

## Digital Divide and e-Training for people with Disabilities

**Ileana Hamburg**

Institut Arbeit und Technik, WH Gelsenkirchen, Munscheidstr. 14,  
D-45886 Gelsenkirchen, Germany

**Gabriela Lütgen**

Institut Arbeit und Technik, WH Gelsenkirchen, Munscheidstr. 14,  
D-45886 Gelsenkirchen, Germany

### ABSTRACT

There are currently a number of challenges particularly for people with disabilities due to digital divide with a significant limitation of the ICT to be accessible and to adapt to user needs. This paper focusses on accessible ICT platforms and e-training as well as hopes and challenges of them. Cerebral palsy (CP), one of the most common motor disability in rehabilitation with antenatal antecedents and often multi-factorial is given as an example as well as a European project with the participation of authors as partners.

**Keywords:** Digital Divide, ICT, ICT Platforms, e-training, Cerebral palsy

### DIGITAL DIVIDE AND ICT

Digital Divide refers to the gap of unequal accessibility and experience at the of modern information and communication technologies ICT (i.e. telephones, televisions, computers and the Internet), between people particularly due to demographics and disability.

The World Health Organization (WHO) affirms that about 15% of the world's population have disabilities, 2-4% of them with significant difficulties in their daily activities. This means that a significant number of people are unable to access technology because it wasn't developed for all. In USA about 54% of households with a disability use the Internet, compared to 81% of households with no disability [http://www.who.int/disabilities/world\\_report/2011/report/en/](http://www.who.int/disabilities/world_report/2011/report/en/).

Mary Pat Radabaugh, formerly with the IBM National Support Center for Persons with Disabilities, sums up the importance of technology in the empowerment of persons with disabilities (National Council on Disability 1993): "For most people, technology makes things easier. For people with disabilities, technology makes things possible."

ICT can enable persons with disabilities to access lifelong education, achieve skills development and employment (Broadband Commission for Digital Development et al. 2013) and should be used to promote inclusion and full participation of persons with disabilities in life.

ICT also are used as r channels for the delivery and implementation of governance, welfare, socioeconomic development, and human rights programming [15]. They can contribute to poverty reduction by enabling direct interactions between producers and markets globally, new methods of delivering personalized public and social services quickly, different channels for income generation, and innovations in asset accumulation and access to finance [10; 19]. The Internet offers multiple channels to access and adapt information, with a global reach,

which can improve transparency, accountability, and monitoring of development programs and services. Multiple channels are used for communication and service delivery including email, text messaging, voice communications, and video. People with physical disabilities or diseases that affect hand dexterity like quadriplegia resulting from spinal cord injury, multiple sclerosis, muscular dystrophy, cerebral palsy or stroke are unable to interact with touch screens, mice, or keyboards without the presence of assistive technology to bridge the gap. Additionally the lack of access to personal devices and the Internet is also prevalent among those with cognitive, hearing and visual impairments <https://medium.com/.../what-is-the-digital-divide-and-how-does-it...>

The use of technology in the empowerment of persons with disabilities is not new. Assistive (enabling) and adaptive technologies aid persons with difficulties to use the computer in verbal communications, and telecommunication relay devices have been used to promote independence and participation. It is an alternative way to access the content on screen, command the computer or process data. Specific adjustment software or devices for using the computer include [3].

Screen reading software (speaks displayed text and allows simulating mouse actions with the keyboard),

- Screen magnification software (for enlarging the content of the screen),
- Braille display (for displaying Braille characters),
- Alternate input devices (e. g. Screen keyboard) and special keyboard (to make data entry easier),
- Keyboard enhancements and accelerators (like StickKeys, Mousekeys, repeatKeys, SlowKeys, BounceKeys, and shortcut keys),
- Alternative pointing devices (e. g. Foot operated mice, head mounted pointing device, or eye tracking systems),

Unfortunately, many assistive technologies are expensive. Screen readers, text-to-speech software and Augmentative and Alternative Communication (AAC) devices can cost more than 1,000€ each, and not everyone is aware of the financing or grant opportunities within their country. Particularly, persons with disabilities in low and middle-income countries face significant challenges in acquiring assistive devices such as the cost and availability of standalone, specialized equipment [34]. High prices of assistive technologies can be a barrier to their use in promoting the independent living, education, and employment of persons with disabilities in low and middle-income countries, which have lower state funding to facilitate the acquisition of assistive technology [4]. The continuous progress of ICT requires continuous improving the learning quality applied in education and training systems by addressing new perspectives and opportunities. E-training could be an answer to fulfill needs to learn of the students in a personalized and inclusive way. There is an optimism about the potential of e-Learning to reduce barriers to education and improve the lives of individuals with disabilities [7]. Developing accessible online educational environments is as a principal solution to address this issue and to remove the barriers that people with disabilities may meet when they access these learning technologies. An appropriate technology has to provide people with disabilities with adaptive and personalized learning experiences that are tailored to their particular educational needs and personal characteristics. It should improve their motivation, satisfaction, learning speed and learning effectiveness.

