to (mentally) connect with one another. Trust and confidentiality are necessary preconditions. The person has to feel free to “expose”

their disability, health condition, and concerns to their peers in order for them to establish a healthy and beneficial relationship. The supported person also has to be fully engaged and ensure they inform their peer supporters of all their practical and emotional needs, keeping them informed of any changes therein. They also have to feel comfortable enough to admit when their needs are not being met. Respect for each other and taking responsibility are key components in order for this relationship to flourish.

With regards to the person's independence, the peer supporter should optimise the person's independent status and not act on their behalf. The long-term goal should always be to encourage the person to advance their current level of autonomy and self-sufficiency.

Understanding the peer also involves identifying the various ways they can be supported and then determining different degrees of intervention where appropriate. The peer supporter has to balance three issues: what the supported person would prefer, what they or their social insurance can afford (e.g. assistive technology equipment, workplace adjustments, direct payment schemes, etc.), and what achieves the greatest autonomy and self-reliance.

## **5.1.2. Relationship work Peer-supporters as positive role-models**

### **5.1.2.1. Kinds of relations**

A peer-to-peer support is usually a non-professional procedure. There are many different environments where a person with a disability can find themselves needing support. It is common for peer support systems to be extremely well organised, much like the framework within a University or educational institution.

#### **Universities**

Peers usually provide emotional and academic support to undergraduate and postgraduate students experiencing different types of disabilities and health conditions (physical, sensory, cognitive).

In a mainstream procedure, disability service departments assess the support required for specific emotional and study skills and then appoint a suitable peer supporter to the person.

#### **Working place**

In the workplace, peer support is mainly provided on a one-to-one level, usually in a non-official manner, where senior employees with disabilities guide new employees through the reasonable adjustment phase in the work environment, identify and locate the resources required to support the person's productivity and independence, and proactively schedule their tasks in a less time-consuming format.

#### **Confidentiality**

- In peer support relationships, personal information is never disclosed to anyone (including family members) without the trainee's explicit consent.
- Personal information about trainees is treated with discretion.

- Absolute confidentiality should not be promised by the peer in situations of emergency; in extreme cases, the peer should advise the peer supported person that they may have to consult a professional.

### **5.1.2.2. Elements of relations**

Peer support is designed to support the trainee to work through their difficulties, to enhance their understanding of themselves, and to identify and develop coping mechanisms and management techniques:

- Self-perception and self-reflection: observing your own behaviour and being clear about the causes for this, and then comparing this to the life-choices and experiences of their peers.
- Own experiences: sharing the daily challenges, the demanding healthcare incidents, the personal assistance management, the procedure of setting new priorities, the right to take risks, and the right to fail.
- Setting a routine - ongoing procedure: the day to day working relationship helps peers determine how they would like things to be carried out and maintains a great deal of flexibility to ensure things work well.

Some trainees find that long term peer-support/counselling is more suitable for their needs, particularly when they have just been injured (being disabled for less than 3 years).

### **5.1.3. E-peer support: pros and cons**

Online distance peer support is often a good option in cases where the supported person lives a long distance away or has a severe disability meaning that attending meetings can be a challenge for them

When embarking on training at a distance, the fundamental aim is to establish an open relationship with the supported person based on the technological benefits. There are many ways e-peer support can be delivered:

- Via the internet: it offers a great variety of workshops, courses, webinars, videos, blogs, discussion groups, and literature.
- Via the intranet: it offers security and engages learning and development by allowing for personalisation where courses can be customised to specific needs. Queries can be resolved by accessing a wide range of knowledge sources and databases.
- Via mobile devices: portable devices, like smartphones and tablets, can allow convenient access to text, audio, or video files wherever the person is. There are many kinds of assistive applications and default functions such as text message reminders and quizzes, and calendars or diaries. These can aid with planning tasks or a preparing a daily schedule. Most of those devices now have access to email and the internet along with the ability to play audio and video files, giving users a broad mix of possibilities for peer support.

E-peer support has a number of essential pros:

- Peer supported people are being unexpectedly honest in giving feedback during the e-peer support experience. On the other hand, persons conducting face-to-face sessions frequently express anxiety in sharing their writing for fear of being wrong or rejected by peers.
- It is much easier for supported people to give negative feedback to their peers without hurting the feelings of others or damaging personal relationships.
- Training is delivered at a specific pace through scheduled sessions, but with free and full access to the training material. There is also internet training that takes place in real time where the trainer directs a course via chats and webcasts.
- It eliminates/reduces the non-learning expenses of training such as travel and lodging costs for participants.
- It enables trainees to experience training in real time but also to store and retrieve information transmitted through the course.
- It can be a cost-effective learning tool for everyone.

There are also shortcomings in e-peer support:

- The lack of human interaction.
- Difficulties with group functioning can occur; this is problematic as many peer support activities are organised in groups.

#### **5.1.4. Activities**

- Case studies reflecting experiences with support in groups.
- Identifying and managing expectations of peer supported people.
- Discuss performing peer consultation:
  - In person, on the phone, or via the internet
  - Peer-to-peer or in group sessions
  - Ad hoc or ongoing formats
  - Peer support on ICT AT equipment

### **5.2. Mentoring**

#### **5.2.1. What is Mentoring?**

**A one-to-one, non-judgmental relationship, in which an individual mentor voluntarily gives his/her time to support and encourage another, the mentee.**

*Acu, Home Office 2001*

**Mentoring is to support and encourage people to manage their own learning in order that they may maximise their potential, develop their skills, improve their performance and become the person they want to be.**

*Eric Parsloe, The Oxford School of Coaching & Mentoring*

A mentor can be anyone; a friend, a relative, or a colleague. A mentor is viewed as an older, more experienced person who acts as a tutor or a leader. A mentoring relationship is usually one where a

more experienced person helps another person to increase their awareness of their abilities, comprehend their strengths and limitations, and identify areas for personal development.

However, mentoring has to be carefully established, taking into account the following aspects:

- it is an organised relationship whereby partners must be carefully selected;
- it is governed by an explicit agreement between the parties;
- it is voluntary and each partner must agree to the choice of the other and be able to withdraw if the relationship fails;
- it is confidential between the parties;
- its main purpose is to serve the needs of the mentee;
- it is a mechanism for sharing experience between two parties, a two-way street with benefits for both sides.

This relationship commonly comprises the following:

- A mentor coordinator: this person organises, supervises, and coordinates the mentor/mentee relationship.
- The mentor: this is a person who has lived through a specific experience, in this case the usage of ICT AT.
- The mentee: this is a person who is new to an experience, in this case the usage of ICT AT.

Experience, skills, and competences are far more valuable in a mentoring relationship than age or position. Open and clear communication, trust, and assertive cooperation of both parties are essential. In most cases, the experience is two-way with mentors learning from their mentees.

The mentor recognises what the mentee understands or fails to understand. They share skills, techniques, and methods, and give additional information and examples or direct questions. They may ask for additional support from other colleagues, all so that the is able to learn and understand all the relevant details of the required knowledge, skills, concepts, or viewpoints. Furthermore, the mentor must ensure that the mentee has really grasped what they have learned and can reproduce it in their own words or means if necessary.

### **5.2.2. Main characteristics**

As a process based on mutual trust, reliability, and respect, the mentoring framework is divided into three phases. These are based around Morton-Cooper and Palmer's description of three key phases of the mentoring relationship: initiation, development/working, and termination<sup>112</sup> (please refer to Figure 59).

- **Phase 1 - Foundation:** This describes the time when the mentor and mentee initiate their relationship and establish a contract, ground rules, and boundaries that will "govern" the mentor-mentee relationship.
- **Phase 2 - Development and Training:** This describes the process of training, review, and feedback.

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<sup>112</sup> Alison Morton-Cooper, Anne Palmer Mentoring, preceptorship and clinical supervision: a guide to professional roles in clinical practice. Wiley-Blackwell, Oxford, 2000, pp. 44-45.

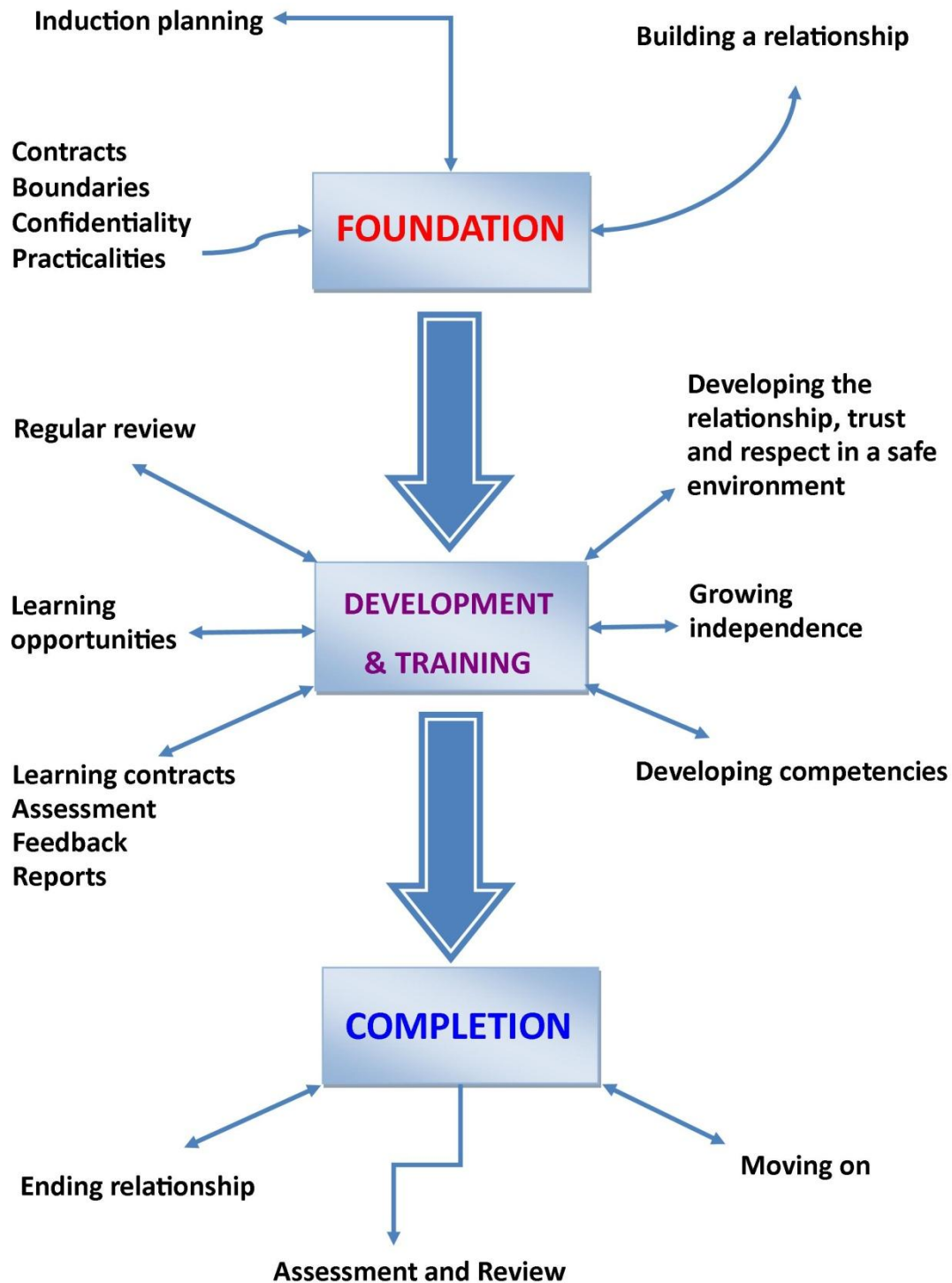
- **Phase 3 - Completion Phase:** This describes where the termination and assessment of the process take places. As the couple reaches the end of the mentoring programme, the mentor and mentee will be preparing for the transition and the end of their relationship. The aim of the assessment is to ascertain whether the objectives set at the beginning of the process were successfully achieved.

These stages are not clear-cut and frequently overlap. The mentor-mentee couple may even find themselves returning to an earlier phase. This is all part of the organic development and progress of the relationship.

It is also important to recognise what a mentor/mentee relationship is not.

- While it is a close relationship, it is not a friendship;
- The mentor is not a psychiatrist and cannot resolve personal problems;
- It is not two people spending time together.





**Figure 59: Mentoring framework**

### **5.2.3. Recruitment and Selection of Mentors**

An active recruitment campaign is almost always necessary for a successful mentoring programme. However worthwhile the objectives are, people won't join if they don't know about it.

Efficient recruitment must be targeted. Resources will be misused unless they are directed at appropriate groups of individuals. The mentoring coordinator will be heavily involved in a recruitment drive

Successful marketing techniques for mentoring programmes have included:

- Posters, leaflets and flyers;
- Targeted e-mail shots;
- Presentations to invited audiences;
- Testimonials and case studies from previous successfully held mentoring schemes;
- Inclusion on websites;
- Promotion through social media (Facebook, Twitter, LinkedIn and senior web platforms);
- Announcements through mass media (radio, TV, web media).

It is useful to work through contact networks, such as local employers, volunteer groups, and unions of disabled people, NGOs providing services to people with disabilities and other you may find appropriate. Face-to-face recruitment and the word-of-mouth of well-disposed intermediaries can be very valuable.

More participants must be recruited than required: some will drop out, others will prove impossible to match with a mentee, and some will prove to be inappropriate for mentoring.

The timing of recruitment is equally important. For example, there is little point in trying to recruit participants in the middle of the summer holiday period. It is paramount that the gap between recruitment and the start of mentoring is not too prolonged as this can cause potential loss of motivation and people may withdraw their interest in the scheme.

#### **5.2.3.1. Mentor's roles and skills**

The mentor has the following roles:

- to get to know the mentee and establish a good, stable relationship based on mutual trust and respect
- to assist in the preparation and implementation of an appropriate learning plan with clear objectives and tasks to be carried out by the mentee.
- to inform and communicate with the mentee about their personal expectations and goals.
- to maintain regular contact with the mentee and to provide guidance.
- to feed back to the mentoring coordinator regarding the implementation of the tasks.

The mentor should have following skills:

- Be a good listener.
- Be a good communicator.
- Be able to share experiences and be capable of applying theory to practice.

- Be responsible during their involvement in the programme.
- Be committed to the theory of equality and diversity management.
- Be creative, enthusiastic, and positively predisposed.
- Be able to play a consulting role rather than an authoritarian one: i.e. provide guidance and directions rather than instructions.
- Be able to maintain a suitable atmosphere where a mutually beneficial partnership is developed and the exchange of information and experience is reciprocal.
- Encourage the mentees to achieve their full potential in the implementation of their everyday tasks.
- Be tactful and respect mentees' feelings.
- Be well organised, having good time management skills.
- Encourage people to decide:
  - where and when they will meet;
  - how long these meetings will last;
  - what they will talk about;
  - how they will do it (in what format)

#### **5.2.4. Role of the mentoring coordinator**

The main tasks of the national coordinator (in Belgium and Greece in the context of the ATLEC project) are:

- Cultural adaptations of available training materials in accordance with local circumstances and idiosyncrasies;
- Training of additional mentoring coordinators;
- Recruitment of mentors and mentees;
- Identification of mentors' and mentees' needs and expectations;
- Matching mentoring couples;
- Initiating the induction process;
- Coordinating the mentoring process;
- Internal monitoring of the mentoring process;
- Evaluation of mentors' and mentees' satisfaction;
- Certification of mentoring couples;
- Reporting of the achieved results and outcomes.

#### **5.2.5. Matching Mentees and Mentors**

The success or failure of a mentoring relationship is closely tied to how well the mentor/mentee are matched.

- A mentor should ideally not be the direct supervisor of the mentee or even be from the same department in an organisation if possible.
- If the personality types are tremendously different, there may be problems with the relationship.
- There must be a sense of win-win in both the mentor and the mentee. Both should want to participate.

- Match the mentor and mentee must be done with great care and attention. There will be a written mentoring agreement signed by both parties and clear evaluation expectations at specific times. These are all vital to the success of a mentoring programme.

## **5.2.6. Benefits for the Mentees and the Mentors**

### **5.2.6.1. Benefits for mentees**

Through mentoring, a mentee can:

- Gain practical advice, encouragement, and support;
- Develop self-confidence and a sense of empowerment;
- Overcome social isolation;
- Develop interpersonal skills;
- Develop strategies for dealing with personal issues;
- Identify goals and establish a sense of direction;
- Gain insight into the world of work and explore career options;
- Develop social and professional contacts;
- Learn from the experience of others and adapt and/or improve their skills and knowledge.

### **5.2.6.2. Benefits for mentors**

The mentor will benefit in terms of:

- Enhancing communication skills;
- Widening understanding of other people;
- Finding an opportunity to reflect on experiences and perceptions;
- Increasing social contacts;
- Experiencing professional growth and job satisfaction;
- Sharing skills and experience with other people;
- Raising motivation and work satisfaction;
- Providing the opportunity to the mentee for the development of their skills;
- Having new perspectives for personal realisation;
- Behaving potentially as a supporter for change;
- Building further confidence and personal development;
- Developing skills for understanding others, getting acquainted with their environment, etc.

## **5.2.7. Developing competencies**

The mentor should:

- Make a list of all the competencies that the mentee would like to develop;
- Prepare a plan for each meeting;
- Revisit this plan at each meeting;
- Recap and minute each meeting;
- Give practical examples to the mentee;
- Give practical assignments to the mentee.

By taking the minutes of each meeting with the mentor, the mentee will be helped to enhance their portfolio and can present this to any potential employer. Practical assignments can also be added to the portfolio. In short, the mentee will make a portfolio of competencies developed during the mentoring process.

### **5.2.8. Action Planning**

The mentee and the mentor should determine the goals and an action plan as soon as possible. This is a good way of becoming acquainted with one another, even if the final outcome is that a slightly different set of goals has been reached.

As a pair, it is vital that they get to know a little about each other so that a bond of mutual respect and trust can form. It is not advised that face to face contact or/and emails become too personal, but sharing likes and/or dislikes can help to find some common ground.

Finally, supporting a mentee to set realistic, achievable goals is one of the most important tasks for a mentor and this comes right at the beginning.

### **5.2.9. Monitoring the Mentoring Process**

The monitoring and evaluation of the mentoring scheme is a key responsibility of the mentoring coordinator who should have developed suitable evaluative processes and ways of gathering mentors' and mentees' feedback.

The purpose of monitoring is to gather systematic feedback on the progress both of the individual couples and of the programme itself. It must cover all stages of the mentoring process and be explained to participants beforehand. Monitoring and evaluating the mentoring process is essential as it targets areas for improvement, even while the scheme is in progress.

Monitoring systems may include:

- Questionnaires
- Interviews
- Structured diaries
- Reports from participants
- Focus groups and meetings

The mentoring coordinator should also gather information about the success (or otherwise) of the programme. Such evaluation could be half way through the programme and at the end. The evaluation can be completed by the mentee and mentor individually or together as a couple. For the evaluation process, the same mechanism can be used as for monitoring.

The mentoring coordinator needs to know whether the mentors and mentees view their experiences as successful and what aspects of the mentoring programme worked well and why and what aspects require improvement and why. This information can then be used to inform future mentoring programmes. The mentoring coordinator also needs to know what the participants did during the mentoring programme so they are then able to relate this to positive and negative feedback.

### **5.2.10. Achieving Success through Mentoring**

Mentoring has proven to be very successful, especially for disadvantaged people. The mentoring process brings confidence to the mentee, enriching their knowledge and enhancing their skills. Taking a long-term perspective, it bolsters self-confidence and broadens horizons, creating opportunities for networking and integration.

### **5.2.11. Supporting documents**

The following supporting documents may be used during the mentoring process and have been placed in the annexes:

- Application Form – Mentors – see Annex 2: Application Form – Mentors
- Application Form – Mentees – see Annex 3: Application Form – Mentees
- Development of agreement/contract of the activities of the mentoring couple – see Annex 4: Development of agreement/ contract of the activities of the mentoring couple
- Mentor/Mentee Agreement – see Annex 5: Mentor/Mentee Agreement
- Action Plan for the work of the mentoring couple – see Annex 6: Action Plan for the work of the mentoring couple
- Confidentiality agreement – see Annex 7: Agreement on confidentiality
- Mentee evaluation form - see Annex 8: Mentee evaluation form

### **5.2.12. Activities**

- Preparation and implementation of an achievable plan for objectives and tasks carried out by the mentees
- Regular overview
- Individual mentor-mentee couple interaction
- Develop and pilot supporting materials for mentees and mentors
- Encourage decision-making with regards to:
  - where and when mentees/mentors will meet;
  - how long these meetings will last;
  - what they will talk about;
  - how they will do it (in what format).
- Development of a constructive, stimulating, and encouraging mentoring review
- Use ICT AT knowledge to support individuals with disabilities in making proficient use of appropriate ICT AT solutions.

## **5.3. Teacher with ICT AT expertise**

### **5.3.1. Definition of ICT/ ICT AT**

Assistive Technology (AT) refers to “any device or system that allows an individual to perform a task they would otherwise be unable to do, or increases the ease and safety with which the task can be performed” (Royal Commission, 1999).

When it comes to AT for Information and Communications Technology (ICT), we refer to the assistive technologies that accompany the unified communications and integrated telecommunications, as well as computers and other audio-visual systems which enable users to work and manipulate information with equal access to the technology, regardless of any impairment or disability.



Some assistive technologies will have some benefit for all users whilst others will be very specialised and only used by the minority. A good example are mind-mapping techniques, once the domain of the dyslexic user, which are now widely used in various boardrooms for delivering presentations by sales force teams as another way of exemplifying their products. Until very recently, the most commonly used assistive technologies had been under-exposed and thus overlooked by users who were unaware of the benefits and productivity of such tools. Today, there are more and more commercial suppliers of ICT AT systems and they are marketed as productivity tools for business efficiency.




Assistive Technology has undergone a revolution in recent years as there are more people using mobile and portable devices and more free and open source software currently available. There is now a wide range of hardware devices such as Braille displays and switch input devices – as well as software products such as screen readers, on-screen keyboards, and spelling aids.

The most common ICT AT tools are usually designed to enable the user to access the software on their computer access information via the internet, and interact with less accessible web content. They often provide a range of editing and speech tools that could be used across a number of different browsers, whilst also enabling access to digital resources and opportunities that would otherwise be impossible for users with disabilities to experience.

ICT AT can be used across a wide range of environments for an extensive set of tasks catering for all skills and abilities. It can illustrate to both educational institutions and businesses that the benefits of assistive technology for users with disabilities and business efficiencies are invaluable.

AT devices influence whether someone can live and work independently and be an active member of their local community.

**Table 16: Disabilities and their related assistive technologies**

<b>Disability (characteristics)</b>	<b>Requires ...</b>	<b>Assistive technologies (examples)</b>
Visual impairments <ul style="list-style-type: none"> <li>• Blindness</li> <li>• Weak vision</li> <li>• Tunnel vision</li> <li>• Dimness</li> <li>• Extreme near- or far-sightedness</li> </ul>		<ul style="list-style-type: none"> <li>• Screen readers</li> <li>• Braille displays</li> <li>• Voice recognition</li> <li>• Magnification</li> </ul>
Auditory impairments <ul style="list-style-type: none"> <li>• Deaf</li> <li>• Hard of hearing</li> <li>• High/low frequency loss</li> </ul>		<ul style="list-style-type: none"> <li>• Require visual representation of auditory information</li> </ul>
Mobility impairments <ul style="list-style-type: none"> <li>• Repetitive strain injury</li> <li>• Arthritis</li> <li>• Stroke</li> <li>• Spinal cord injury</li> </ul>		<ul style="list-style-type: none"> <li>• Keyboard controls</li> <li>• Breath control</li> <li>• Retinal scanning devices</li> <li>• Voice recognition</li> </ul>

Disability (characteristics)	Requires ...	Assistive technologies (examples)
<ul style="list-style-type: none"> <li>Amyotrophic lateral sclerosis (ALS)</li> <li>Loss of limbs or digits</li> </ul>		

### 5.3.2. How to solve ICT AT problems in learning/working practice

There are a number of reasons why a user (trainee/student or employee) may have difficulty accessing their training courses or their workplace. Since the range of disabilities is so varied, the scope of suitable and practical adjustments is also very diverse.

When trying to resolve ICT AT challenges in training or working environments, it is particularly important to recognise that:

- The best “practical adjustment” for learning to take place may depend on:
  - the nature of the trainee/worker
  - the type of disability
  - the nature of the resource(s)
  - the learning objectives
- The most expensive adjustment may not always be the most effective;
- A range of alternative adjustments could be of great assistance;
- There is no single solution for accessibility.

It is useful to bear in mind that financial resources can create a barrier but there are increasingly free and open source software tools made available (e.g. NVDA) as alternatives for the sometimes expensive proprietary solutions. There is an extremely wide range of tools available from software for designing accessible learning objects through to simple widgets and programs to help you see the cursor on your screen.

### 5.3.3. What skills, strengths and understandings will the teacher/expert need?

Meeting the diverse needs of trainees with disabilities is challenging at the best of times, especially when training takes place in different locations and venues with different ICT tools and set ups. Trainers should be equipped to meet learner needs by:

- Making better use of existing resources and assets.
- Exploring how to use the various tools (hardware/software) to support a trainee’s needs.
- Acknowledging the learning outcomes for every training session.
- Improved understanding of how to develop accessible learning materials that can engage the users.
- Adopting a position of acceptance of equal responsibility for their own learning.
- Engendering self-motivation with the trainees for the training procedure.

- Being aware of their own training performance and being able to improve their skills for future sessions.
- Being armed with multiple organisational skills, being supportive and collaborative, having a team working spirit, all whilst being able to manage their own work, time, and stress.
- Being insightful, flexible, and adaptable to the learners' needs.

Trainees need to feel that their voice is being heard and that their needs are being considered. They need to be able to “connect” with their trainer and build a solid relationship based on confidence and trust.

### **5.3.4. How to adopt an integrative approach to practice training**

Inclusive practice is good practice. That is the most important thing a trainer has to consider while trying to teach in an integrative way. Technology and ICT AT tools can really help in increasing a trainer's understanding of accessible and inclusive practices – as well as disability awareness – so that they can improve classroom learning experiences.

In this respect, peer-support trainers have a valuable role in supporting users and breaking down barriers to participation at source. Together with mentors, peer-supporters play the most important role in the total experience of a trainee or a staff member with disability.

Integrated key elements of the training process include:

- Organisational and technical aspects of the training strategies
- Key competencies
- Cultural factors and social/personal parameters which affect the training procedure, e.g. family restraints, access and equity issues, existing and potential skills of trainees etc.

The following features are central to ensure maximum integration within training/vocational procedures:

- Demonstrate flexibility and consistency of training strategies to enhance the skills of trainees;
- Use an approach which is based on the fact that learning is always affected by the context in which it takes place and by trainees' special characteristics and attitudes;
- Use a multi-disciplinary approach to teaching;
- Recognise the diversity of skills and resources;
- Ensure the needs of trainees are considered.

### **5.3.5. How to make a work or education environment accessible**

Work and educational environments are not always accessible to people with disabilities. Office equipment, workstations, and ICT devices have to support disabled staff or trainees in the workplace/training centres when required. Equipment must respond to the issues that confront office workers and trainees with disabilities every day, the body characteristics of the person working, and the work that is being done.

There are companies that purchase adjustable equipment for the reasonable accommodation of their employees or trainees with disabilities as they might have special educational/working needs (wheelchair users, vision difficulties etc). The adjustments aim to offer flexibility in accommodating the users so that they may interface effectively with their equipment.

There are many different ergonomic methods that solve common accessibility barriers. Accessibility adjustments and ergonomics are meant to support trainees/employees to work more comfortably and efficiently. The basic rule is that equipment should be sized to fit the individual user.

Below are some examples of the type of support the accessibility approach offers:

- Provision of assistive software or hardware or standard ICT solutions: laptops with assistive software, ergonomic mice and keyboards, special switches and joysticks, Braille input/output, etc.
- Provision of suggestions on screen settings and on ergonomic mice and trackballs.
- Provision of information on assistive technologies for ICT (e.g. screen readers, speech recognition programs, environmental control systems, smartphone and tablet applications etc).

### **5.3.6. Ergonomics, positioning of equipment, and space**

Ergonomically designed environments aim to optimise work performance, minimise fatigue by fitting to the body size, exclude controls that are confusing to operate (or require too much force), and eliminate displays that are difficult to read or understand.

In the end, ergonomics is all about improving productivity, safety, and comfort whilst interacting with other people, technology, and the environment. In the human-centred design approach, the goals are 3-fold: enhance human abilities, overcome human limitations, foster user acceptance.

The following are the main features of ergonomics to consider:

- Adjusted software/hardware for greater usability
- Adjusted workstation (work surfaces and accessories)
- Adjusted surrounding environment (space planning, lighting, acoustics)

The type of workplace adjustment required by any person with disability is a highly individual matter and can only be effectively determined by speaking with the person with a disability directly and investigating possible options. Here are some examples:

- Changes to work practices or methods
  - Developing regular workplace routines completed in similar ways, times and/or places as often as possible;
  - Using electronic 'to do' lists to record and track the tasks that need to be regularly completed on a daily, weekly, or monthly basis; and/or
  - Providing clear written instructions about new job processes.
- Flexible work arrangements
  - More frequent or differently sequenced breaks in work routine to allow for rest, quiet time, taking medications, eating snacks, etc; and/or

- Working from home for a certain amount of time or for specific tasks.
- Alterations to work premises or work areas
  - Adjustable height desk or workbench;
  - Working at an alternative site that is quieter or closer to home;
  - Increasing lighting at workstation and other work areas;
  - Providing clear markings and colour contrasts on steps or pathways;
  - Providing a parking space close to the entrance of the building for wheelchair users; and/or
  - Building modifications to allow access to a building or bathroom facilities.
- Information and communication in alternative formats
  - Giving new instructions in written and spoken form where possible;
  - Providing important documents in accessible electronic versions prior to meetings;
  - Accessing interpreters for employees who are deaf or have a hearing impairment; and/or
  - Allowing extra reading time where a large amount of reading is required.
- Modified equipment, specialised equipment, furniture, or technological aides
  - Lifting equipment for an employee who cannot lift heavy objects safely;
  - Arranging telephone typewriter (TTY) phone access for an employee who is deaf or has a hearing or speech impairment;
  - Voice-activated recorder for verbal instructions;
  - Screen reading software for employees with visual impairments; and/or
  - Disability specific equipment such as Braille.

### **5.3.7. Customisation and localisation of ICT AT**

There are many adjustments that can be implemented in order to obtain a customised ICT AT solution. For example, there is a personal computer that has been set up as an accessible workstation. In addition to the default software, it also has assistive software and hardware to make it accessible to users with disabilities, such as optical character recognition, image scanning and editing, screen reading, mind mapping, and literacy support. The customisation a user requires can depend on what sort of disability they have.

A complete overview of such solutions is available in section 3.5: Categories of ICT AT for the computer.

### **5.3.8. How to select the facilities, AT hardware, software, smartphones, tablets, and apps**

This is addressed in full detail in Chapter 2: Assessment.

### **5.3.9. The ICF based approach to technology and functioning**

This is addressed in full detail in Section 3.8.3 ICF: principles and constructs.

### **5.3.10. National/European legislation on ICT AT (access points, consultation, funding, and purchase)**

This is addressed in full detail in Section 3.11.4: Disability legislation in Europe.

### **5.3.11. Provision of ICT AT and customer service**

AT is most often provided to individuals through health and social care practitioners but is also increasingly available for direct purchase by consumers. Today some common devices can often be found in high street shops or purchased online. Application software able to make a computer (or a tablet or a smart phone) accessible, or to transform it into a communication device, can often be downloaded from the “internet cloud” at relatively inexpensive prices. Some may even be free-of-charge and come with their open source code.

Moreover, the availability of mainstream goods that are accessible or usable by people with disabilities is also increasing and, due to increased public awareness and accessibility regulations, this trend is expected to continue. Indeed, the world of assistive technology is evolving dramatically, with new products appearing on the market at an ever-increasing pace. Their costs depend upon market dynamics and the existence of intermediaries (insurance companies, national/regional service delivery systems).

Public AT service delivery systems have been in place in many European countries for a number of years as part of their national or regional welfare systems. The various systems differ significantly due to each country’s disability policy, socio-economic context, and history. A system may be considered more or less advanced than others; however, no system recognises itself as “perfect”. It is thought to be impossible to design a “perfect” AT service delivery system that is applicable in every country in the EU. Provision of AT is just one element of each country’s healthcare and social support policy, which in turn is related to its geographical, historical, political, and legislative context. Each country therefore needs to design a system that is best tailored to its circumstances. However, lessons can be learnt from each system in each country. Sharing such experiences and views is invaluable in learning to what extent “good practices” could be exported from one country to another, what the key principles of today’s “ideal” AT service delivery system are, and what roadmaps could be envisaged for a future where ICT AT is at the forefront of the decision-making process. Indeed, the experience of service delivery practice suggests that in each country there is scope for improvement, especially in relation to the new challenges hastened by today’s rapidly changing society. In the spirit of the UN Convention, that completes the shift from a “medical model” to a “biopsychosocial model” of disability, people with disabilities should be included in those discussions and decisions which are relevant to them and this includes the design of service delivery policies.

Unfortunately, most service delivery systems are not yet flexible enough to keep pace with the aforementioned advancements and therefore are unable to take advantage of state-of-the-art technology to increase service efficacy for the benefit of their citizens. Furthermore, they have to contend with a general trend of diminishing resources.<sup>113</sup>

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<sup>113</sup> Service Delivery Systems for Assistive Technology in Europe – AAATE & EASTIN Position Paper – 1.10.2012



Example case from Germany: Constraints in access to assistive technologies for people who are hard of hearing (HoH)<sup>114</sup>

As indicated by interviews and questionnaires, the main constraints in accessing required technologies are as follows: lack of information / stereotypes, costs of devices (real or assumed), unavailability / lack of assessment information, limited training on device use and rehabilitation services (which can create disincentives and barriers to work), as well as device complexity and/or long periods of waiting.

Access to assistive technologies for people who are HoH is provided on an application basis in most countries in Europe. The “prescribed” list of equipment limits the individual’s choice and causes financial pressure. Assessments are based chiefly on the medical model of disability and are not based on the person’s specific needs (e.g. a need for more powerful dB coverage / frequency output of a hearing aid, remote control, or an “audio shoe” for a hearing aid). In the words of a German interviewee, “you can hear with an inexpensive hearing aid, but how will you understand speech with it?”

Procedures are often described as “bureaucratic” while budget limitations and upper price limits severely undermine the choices and possibilities of independent living for people who are HoH. For example, a quality hearing aid necessary for a severely hard-of-hearing or late-deafened person costs 1000-2500 Euros but Germany has a fixed percentage where usually only about up to 420 Euros from the cost of a hearing aid is covered by the insurance. This explains the chief complaint for German respondents being the affordability of quality hearing aids. The amount of government subsidy for hearing aids is perceived to be unreasonably low. Respondents indicated that “obviously the government and health insurance have absolutely no idea what needs people with HoH have.” German respondents indicated a lack of understanding of the specific needs of HoH people by the service providers. The low level of public awareness produces insufficient implementation of existing laws. An example of this is the viewpoint that installing assistive devices and recruiting interpreters is not very important since “everyone can hear” and people with hearing disabilities exist in their own small group and rarely participate in the mainstream.

### **Recommended reading**

The following document provides an overview of ICT AT provision in a number of EU countries: “Europe with Free Choice of Assistive Technology The provision of assistive devices in specific European countries” - <http://www.hi.se/Global/Dokument/fritt-val-av-hjalpmedel/Europe%20with%20Free%20Choice%20of%20Assistive%20Technology%20-%20publ-10395.pdf>

## **5.3.12. Activities**

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<sup>114</sup> Constraints in access to assistive technologies — and communication — for hard-of-hearing people in the Russian Federation and in Germany, Karina Chupina, PhD student, Humboldt University, Berlin, President of International Federation of Hard of Hearing Young People, Disabilities Studies Quarterly, Vol 31, No 4 (2011), <http://dsq-sds.org/article/view/1709/1757>

- Establish contact with experienced teachers/experts who have been working in the field for several years and with colleagues and people with disabilities.
- Provide cases based on the personas included to work on a solution to an ICT AT issue and make a well informed and justified decision.
- Create role plays involving a mentor and a mentee, one is a supporter, the other is a teacher who is approached by a learner with a disability who has a real need. The personas can be very useful here.
- Explain how to organise/structure an ICT AT-rich learning environment.
- How do you provide a wheelchair-friendly/disability-friendly learning environment? What means do you have available?
- Provide a range of assistive technologies that might be useful to different mentees with a disability or disabilities.
- Organise a session with a person with a visual impairment, who is a fond user of ICT AT and explore with them how they use the computer or mobile device, for example.
- Install the ATLEC mobile application and explore it in your own language.
- Use the EASTIN database (<http://www.eastin-cl.eu/eastin>) and look for specific solutions that suit certain individuals (base yourself on the available personas).
- Organise a visit to a training/reference centre for people with disabilities or another representative organisation. You can also organise a visit to a local AT centre or to local AT orientated fairs/exhibitions.
- Use the ICF framework (including contextual factors) to record the impact of the environment on an individual's functioning. Use the link below for this  
<http://apps.who.int/classifications/icfbrowser/>.
- Evaluate and monitor the funding/purchasing procedure of ICT AT products in Europe. A useful tool is the "Analysing and federating the European assistive technology ICT industry", Final Report, March 2009.  
([http://ec.europa.eu/information\\_society/newsroom/cf/document.cfm?action=display&doc\\_id=606](http://ec.europa.eu/information_society/newsroom/cf/document.cfm?action=display&doc_id=606))
- Identify together with the learner their training needs, discuss a realistic learning path, and subsequently tailor training materials and strategies to their needs.

## Annex 1: Personas

These personas were created for the ACCESSIBLE project which is financially supported by the European Commission ([www.accessible-project.eu](http://www.accessible-project.eu) – Accessible Applications Design and Development). They are based on the personas created for the AEGIS project which is also financially supported by the European Commission ([www.aegis-project.eu](http://www.aegis-project.eu) - open Accessibility Everywhere: Groundwork, Infrastructure, Standards). These personas are licensed under a Creative Commons Attribution-Share Alike 3.0 License.

### Jackie Dough

#### ➤ Profile

- Name: Jackie Dough
- Age: 17
- Location: Lincoln, UK
- Marital status: Single
- Job: Student
- Impairment: Developmental verbal dyspraxia

#### ➤ Meet Jackie Dough

- Jackie (17) lives in Lincoln, UK and was born with developmental verbal dyspraxia (DVD). As a result of DVD, she has difficulty in voluntarily making speech sounds and stringing these sounds together in the correct order to make words. Many people who see and hear her think she has an intellectual impairment; however, DVD is categorised as a speech disorder. She is also somewhat awkward in her movements as DVD also affects her gross motor coordination which, in turn, affects her walking and running capabilities. This results in poor balance (sometimes even falling over in mid-step) and tripping over her own feet.

#### ➤ Technology usage

- Jackie is an avid user of the computer, especially to browse the internet and visit her favourite music portals. She has been lucky to have a very ICT-dedicated teacher at school who saw that Jackie was smart, but needed support to allow her to facilitate her communication to her peers. Since 3 years old, Jackie has been using TextAloud at school and Free NaturalReader 9.0 at home, which allows her to facilitate her communication in the class environment and at home. She also has a mobile on which she runs Mobile Speak for Windows Mobile Smartphones by CodeFactory. This allows her to improve her communication even without her PC. She can type small messages in real time or she uses messages she has prepared beforehand which are then read out. She uses this regularly when going to the local supermarket or bakery.

## **Magda Paskimada**

### ➤ Profile

- Name: Magda Paskimada
- Age: 29
- Location: Athens, Greece
- Marital status: Single
- Job: Employed
- Impairment: Juvenile rheumatoid arthritis

### ➤ Meet Magda Paskimada

- Magda (29) lives in Athens, Greece and developed systemic juvenile rheumatoid arthritis when she was 18 months old. She also has major speech delay secondary to moderate congenital deafness inherited from her mother. The arthritis affected Magda's whole body, resulting in stiffness in all limbs. With time, a greater number of joints were affected, causing Magda to be confined to a wheelchair. The movement of her upper and lower limbs is also severely hampered.

### ➤ Technology usage

- Magda works for a small NGO where she is responsible for administrative tasks. Initially, the work proved to be very difficult for Magda since it required considerable typing, which is quite difficult and painful for her. The manager of the NGO, however, was very pleased with Magda's work and said that he would purchase speech recognition software. Instead of typing, Magda would then have to dictate her text. Nuance's Dragon NaturallySpeaking Speech Recognition Software was purchased. After a short training period, Magda now completes all text in her editor using this software. This facilitates her daily work tremendously and there are also options to use this in other applications such as her iPhone.

## Charles Lewis

### ➤ Profile

- Name: Charles Lewis
- Age: 37
- Location: Norfolk, UK
- Marital status: Single
- Job: Unemployed
- Impairment: Chronic motor and vocal tics

### ➤ Meet Charles Lewis

- Charles (37) lives in Norfolk, UK, and experience chronic motor and vocal tics, as a result of Tourette's Syndrome<sup>115</sup>. This has affected his social life considerably. His motor tics consist of rapid, repetitive muscle movements, such as rapid eye blinking or head jerking, while his vocal tics, sometimes called phonic tics, are phrases or sounds such as grunting, sniffing, barking, and throat clearing.

### ➤ Technology usage

- Charles is interested in many things but, due to his disability, he rarely leaves the house where he lives with his parents. However, internet has opened up a whole new world for him. He uses a desktop PC with a larger keyboard, both fixed on his bureau so that he does not displace them when he has non-controllable muscle movements, and he also uses a large mouse. He also has a large screen and uses screen embosser software to enlarge the size of the text considerably. He had a small screen in the past, but this did not allow him to focus sufficiently due to his head movements and also caused headaches. Using a mobile is difficult but possible, as long as it has large buttons and a large screen.

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<sup>115</sup> For the disorder to be considered Tourette's Syndrome, the person needs to have at least two motor tics and a vocal tic that have been present for more than 12 months.

## **Maria Skoufakis**

### ➤ Profile

- Name: Maria Skoufakis
- Age: 21
- Location: Thessaloniki, Greece
- Marital status: Single
- Job: Unemployed
- Impairment: Rett syndrome

### ➤ Meet Maria Skoufakis

- Maria (21) lives in Thessaloniki, Greece and was born with Rett syndrome. This resulted in a loss of speech and both gross and fine motor skills, along with muscle weakness, seizures, and breathing irregularities.

### ➤ Technology usage

- Maria started using Augmentative and Alternative Communication (AAC) at a very young age. Her eye gaze and voice output devices have helped her a great deal in daily communication. She uses those both on her computer at home and on her laptop at University. However, whenever she goes somewhere else (e.g. the library in Drama), she is unable to use supportive technologies unless she installs all the software again. She is eager for a 'plug and play' solution that allows her to carry her AT with her on a USB stick wherever she goes.



## John Howard Jones

### ➤ Profile

- Name: John Howard Jones
- Age: 67
- Location: Dublin, Ireland
- Marital status: Married
- Job: Pensioner
- Impairment: Parkinson's disease

### ➤ Meet John Howard Jones

- John (67) was diagnosed 2 years ago with Parkinson's disease. He lives with his wife in Dublin, Ireland. He has no signs of dementia but does have mild cognitive impairments (short term memory loss). The disease has also affected his motor skills (rigidity, visible in joint stiffness and increased muscle tone) and, to some extent, his speech (very soft and identified as hypophonia).

### ➤ Technology usage

- John has been an avid computer user from the early 1980s and has done extensive research on his own to identify what can help him in his daily life to make PC usage easier. In addition to large keypads for both his mobile phone and computer and a trackball, John also started using voice activated programmes for his PC, laptop, and mobile. A friend of John with early stage Parkinson's disease who is in the same local health centre attending special support sessions has also started using voice activated programmes after seeing how it helped John. However, having been unemployed for many years, his friend criticised the price of the required software and wondered if there was an OSS alternative.

## Maurice Nalobaka

### ➤ Profile

- Name: Maurice Nalobaka
- Age: 47
- Location: Antwerp, Belgium
- Marital status: Married
- Job: Employed
- Impairment: Night blindness

### ➤ Meet Maurice Nalobaka

- Maurice (47) grew up in the poor suburbs of Kinshasa, Democratic Republic of Congo (former Zaire) before moving to Antwerp, Belgium when he was adopted, aged 6. Due to a chronic vitamin A deficiency he experienced as a child in Kinshasa, Maurice developed night blindness, a disease which remains a scourge among children in many poor countries. As a result of his condition, Maurice cannot only see poorly at night, but also requires some time for his eyes to adjust from brightly lit areas to dim ones. Additionally, his contrast vision has also been greatly reduced.

### ➤ Technology usage

- Maurice uses both a PC and a mobile and both have their screens set in extreme colour contrasts. This is extremely useful, especially when visiting websites which mostly have a very poor contrast. Additionally, he only works with large flat-screen monitors to ensure that the colours are vivid and clear, thus avoiding eye strain when using the computer. He also uses glasses with an anti-reflective coating. Lately, he has been using a screen embossing software. The fact that many of the websites he visits do not appear to consider the needs of low vision users aggravates him. He concludes: if it is not accessible to his needs, he simply will not visit it again and it is “blacklisted” in his opinion.

## **Kathleen de Munck**

### ➤ Profile

- Name: Kathleen de Munck
- Age: 78
- Location: Yerseke, The Netherlands
- Marital status: Married
- Job: Pensioner
- Impairment: Cataract

### ➤ Meet Kathleen de Munck

- Kathleen (78) lives in Yerseke, The Netherlands. She developed a traumatic cataract some years ago. In addition to compromised clear vision, and a loss of contrast sensitivity, contours, shadows, and colour vision are less vivid. Directly linked to her cataract, Kathleen also developed an excessive sensitivity to light and an aversion to sunlight or well-lit places.

### ➤ Technology usage

- Kathleen utilises both the mobile and the PC but has increasing problems using them. Recently, her reading has also been affected. Kathleen therefore started using text to speech software on both devices, realising that, in the future, these will be her only tools to ensure she can read her text messages or what is published in websites.

## David Burt

### ➤ Profile

- Name: David Burt
- Age: 63
- Location: Worcester, UK
- Marital status: Divorced
- Job: Employed
- Impairment: Glaucoma

### ➤ Meet David Burt

- David (63) lives in Worcester, UK and has periphery vision loss as result of an open angle, chronic glaucoma. He experiences a loss of vision on the periphery, known as tunnel vision, but retains a rather clear central vision. According to his eye specialist, his heavy computer usage combined with being short-sighted is possibly linked to his glaucoma.

### ➤ Technology usage

- David is still using his PC a great deal but he limits the potential for glare. He uses a monitor filter and has his monitor face the wall instead of a window since light coming in a window interferes with the light on the monitor (this is a problem due to David's contrast difficulties). He also replaced his old computer monitor with flat screen type as this is less stressful to the eyes.

## Peter Brown

### ➤ Profile

- Name: Peter Brown
- Age: 23
- Location: Glasgow, UK
- Marital status: Single
- Job: Unemployed
- Impairment: Asperger's syndrome

### ➤ Meet Peter Brown

- Peter (23) lives in Glasgow, UK, and as a result of his Asperger's syndrome, shows significant difficulties in social interaction, along with restricted and repetitive patterns of behaviour and interests. However, his linguistic and cognitive development has not been affected.

### ➤ Technology usage

- Peter is very keen on playing (educational) computer games. His parents and his teachers have noticed that this also resulted in Peter exhibiting positive social and cognitive skills that he would rarely demonstrate in a traditional classroom environment. Peter is often discusses the game with his peers in and outside the classroom. At first, Peter asked his parents how to spell words and utilised a calculator in order to achieve objectives within the games he plays. These games turned out to be problem solving and encouraged Peter to surf the web for online discussion groups associated with the game. Peter also uses a picture communication symbol library software which enables him to communicate online with other people, including his parents. He sends emails which contain pictures and symbols from this library.

## Ellen Kell

### ➤ Profile

- Name: Ellen Kell
- Age: 67
- Location: Denton, UK
- Marital status: Single
- Job: Unemployed
- Impairment: Deaf and blind

### ➤ Meet Ellen Kell

- Ellen (67) lives in Denton, UK and contracted meningitis when she was 12 years old, which resulted in blindness and partial deafness. At a later age she became totally deaf. However, with the help of an assistant, she was able to learn signatures that were put in the palm of her hand, as well as use initially her residual hearing. She is also capable of using Braille.

### ➤ Technology usage

- At present Ellen uses the TeleBraille communication device. This device enables a deafblind person and a person using a TDD (Telecommunications Device for the Deaf) to communicate by telephone. It can also be used for face-to-face communications between a deafblind person and a sighted person. Ellen also depends heavily on the usage of Braille and uses a low cost Braille pad to read a text document from her PC or when she surfs the internet. However, many websites are still not accessible or so badly organised that Ellen gives up after some minutes as she cannot find the information.



## **Nikolaos Souflakos**

### ➤ Profile

- Name: Nikolaos Souflakos
- Age: 31
- Location: Nicosia, Cyprus
- Marital status: Single
- Job: Unemployed
- Impairment: Traumatic brain injury

### ➤ Meet Nikolaos Souflakos

- Nikolaos (31) lives in Nicosia, Cyprus, and was involved in a severe car accident when he was 19 years old. He was in a coma for 5 months and experienced permanent neurobiological damage. He was able to fully recover from his back injury he sustained during the same accident. Nikolaos has difficulty speaking and being understood (expressive aphasia) while also experiencing blurred vision.

### ➤ Technology usage

- To communicate with his peers, Nikolaos uses software on his PC that allows him to communicate using symbols which are transferred to sound. In addition, he also uses text to speech software despite the fact that his linguistic skills were severely affected by his brain injury. He therefore uses word prediction software. On his mobile, he also uses such word prediction software and a simplified interface based on symbols. He mainly uses Nokia phones because the menu structure is similar across all newer models.

## **Andy Catteeuw**

### ➤ Profile

- Name: Andy Catteeuw
- Age: 23
- Location: Houthalen, Belgium
- Marital status: Single
- Job: Student
- Impairment: ADHD

### ➤ Meet Andy Catteeuw

- Andy (23) lives in Houthalen, Belgium, and was diagnosed with ADHD at the age of 9. While Andy developed coping mechanisms to compensate for some of his impairments (inattentive type symptoms), many aspects of daily life are more difficult when compared with other people. This is mainly visible in Andy's difficulty in processing information as quickly and accurately as others.

### ➤ Technology usage

- Andy has learned throughout the years that his focus improves when using the computer to do his work. However, the interface must not be too busy or yield too much information. This is the same with regards to his mobile. Simplicity is bliss for Andy.

## Matthew Perkins

### ➤ Profile

- Name: Matthew Perkins
- Age: 28
- Location: Birmingham, UK
- Marital status: Single
- Job: Employed
- Impairment: Down's syndrome

### ➤ Meet Matthew Perkins

- Matthew (28) lives with his parents in Birmingham, UK. He has Down's syndrome and went to a mainstream school where he followed an adjusted curriculum. Matthew has problems with reading due to poor eyesight but is currently working in an office where he is responsible for the typesetting of catalogues and brochures.

### ➤ Technology usage

- Matthew's parents have been advocates of integrating him into every part of daily life. This also includes working. As Matthew has problems with reading due to his poor eyesight, his employer provided a computer with TTS software. He uses this for the typesetting of catalogues and brochures. His mobile is also equipped with TTS software and he uses this on a daily basis to inform his parents when he will be home since he takes a bus to go to and from work.

## **Benoit Dupré**

### ➤ Profile

- Name: Benoit Dupré
- Age: 44
- Location: Brussels, Belgium
- Marital status: Married
- Job: Expert at the Flemish Institute for Inequalities and Disabilities
- Impairment: None

### ➤ Meet Benoit Dupré

- Benoit (44) lives with his wife and two children in Brussels, Belgium. He works as a counsellor at the Flemish Institute for Inequalities and Disabilities. Benoit is mainly involved in drawing up governmental policies regarding people who have impairments. He is also involved in making adapted prints of schoolbooks for people with reading difficulties and creating audio books for people with cognitive difficulties. According to Benoit, a fundamental attitude change is needed for technological development related to assistive technologies. The focus should first be allowing people to accept their disability and then introducing them to specific technologies that could help them in their day to day life.

### ➤ Technology usage

- Benoit works part-time for a local NGO that addresses the needs of young visually impaired students. In this respect, Benoit is involved in assessing mobile and desktop interfaces. He often becomes frustrated with the poor interfaces provided with software, especially then in terms of colour contrast. He uses aDesigner 2 as a quick way to assess accessibility of public websites for the NGO. He finds that many websites are poorly designed for people with visual impairments.. The NGO makes accessibility reports on a 6-monthly basis and sends those to the respective public institutions responsible for the websites. Benoit has to remain focused on the WCAG 1.0 guidelines since he knows that if he were to apply WCAG 2.0, none of the websites would even pass the very basic guidelines (or 'success criteria' as they are called in WCAG 2.0). Increasingly, the NGO he works for receives requests from public bodies to provide them with experts on accessibility, mainly in the field of internet accessibility, since these public organisations often lack the necessary in-house expertise. Benoit is therefore also involved in running training sessions for developers that design and develop public web services. Feedback he collects from the trainees indicates that they lack thorough knowledge of WCAG 1.0, and have hardly any experience with WCAG 2.0. Benoit realised very quickly that only hands-on experience contributed to the trainees improving their skills. He therefore introduces his trainees to a set of tools that can be of some assistance (e.g. Eclipse's aDesigner 2, online css validators, etc.). However, it would be practical if there was a tool that combined all validators into one program. Additionally, he observed that most web

interfaces are not trialled by users nor would they be in the near future. Benoit wonders whether this could be automated via an online tool but so far he has not found such an application.

## Clyde Channing

### ➤ Profile

- Name: Clyde Channing
- Age: 36
- Location: Manchester, UK
- Marital status: Married
- Job: Senior software developer
- Impairment: None

### ➤ Meet Clyde Channing

- Clyde (36) lives with his wife Amy in the centre of Manchester, UK. He has been working as a senior developer at Quixcon Software Solutions for almost 5 years now. Clyde is a very pragmatic person who likes to get things done. However, lately he feels a bit disappointed that, due to the fast pace of ICT-innovation, he never really gets the opportunity to explore a topic in-depth and ensure developed interfaces are also fully accessible. The strict deadline policy of his company often means that as long as his code endures the basic accessibility tests (often also supported by the fact that applied national standards of clients are often subsets of W3C standards), the company will release it. Bugs can always be fixed afterwards, they say. This leaves Clyde with the feeling that he cannot really finish his 'baby'.

### ➤ Technology usage

- Clyde wants to make his work easier and introduce accessibility at the very beginning of every development stage, thus avoiding patchwork or incomplete work afterwards. For this he would like to have easy assessment tools built into the main design software, so that he can assess accessibility at a very early stage. Clyde has recently started studying WCAG 2.0 guidelines. This has now become obligatory for all developers in the company where he works since all tenders the company participates in require minimum WCAG 2.0 level AA accessibility for the front-end interfaces of all online services. Being aware of his competencies in this area, his team manager has appointed Clyde to organise internal training for this. Clyde recognises this as a perfect opportunity to introduce assessment tools to his colleagues who are responsible for web, mobile, and desktop applications. However, trialling by experienced users is lacking. Clyde has suggested his company contact a small group of expert users of a local disability AT interest group. This suggestion has not been realised thus far and Clyde is seeking a viable, software driven alternative.



## Ramin El-Fassi

### ➤ Profile

- Name: Ramin El-Fassi
- Age: 24
- Location: Brussels, Belgium
- Marital status: Single
- Job: Employed
- Impairment: Dexterity issues

### ➤ Meet Ramin El-Fassi

- Ramin El-Fassi (24) has recently graduated from college where he obtained a Bachelor's degree in Communication and New Media. After enjoying his final summer holidays as a student, he immediately found a job as a junior account manager at a dynamic communication bureau in the centre of Brussels, Belgium.

### ➤ Technology usage:

- At work, Ramin uses his desktop PC for most of each the day. His system has MacOS installed; Ramin works with design software, designing and adjusting graphics or drawing up workflows and wireframes. Due to his dexterity impairment –mainly limited strength in both arms and hands –, Ramin uses a trackball instead of a regular mouse. At home he uses the laptop he bought during college. Although the school offered public desktops during classes, Ramin needed a personal laptop to be able to use his trackball and other settings, otherwise he would have been forced to install all necessary drivers every time he logged onto a different computer system. Ramin never uses the integrated touchpad; its behaviour is too hard to control or predict. He visits the internet daily and even has his own webpage, a blog he had to maintain to post all progress of his master thesis. He still uses it to post interesting things he finds on the net. Ramin likes the word prediction that starts to emerge in several webpages and programs. Ramin has one of the latest smartphones; his new employer allowed him to pick his own phone which he mainly uses to keep in touch with his friends and family. He uses it daily, but not that much at work. Ramin was pleased that he was able to learn all the important functions of his phone in under 30 minutes. Ramin always uses his own phone as it offers him everything he needs.

## Nitesh Sarin

### ➤ Profile

- Name: Nitesh Sarin
- Age: 36
- Location: Pocklington, UK
- Marital status: Single
- Job: Unemployed
- Impairment: Dyslexic and colour blind

### ➤ Meet Nitesh Sarin

- Nitesh Sarin (36) lives in the quiet town of Pocklington (between York and Hull) in the UK. At the moment he is applying for a job at Phoenix Software in Pocklington, in the marketing and communications department. Nitesh studied at the York College where he obtained a Foundation Degree in Hospitality Management over 2 years. Nitesh has minor to medium sight difficulties and issues with certain colours but is able to read a newspaper. He is also dyslexic.

### ➤ Technology usage

- At home Nitesh owns a PC with Windows Vista and a 21" screen (this makes it easier for him to read text on the screen). At the moment he is using his PC to prepare for his job interview at Phoenix Software next week. He is surfing the web to find out more about the company and what they might be looking for in an employee. Nitesh occasionally makes use of speech output and screen magnification (Zoomtext). He spent 2 hours trying to install these assistive technologies; luckily, he now knows how these work. Nitesh knows he can be impatient sometimes but this is because he believes that all this technology should work a lot better so he can get what he need much faster. To entertain himself, he uses his PC to play DVDs – he is a big fan of mafia movies – and to play music (Nick Cave). He would like to get more creative on his PC, such as designing his CV for next week, but the graphics programs he has tried are not compatible with his assistive technologies. Nitesh is quite happy with his mobile which he has been using for two years now. A friend had about the same visual problems as Nitesh and was really up to date on everything "mobile". Nitesh's mobile was recommended by this friend, and he never regretted his choice. His mobile is very important to him since it is his main link to his friends and family; he uses it several times a day wherever he is. The phone is compatible with his speech output software and contains some preset high contrast visual themes. It also has a camera which he mainly uses to take funny pictures when he goes out with his friends.

## Peter Vandezande

### ➤ Profile

- Name: Peter Vandezande
- Age: 43
- Location: Brugge, Belgium
- Marital status: Single
- Job: Unemployed
- Impairment: Multiple Sclerosis, memory loss - reduced dexterity

### ➤ Meet Peter Vandezande

- Peter (43) has short term and long term memory loss and muscle weakness and spasms in his arms and legs due to Multiple Sclerosis. He stopped working at the age of 34 because of his medical condition. Peter is single and lives in a sheltered house in Brugge, Belgium. Peter enjoys his stay in the sheltered housing which is located in a green and relaxing environment. He likes his little chats with the other residents and when he is not in any of the social areas, he usually searches for information about one of his many interests. He reads a great deal about his condition so he acknowledges that, as time passes, his mental health will deteriorate.

### ➤ Technology usage

- Peter owns a desktop PC which he has set up in his room. His desktop used to be his sister's, but she gave it to him as she bought herself a laptop. The PC is running Windows XP which Peter likes; he knows his way around and it has all his favourite icons enlarged and close by. Peter likes general surfing and he especially enjoys helping people who want to obtain information on MS. From time to time he visits the website of his favourite football team, made in Flash. He finds it really disappointing that this website is hard to navigate because of the lack of keyboard support. Peter has difficulties with handling the mouse due to muscle weakness in his hands and occasional spasms in his arms. Peter has a regular mobile phone that he uses to call friends and relatives. His sister programmed the buttons so that he could use the speed dialling option. He has a list of all the names and corresponding speed dials taped to his coffee table. Texting takes too long due to his condition. He sometimes uses the calendar functionality when he needs to remember appointments he makes with some of the other residents.

## Emma Karlsson

### ➤ Profile

- Name: Emma Karlsson
- Age: 38
- Location: Sollentuna, Sweden
- Marital status: Single
- Job: Employed
- Impairment: Dysarthria

### ➤ Meet Emma Karlsson

- Emma (38) is Swedish and grew up in Sollentuna, Stockholm. At birth she experienced neurological damage, causing her to have dysarthria. Emma whispers very softly and produces abnormal intonation when speaking, making it hard for other people to understand her. She also has hearing problems when people or devices speak too quickly. Emma works as an independent photographer and regularly gets contracted through her extended network she has built throughout the years. Most of the assignments she takes on are weddings or communions. Emma is also an active helper at the local community centre.

### ➤ Technology usage

- Emma uses her laptop with a preinstalled version of Windows Vista every day at home. She sends many emails (she is an avid Gmail user) and maintains her Flickr pro-account. She makes video calls to some of her friends to communicate in sign language. Emma is also constantly on the lookout for new photo editing techniques and other related information on photography. Emma regularly plays casual puzzle games, sometimes online against friends or family members. She reads news on various sites, blogs, and online magazines. Emma uses her mobile phone for calling and texting her friends and family. She also enters notes or reminders and on occasion she uses the built-in calendar. She bought one of the first available smartphones because they had many promising features. However, her smartphone does not offer what she had hoped for.

## Adam Ljung

### ➤ Profile

- Name: Adam Ljung
- Age: 21
- Location: Gothenburg, Sweden
- Marital status: Single
- Job: Unemployed
- Impairment: Learning disability

### ➤ Meet Adam Ljung

- Adam Ljung (21) lives with his parents and his sister Ida outside Gothenburg, Sweden. He went to a special education school and graduated a year ago. Now, he attends a day care centre four days a week, where he helps out in a small café. He will probably be moving soon into an apartment in a building with service and communal areas. Adam is very interested in sports. He always goes to home games with his dad. He also enjoys cooking and is able to follow simple recipes by himself. Adam was born with a learning disability. He needs extra time to understand or learn new things and to express himself. He has learned to read and write, but he can only handle easy texts and is not always sure of how to spell words. The concept of time is difficult for him. This is a cause of uncertainty, making it hard for him to appreciate how much time he needs to get ready or travel to different appointments. The day care centre has a computer that he can use together with the other staff. However, his use is restricted and the personnel are not always around to help if he encounters a problem.

### ➤ Technology usage

- Adam uses the family computer, a desktop with Windows XP, every night. He likes to surf the net, but he would rather visits his favourite pages than look for a lot of new information. He is a big fan of watching football clips on YouTube, and he frequently reads the sports section of an online easy to read newspaper. His sister has helped him set up a Hotmail account that he uses to send messages to friends or family. He sometimes uses Google to search, but he finds it difficult to find what he is looking for – partly because of his difficulty in spelling words and partly because there are so many search hits that it is too overwhelming for him to filter them appropriately. His sister has introduced him to chat functions in Skype and he'd like to use it, but on the occasions when he has tried it, he has found it hard to read and write as fast as the other person. Adam does not have the computer equipped with any assistive technology, but he has learned that he can use speech synthesis on those home pages that provide it. He has not yet been able to access a local Swedish speech synthesiser on the computers that he uses. Adam owns a mobile phone but he does not use it very often. His father helped him purchase it and when looking at phones they tried to find one with an easy interface. The phone has a relatively large display and he uses it mostly when he needs to. When he

missed the bus going home from the town he was glad that he quickly could reach his father to come and pick him up. Sometimes people send him a text message and his sister has taught him how to store numbers in the contact list, but other than that, he rarely uses any of the other functions.



## Jane Brown

### ➤ Profile

- Name: Jane Brown
- Age: 32
- Location: Devon, UK
- Marital status: Single
- Job: Unemployed
- Impairment: Cerebral palsy

### ➤ Meet Jane Brown

- Jane (32) lives in a sheltered housing in Devon, UK, where she is supported by a number of care assistants. She has been living here since the age of 24. Before that she lived with her parents. She has not been able to progress further in education because of the limitations caused by her disability. Due to cerebral palsy, Jane has severe motor and speech impairments. She is a wheelchair user and is non-speaking. She has almost daily epileptic seizures. Her severe athetosis also limits her hand functionality and she is unlikely to be able to gain employment. She enjoys music and is particularly interested in ballet.

### ➤ Technology usage

- Jane communicates by controlling VOCA software by means of two hand switches. This computer can also allow her limited access to the internet and she communicates with friends by email. She uses on-screen scanning keyboards with symbols and auditory scanning support to communicate with others and control her computer. Jane does not use a mobile phone.

## Edward Hodgins

### ➤ Profile

- Name: Edward Hodgins
- Age: 60
- Location: Dartford, UK
- Marital status: Single
- Job: Employed
- Impairment: Hypoacusis

### ➤ Meet Edward Hodgins

- Edward (60) holds a Bachelor's degree in biotechnology, and has worked all his life in the pharmaceutical sector in Dartford, UK, as a laboratory technologist. For quite a number of years, Edward has experienced moderate hearing loss (hypoacusis). Without his hearing aid, he cannot understand other people talking in noisy environments and he has to turn up the volume on his TV in order to make sense of what is being said. Fortunately, his hearing aid alleviates some of the issues he encounters. Edward leads a fairly regular life despite his hearing loss.

### ➤ Technology usage

- Edward's job does not require him to do a great deal of work on computers. He works on a desktop PC (Windows XP) both at work and at home and this totals approximately 20 hours per week. At work, he sends emails to his superiors and does some basic work in Excel and Word. Edward uses Internet Explorer (because it came with the computer) and Google every few days to search for general information and visit his favourite sites on artistic photography. He likes his old camera and develops his pictures in his self-made dark room. Although he is not an expert at photo editing, he uses basic photo viewing software for storing the digital pictures sent by his children and grandchildren. Very sporadically, he also 'talks' to his grandchildren using instant messaging if he remembers to start up the instant messaging application on his computer. Edward uses a standard mobile phone. It is a rather cheap model, with keys that are somewhat larger than standard. Although he always keeps his phone with him, it is not his main means of communication. He mainly uses it in specific situations, for instance to call people when he is running late for an appointment due to traffic. Edward tries to avoid noisy environments (such as public spaces), since he has trouble understanding voices through the phone. Edward uses no assistive technology on his phone; his main motivation for buying one was the relatively cheap price of the model and the fact that the phone is quite easy to use, without a lot of bells and whistles. He does not like the elaborate, intricate menus in more expensive phones as the ability to simply call is sufficient for him. He does not send text messages very often because he thinks texting is a bit tedious on a phone keyboard and also because he thinks texting is for the younger generation.

## Tomasa Almaraz

### ➤ Profile

- Name: Tomasa Almaraz
- Age: 34
- Location: Barcelona, Spain
- Marital status: Married
- Job: Employed
- Impairment: Deaf

### ➤ Meet Tomasa Almaraz

- Tomasa (34) lives with her family in Barcelona, Spain, where she has renovated a small house some years ago, together with her husband. She holds a master's degree in Law and works in a consulting firm in Barcelona. Tomasa has been completely deaf since her teenage years. At first, it was very difficult to communicate with other people but she has learned to manage her deafness via lip-reading. On occasion, she will use some sign language when with other people who can comprehend it. However, she does not use it very often as most people do not understand it.

### ➤ Technology usage

- Tomasa is quite a heavy technology user. For work, she has a standard Windows Vista laptop, which she also uses at home and sometimes even in train stations and airports when she is in the waiting area. She spends about 50 hours per week using her computer as it is an important tool for her. At work, Tomasa creates and edits word and excel documents and searches for information on the internet. She is also a heavy email user as she has to keep close contact with her clients without being able to make phone calls. At home, she manages the pictures of her children growing up and occasionally plays a casual computer game like Tetris. She has already considered switching to Firefox, but still uses Internet Explorer to surf the internet on a daily basis. Tomasa uses Google, Gmail, updates her blog, uses instant messaging to talk to her friends, completes quizzes on Facebook, sometimes watches a video on Youtube, etc. The mobile phone is also very important for Tomasa: she could not do without it. It is part of her lifestyle, and she carries it around all the time. She uses it to video call her husband if she will be home late and to keep up with her friends. The most important feature of her phone is the look and feel. It has a big screen displaying clear letters and it feeds relatively good images when on a video call. Although her smartphone was quite expensive, the device, with all of its functionalities, was worth the investment. She mainly uses the phone as any other person would, but as she cannot make any regular calls, the video call functionality is very important to her. Besides video call, she uses texting, email (she likes the Qwerty keypad!), and sometimes browses the internet. The phone has so many features, it is a pity she cannot use all of them, such as the built-in radio receiver, MP3 player, etc. Tomasa uses no assistive technology with her phone.

## **Gert Van Dijk**

### ➤ Profile

- Name: Gert Van Dijk
- Age: 42
- Location: Merchtem, Belgium
- Marital status: Married
- Job: Employed
- Impairment: Partly blurred vision

### ➤ Meet Gert Van Dijk

- Gert (42) lives in Merchtem, Belgium with his wife and has had partly blurred vision since his adolescence. Gert works in orchards during the busy seasons and at other times he stays at home and manages the household. Gert did not have a lot of issues at school, but never felt that interested in studying which is why he did not go on to higher education. He immediately started working and, over the years, he has had a broad range of jobs such as helping out on a construction site or at the city's green service. As long as he can be outdoors and use his hands, Gert is happy to work all day.

### ➤ Technology usage

- Gert has bought himself a laptop, mainly because of its portability and the lack of assistive technologies on public computers. He cannot use the most recent software versions because of the poor compatibility with the AT software. Also, his assistive software (RealSpeak and Supernova) is only reimbursed by the government every 5 years which is much too slow to keep up with the pace of technology innovation. Chris is a member of the local dance club. Gert helps her choose songs and put them together in a mix. For the rehearsals, Gert can generate mixes which play the music at half the tempo. This is useful when learning a new choreography. Gert had to search long and hard for an accessible music player and editor. Popular media players such as Winamp do not work with his assistive technologies. His only option was open source, but these communities do not really excel in documentation and support. It took Gert 6 months to finally find what he needed and another 2 months to fully learn the possibilities of those programs. Gert does not carry his regular mobile phone with him all the time, but does use it on an almost daily basis. He uses it to call and text his wife and his friends. He has got a clamshell model which has large, clearly separated buttons. In the beginning he was overwhelmed by the many features available, features he does not have a need for. Learning the basic functions such as calling and texting did not take long. He has a screen embosser and speech output for his phone which helps him a great deal. Occasionally, he downloads an audio book from the internet and uploads it to his mobile phone so that he can listen to it on location or on the move (train). He likes this since the voices are real; exciting books are read by a human voice with emotion. This is in stark contrast to the computerised voices he hears when using his assistive technologies.

## Paulina Reyes

### ➤ Profile

- Name: Paulina Reyes
- Age: 25
- Location: Murcia, Spain
- Marital status: Single
- Job: Unemployed
- Impairment: Blind

### ➤ Meet Paulina Reyes

- Paulina (25) was born blind, and lives in Murcia, Spain. Due to her visual impairment, Paulina was unable to find a job after finishing high school. The only job opportunities she had would have required her to move, which Paulina and her family did not want to do. She started taking guitar lessons and can now play it to a good standard. It was not easy to learn in the beginning. She cannot read regular music scores so she has to use music Braille.

### ➤ Technology usage

- Paulina uses her PC (Windows XP) on a daily basis for the text editor to write letters for job applications and to visit Yahoo and check her emails using Internet Explorer. She tried Hotmail and later Gmail, but there just was too much information on the page. Yahoo email works well with her Jaws screenreader. She also uses OCR software, a Braille embosser, and Adobe reader speech output. The combination of all these technologies enables Paulina to use her PC to a satisfactory degree. However, the investments she and her family had to make to acquire this technology put some pressure on the family finances. The internet was also an enormous help in finding information, Braille music scores, and mp3 music. Paulina bought herself a smartphone which she uses practically all the time. Her choice of smartphone took into account its ease of use and came recommended by a friend who is also blind. The device has large enough keys that provide lots of tactile feedback when pressed. Paulina uses it to call friends and family and to text, maintain her calendar, and listen to audiobooks she downloads from the internet. She uses a VOCA to read her text messages but, unfortunately, the Spanish output often has a faulty pronunciation.

## Carlos Portillo

### ➤ Profile

- Name: Carlos Portillo
- Age: 35
- Location: Gerona, Italy
- Marital status: Married
- Job: Employed
- Impairment: Moderate Aphasia - Paraphasia

### ➤ Meet Carlos Portillo

- Carlos (35) lives in Gerona, Italy with his wife Marisa and 2 children Juan and Angelica. He has a college degree in applied informatics. After being involved in a car accident, he now experiences a moderate form of aphasia. Ever since the accident, he avoids using the car so he now works at a local government institution, managing the back office. Carlos fixes damaged computers and keeps the servers up and running. Due to his moderate aphasia he is still able to write mails, but it takes him longer than some of his colleagues. His colleagues describe him as a very devoted worker. Sometimes he experiences issues in fluency of speech and his writing skills are influenced by his paraphasia. Nonetheless, his boss is very satisfied with the work he delivers.

### ➤ Technology usage

- Carlos uses his PC every day at work and at home. At work he uses his laptop to email, search information on specific computer issues, and occasionally type some documentation for his co-workers. At home, he also uses his work laptop for sending emails to friends and family, to keep in touch (also through Facebook), and listen to his favourite songs. Carlos uses his personal desktop as a sandbox to experiment with new software and Ubuntu OS. Carlos owns a smartphone he bought earlier this year. The phone was offered by his wireless provider on a special sale; Carlos is very loyal to his wireless provider and rarely looks at offers from other companies. Carlos considers his smartphone as a practical tool that suits his technology lifestyle. He enjoys the fact that he can customise the menu layout in such a way that his favourite functions are presented up front.



## Wayne Edwards

### ➤ Profile

- Name: Wayne Edwards
- Age: 52
- Location: Manchester, UK
- Marital status: Single
- Job: Unemployed
- Impairment: Global aphasia - short term memory loss

### ➤ Meet Wayne Edwards

- Wayne (52) lives with his older brother and his family in the suburbs of Manchester, UK. At the age of 48 he had a stroke, causing significant brain damage. Since that time he has had a severe form of aphasia known as 'global aphasia'. Wayne is unable to produce recognisable words and understands little or no spoken language. His reading and writing skills were practically reduced to zero.

### ➤ Technology usage

- Wayne is unemployed and his global aphasia precludes him from using the computer a great deal. He only uses his brother's desktop at home and this is just for playing card games and to pass the time. Wayne sometimes uses speech output (text to speech) or makes drawings on his computer to make things clear to other people. Wayne owns a 3 year old mobile, a sturdy model with large buttons and very few options besides calling and sending text messages. Wayne is not a fan of complex and modern smartphones with too many options as he believes he will probably not understand them. However, he does have the feeling he is missing out on technology that he sees his nephews actively using. He uses his mobile also as a VOCA but texting takes a very long time. From time to time, he gets stuck in the interface because of the complexity of the navigation and terms used for labelling menu options. Due to his global aphasia, Wayne finds it difficult to find his way through the different layers of the hierarchical navigation.

## Mikel Vargas

### ➤ Profile

- Name: Mikel Vargas
- Age: 35
- Location: Albacete, Spain
- Marital status: Single
- Job: Unemployed
- Impairment: Spina bifida

### ➤ Meet Mikel Vargas

- Mikel (35) was born with spina bifida, a disease that causes a poor development of the spinal cord. He lives in Albacete, Spain. Mikel's lower limbs are completely paralysed and he sits in a wheelchair. He only has very little control left over his upper limbs and makes slight involuntary head movements. Due to his condition, he was never able to find a job. Mikel lives in communal living with shared leisure infrastructure. He enjoys the good atmosphere in the group but would like a more independent lifestyle.

### ➤ Technology usage

- Mikel does not own a computer; however, the communal infrastructure allows him to use a shared desktop PC that has been equipped with assistive technologies, including a head tracker, which follows a reflective dot on a cap he has to wear, and a blink switch. Buying and fully equipping a personal system would be unaffordable for Mikel. He considers himself to be an average user but is always willing to help out others who are just starting to use the computer. Mikel never chats on the computer because those applications are generally too cluttered to access and control, but internet access helps him to keep in touch via email and video calls. Mikel owns a PDA but he seldom uses it by himself. A lot of functions can be reached by shortcuts customised to his personal preferences, so he is able to use some basic functionalities like calling and accessing his calendar by himself. He spent a lot of money on the phone, only to be able to use functionalities also offered by very basic and cheap mobile phones. Unfortunately, these basic models are often far less accessible and do not offer the shortcuts which Mikel needs. One of his favourite functions is the voice dialling feature that he has learned to use following some training for his voice interpretation.

## **Caroline Combs**

### ➤ Profile

- Name: Caroline Combs
- Age: 45
- Location: London, UK
- Marital status: Married
- Job: Employed
- Impairment: Muscular dystrophy

### ➤ Meet Caroline Combs

- Caroline Combs (45) lives with her husband Marc (48) and two children Anthony (18) & Robert (16) near London, UK. She is a professor in Ancient History at the University College of London. Caroline experiences muscular dystrophy, causing weakness and stiffness in her upper limb muscles. Caroline is always very busy, and when she does find some time to relax she likes to spend it in her garden. If she is having a good day, she will trim some of the flowers that grow there.

### ➤ Technology usage

- Caroline has been using her desktop PC with Windows XP installed for several years now. She often surfs on the internet to search for academic publications. Caroline is not fond of travelling as it can become very uncomfortable for her with her sore muscles. The internet is thus a very important tool for her to stay in touch with her friends and family that do not live close by. Caroline can use the keyboard and mouse, but only for a very short time before she becomes too tired. That is why she likes the use of speech input and output on the computer. Caroline also has a few switches that help her open her favourite applications. Caroline uses a basic mobile phone to call and send text messages. She bought a durable phone that supported assistive technologies and also provided her with the opportunity to change and customise many of the settings.

## Märta Hansson

### ➤ Profile

- Name: Märta Hansson
- Age: 57
- Location: Jakobsberg, Sweden
- Marital status: Married
- Job: Employed
- Impairment: Macular degeneration

### ➤ Meet Märta Hansson

- Märta Hansson (57) lives with her husband and two daughters in Jakobsberg, Sweden. About 6 years ago Märta started experiencing difficulties with her central visual field as a consequence of macular degeneration. Recently, she decided to attend evening classes in Web Development. After her studies, she started working at a NGO which supports people with disabilities by explaining the ways the government provides (financial) options to help them. She also teaches courses on how visually impaired people can use computers and the internet which includes the use of AT. Many developers attend these courses to learn about the ways in which internet applications can be made more accessible.

### ➤ Technology usage

- Märta has had a PC at home for years. Currently, she uses her (work) laptop more and more, especially because due to her teaching role. Märta uses Windows XP with Office installed for her work – preparing presentations for courses, creating documents for the organisation, and keeping her agenda and contacts up to date via Outlook Express. To help her work on her desktop (17") and laptop (15"), she has speech output and uses screen magnification (Zoomtext). She also has online banking and makes social security arrangements regarding support for assistive technologies for her severe visual impairment.

## **Annex 2: Application Form – Mentors**

1. Name: *Name Surname*
2. Age:
3. Sex: ☐ Male ☐ Female
4. Address:
5. Email:
6. Education:
7. Academic subject:
8. How long ago did you finish with your studies?
9. What is your professional experience? Please summarise your work experience.

When:

Occupation:

When:

Occupation:

When:

Occupation:

When:

Occupation:

### **Your personal and professional qualities, skills, and interests**

10. How would you describe yourself in terms of:

Skills (brief summary of professional skills and experiences, giving particular attention to any areas of expertise you could share with a mentee).

Personal qualities

Interests (List any special interests, including leisure you could share with a mentee)

11. Have you ever been involved in a mentoring relationship?

If yes, please state in what capacity (mentor or mentee).

12. What do you hope to gain from being a mentor?

### **Your professional role**

13. Please tell us about the organisation that you currently work for or are involved with in a professional capacity.

14. What is your role in this organisation?

15. What specific part of your work experience do you hope to share with your mentee?

**Your expectations and preferences for a mentee**

16. What preferences for a mentee do you have which should be considered?

17. Please indicate where you think you are appropriate to be a mentor to the mentee target group (people with disabilities).

18. Where did you learn about this project?

I agree to take part in the project as a mentor.

I understand my responsibilities to my mentee and to the national coordinator NAME TO BE SPECIFIED.

Date:

Signature:



## Annex 3: Application Form – Mentees

1. Name
2. Age:
3. How important is it for you to be matched with a mentor on an age basis  
Please rate it from 0 to 4; 0 means “it is not important at all” and 4 means “very important”  
☐ 1 ☐ 2 ☐ 3 ☐ 4
4. Sex:  
☐ Male ☐ Female
5. How important is it for you to be matched with a mentor from your gender?  
Please rate it from 0 to 4; 0 means “it is not important at all” and 4 means “very important”  
☐ 1 ☐ 2 ☐ 3 ☐ 4
6. Actual address:
7. Email address:
8. Education:
9. Subject and year:
10. Educational institution:
11. Year of graduation:
12. How important is it for you to be matched with a mentor whose subject is similar to yours?  
Please rate it from 0 to 4; 0 means “it is not important at all” and 4 means “very important”  
☐ 1 ☐ 2 ☐ 3 ☐ 4
13. How important is for you to be matched with a mentor whose occupation is similar to/the same as yours?  
Please rate it from 0 to 4; 0 means “it is not important at all” and 4 means “very important”  
☐ 1 ☐ 2 ☐ 3 ☐ 4
14. Please indicate your interest:  
☐ Education  
☐ Work  
☐ ICT  
☐ Other: (please specify)
15. How important is it for you to be matched with a mentor who is involved in the same sector that you have chosen?  
Please rate it from 0 to 4; 0 means “it is not important at all” and 4 means “very important”  
☐ 1 ☐ 2 ☐ 3 ☐ 4
16. Have you ever been mentored? If so, please tell us about it.
17. Where did you learn about this project?

### Your personal and professional qualities, skills, and interests

18. How would you describe yourself in terms of:  
Skills (brief summary of professional skills and experiences, giving particular attention to any areas of expertise you would like to share with a mentor).

Personal qualities

Interests (List any special interests, including leisure you could share with a mentor)

19. What do you hope to gain from being a mentee?

**Your professional role**

20. Please tell us what sectors in the economy interest you (tourism, education, etc).

21. What type of job(s) are you interested in within the above sector(s) (administration, financial, etc)?

22. What specific aspects of your work experience do you hope to improve when working with a mentor?

**Your expectations and preferences for a mentee**

23. What preferences for a mentor do you have which should be considered?

24. Is there anything else about your experiences and the mentor's geographical/environmental location that might help us match you with the most appropriate mentor?

I agree to take part in the project as a mentee. I understand my responsibilities to my mentor and to the national coordinator NAME TO BE SPECIFIED.

Date:

Signature:

## **Annex 4: Development of agreement/ contract of the activities of the mentoring couple**

Each established relationship is based on the agreement between the parties involved. Each process is based on several major parameters.

- Trust
- Wishes
- Expectations
- What does the mentee want?
- What does the mentee expect?
- What does the mentee expects from the mentor?
- What is the use of the mutual work?

The agreed terms of the relationship between the parties.

- When are you going to meet?
- How will you appoint the meetings?
- Will anyone else know about the relationship(confidentiality)?
- Where are you going to meet?
- What kind of behaviour is acceptable and what is not?
- When will you define the topics of future meetings, etc.

The goals of the activity in the context of the partnership should be agreed on along with the steps for the achievement of these goals. The goals and the steps for their achievement are systematised in the form of a plan for the mutual activity of the couple:

- Clear agreements
- Exact agreements
- Concrete agreements
- Realistic agreements

Features of well-defined goals

- Clear, noticeable, and measurable goals
- Realistic agreements that are small, limited in time (related with terms), concrete and achievable, not general/universal/obscure.
- The goals are described with specific and concrete concepts. They are described as the beginning of something and not as the end of it.
- They are perceived by the mentee as if they are involved in “serious” work.
- Realistic and achievable by the mentee.

Perspectives: A goal, directed towards future realisation. It is not necessary for it to be realistic and achievable. A starting point in the mentoring process is to look at the needs, point of view, and the vision of the mentee. At this stage it is more important to let the mentee have dreams, perspectives, desires, and what they think is best for them. At this stage we do not comment on the content of the perspective but support the person’s right to have aspirations.

Definition of the basic goal: A phase in which we help the mentee identify more realistic, achievable, and measurable goals. In order to help the mentee choose a more realistic goal, a stable relationship should be established and the terms of confidentiality need to be set.

Work goals: The work goals are smaller and more easily achievable goals. When we define them, we look for an answer to the question: What should the mentee learn / change / achieve in order to turn the basic goal into reality?

Support and means for achievement of the goals: The support and the person the mentee needs to make these goals a reality. The means necessary for the achievement of the goals should be available.

The things that will be useful for the mentee/ mentor once the goal is achieved:

- Benefits for themselves: ...
- Benefits for the others: ...

Steps for achievement of the work goal

- Which is the first step to the goal?
- Which step will be next?
- What will indicate the accomplishment of substantial progress?
- What are the criteria for success?

A list of things that may be difficult for you in the achievement of your goal:

- ...

A list of the possible challenges that may face and the strategies for dealing with them:

- ...

What progress and positive influence have you observed during your life?

- Promises that have been kept: ...
- Signs of progress: ...
- Positive effect: ...

## **Annex 5: Mentor/Mentee Agreement**

### **Mentor**

I, (Mentor's name) agree to provide a mentoring service on a voluntary basis for (Mentee's name) from (date) 2013 to (date) 2014.

I agree to keep any information I receive in this situation confidential within the pairing and to the project.

I agree to assist my mentee in the establishment of career information-related goals and the attainment of these goals, as far as is possible.

I agree to provide feedback on our progress to the National Coordinator and to my mentee.

I agree to maintain the relationship at a mutually acceptable level of communication and support.

I agree to abide by the guidelines as set out in the section 'Roles and Responsibilities' for Mentors.

Mentor's signature:

Date:

National Coordinator's signature:

Date:

### **Mentee**

I, (Mentee's name) agree to be mentored on a voluntary basis by (Mentor's name) from (date) 2013 to (date) 2014.

I agree to keep any information I receive in this situation confidential within the pairing and to the project.

I am obliged to 'set the agenda' with the assistance of my mentor in relation to the goals of the project and to do my best to achieve my own set goals.

I agree to provide feedback on our progress to the National Coordinator and to my mentor.

I agree to maintain the relationship at a mutually acceptable level of communication and support.

I agree to abide by the guidelines as set out in the section 'Roles and Responsibilities' for Mentees.

Mentee's signature:

Date:

National Coordinator's signature:

Date:

## **Annex 6: Action Plan for the work of the mentoring couple**

Name of the mentee:

Name, organisation and position of the mentor:

Period of the process of mentoring:

Organisation of the work process:

Goals of the mentoring:

Action plan – concrete time limits and deadlines for the achievement of the goals are set:

Revision of the plan – if necessary:

Report of the mutual activity:

Date:

Town:

Mentor:

Mentee:



## **Annex 7: Agreement on confidentiality**

### **For mentees / mentors**

..... as the National Coordinator of the project “ATLEC” establish a mentoring programme in which professionals from the private, public and voluntary sector (mentors) are engaged in mentoring relationships and provide support to individuals (mentees) that seek to develop and improve the effectiveness of their skills, confidence, and practice.

..... (Name of coordinating organisation) kindly ask for your consent to share personal information and data which will be used solely to recruit and match an appropriate mentor / mentee.

This information will be stored in a computer system of the coordinator.

### **Mentees**

People who potentially may be involved as mentees will be asked to provide information related to their age, gender, contact information, education, professional experience and personal information (any special needs, if appropriate). They will be able to choose from several mentors, but contact information for the mentor will not be provided until the final decision is made.

### **Mentors**

People who potentially may be involved as mentors will be asked to provide information in connection with their gender, age, contact information, education and work experience. Mentors will receive basic information on the mentees, so that they can decide whether they wish to participate in the programme as their mentors.

In light of the above, the parties agree that:

A. The National Coordinator will keep information strictly confidential.

B. Both mentor and mentee will keep confidential any information or data that they have become familiar with, in connection with, and during their participation in the programme.

C. All mentors and mentees are to participate voluntarily in the “ATLEC” project. The mentoring programme does not include any remuneration. The mentor makes no promises regarding the advice provided to the mentee and is not required to commit to a long-term professional relationship with the mentee.

D. Both the mentor and mentee can withdraw from the mentoring relationship at any time. Both the mentor and mentee can withdraw from the mentoring programme entirely. In the latter case, the National Coordinator of the programme will require advance notice of the decision.

E. Mentors and mentees agree to submit feedback to the National Coordinator upon request in order to facilitate the management, evaluation, and monitoring of the quality of the mentoring programme.

F. By participating in the mentoring program under the project "ATLEC" parties agree that the National Coordinator of the program cannot be held liable in respect of disputes and questions arising between the persons involved in individual mentoring relationships.

I understand and agree to the above conditions.

Date:

Signature: (mentor)

Signature: (mentee)

Signature: (National Coordinator)

## Annex 8: Mentee evaluation form

We are committed to maintaining and improving the delivery of the mentoring programme.

To help us achieve this, please take a few minutes to complete this questionnaire. All your answers will be treated in confidence.

1. Tell us about yourself
  - a. Your Name .....
  - b. Your Mentor's name .....
  - c. Date of first meeting.....
2. Please enter today's date .....
3. Have you met with your mentor? How many times?
  - ☐ Not Yet
  - ☐ 1
  - ☐ 2
  - ☐ 3
  - ☐ 4
  - ☐ More

Comments .....

4. How comfortable are you with your mentor?
  - ☐ Very comfortable
  - ☐ Comfortable
  - ☐ Getting to know the person
  - ☐ Uncomfortable
  - ☐ Very uncomfortable
  - ☐ Not applicable – not met yet

Comments .....

5. Have you agreed ground rules, schedule of meetings, expectations, responsibilities, etc.?
  - ☐ Yes
  - ☐ No
  - ☐ Not Yet
  - ☐ Other (please specify).....
6. Have you agreed objectives – what you wish to be achieved, what you want out of the relationship?
  - ☐ Yes
  - ☐ No
  - ☐ Not Yet
  - ☐ Other (please specify).....

7. Which of these areas have you discussed with the Mentor?

	YES	NO	NOT YET	N/A
<b>Look for ways of achieving goals</b>				
<b>Identify areas for development</b>				
<b>See tasks to help improve</b>				
<b>Identify areas of strength</b>				
<b>Look for opportunities to better utilise areas of strength</b>				
<b>Other (please specify)</b>				

## 8. How do these statements apply to you as Mentee?

	YES	NO	N/A
<b>I am certain of what I need to achieve within my mentoring relationship</b>			
<b>I feel confident that our objectives are realistic and feasible</b>			
<b>I know what my mentor expects of me</b>			
<b>I have a good understanding of my mentor</b>			
<b>My mentor has a good understanding of me</b>			
<b>I feel relaxed during our mentoring meetings</b>			
<b>I am happy to talk about myself and my views</b>			
<b>I think we are well matched</b>			
<b>We respect each other</b>			
<b>Comments, where applicable.</b>			

## 9. On a scale of 0-5 please select the rating that reflects how you feel at the moment. 0 = totally lacking, 1 = not very good, 2 = not too bad, 3 = fairly good, 4 = very good, 5 = excellent/no problem

	0	1	2	3	4	5
<b>Confidence</b>						
<b>Communication skills</b>						
<b>Listening</b>						
<b>Assertiveness</b>						
<b>Ability to handle difficult people</b>						
<b>Ability to handle awkward situations</b>						
<b>Problem-solving</b>						
<b>Managing change</b>						
<b>Coping with new situations</b>						
<b>Working in a team</b>						
<b>Technical knowledge</b>						
<b>Time management</b>						
<b>Attendance/punctuality</b>						
<b>Comments, if applicable</b>						

## 10. Have you had training that you have utilised?

- ☐ Yes  
☐ No  
☐ Not Available  
☐ Did Not Need it  
 Other (please specify).....

## 11. Have materials been developed for you?

- ☐ Yes  
☐ No  
☐ Do Not Know  
 Other (Please specify).....

## 12. Would you recommend mentoring to a friend?

- ☐ Yes  
☐ No

- ☐ Do Not Know  
Other (please specify).....

13. Would you become a mentor?

- ☐ Yes  
☐ No  
☐ Do Not Know  
Other (please specify).....

14. Do you have any further comments?