But at the moment only a select population has the ability to take advantage of them and so increasing the digital divide. It is necessary that ICT designers integrate accessibility features

in their product or service to make it possible for people with disabilities to access them independently.

One inclusive organization that follows principles of accessibility happens to be one of the largest tech companies - Apple. Apple's accessibility features have improved over the years with the introduction of Voice Over, Switch Control, and more. These features have opened doors to the millions of people who could not use smartphones because they could not hold or touch the device, read the screen, or hear the commands.

With more access to products with accessibility integration and to assistive technologies like Tecla, the gap of people with disabilities affected by the digital divide could be lower.

In the following we present some issues of ICT to support inclusion of people with disabilities.

### **Multiple channels for communication and access content**

ICT enables content creation and delivery in various formats by using different media and multiple communication channels simultaneously to connect i.e. SMS, voice, websites with multimedia, social media, and mobile apps [2; 4]. People with a disability can choose the one most suited media and channel without additional financial burden on the demand or supply side.

### **Availability and Affordability**

The rapid developments in digital technologies support the field of assistive and adaptive technology because they have brought many of these specialized functionalities within the domain of general consumer and personal technology. The cost and availability of accessible technology for persons with disabilities can decrease

### **Different Apps**

There are apps using icons, images, and storyboards to communicate and assist people with hearing disabilities by providing instant captions for audio content including phone calls, voice amplification, and video calling, and converting audio alerts into text. There are educational apps that focus on assisting students with learning disabilities in learning and working on math, composition, and reading. Additionally web-enabled services offer targeted assistance for individuals with disabilities such as remote live captioning for meetings and webinars, remote sign language interpretation, and video relay where a sign language interpreter assists in the communication between individuals with and without hearing disabilities. Crowdsourcing platforms offer new opportunities for persons with disabilities to learn and inform others about accessibility of restaurants, hotels, tourist destinations, and other public sites.

## **HOPES AND CHALLENGES FOR ACCESSIBLE E-TRAINING AND ICT PLATFORMS**

Technology has the potential to overcome disabilities barriers and improve access to learning for students with disabilities. The increased use of ICTs in most sectors of society and recent developments in adaptive hardware and software should make possible that people with disabilities to do tasks that were difficult or impossible for them to do in the past (<https://www.ruhglobal.com/wp-content/uploads/2017/01/Nabil-Eid-from-Syria-Middle-East-ICT-acces>).

The unequal access to information systems for distance learning students has been studied intensively over past years through different demographics and metrics, which are resulting in different stages and interpretations of the digital divide. These have primarily moved from

digital “have” versus “have-nots” towards a more social and intellectual inequality [20]. The modern digital divide is not a question of whether users possess the right technology at hand, however with new technology being constantly introduced in the market, discrepancies arise which in turn cause also a new form of divide.

Existing empirical research on training by using ICT platforms and e-training for students with disabilities is not sufficient, and trainers/teachers remain with many questions which are not answered and there is not a consensus about how best to serve such students in accessible content and an online environment.

A very recent study [11] looks into the historic evolution of the digital divide across a set of countries in the EU in order to examine the effectiveness of latest mitigation techniques and policies embedded in relation to this subject.

Analyses on digital gaps noted in different regional dimensions conclude that there is still a high level of imbalance even in developed countries [31].

The key element is how to ensure that such platforms and online learning/training is accessible to the broadest spectrum of learners in the world with and without disabilities.

UN Report [26] indicates that people with disabilities face a wide range of barriers, including access to information, education and a lack of job opportunities. ICT can be a powerful tool in supporting education and inclusion for persons with disabilities.

In the education sector, current learning platforms are complex and lead to confusion on both the student and teacher’s part.

Accessible e-training modules on ICT platforms as web-based courses can be taken and completed successfully by learners with disabilities. Accessible e-Learning creates an online learning experience that includes as many people as possible regardless of their limitations whether physical, sensory, or cognitive. The challenge of developing accessible content is to develop e-Learning for a corporation, academic institution, or government agency and following best practices.

Research has been conducted recently that aims at adapting information systems to end users with disabilities. As part of the EU4ALL framework ([https://cordis.europa.eu/project/rcn/80191\\_en.html](https://cordis.europa.eu/project/rcn/80191_en.html)) such mitigation involves the design of an integrated system that displays the most appropriate output to the user.

Referring the Web, the W3C [32]. (W3C Web Accessibility Initiative, 2013) carried out a key solution promoting people with disabilities in accessing, using and interacting with the web through the Web Accessibility Initiative (WAI). The WAI develops strategies, guidelines, and resources to make the web accessible to people with disabilities. The WAI targets, among others, web content through Web Content Accessibility Guidelines (WCAG) [33], authoring tools through Authoring Tools Accessibility Guidelines (ATAG) [33], and user agent through User Agent Accessibility Guidelines (UAAG) [33]. In the WAI model, the WCAG is complemented by accessibility guidelines for browsing and access technologies (UAAG) and for tools to support creation of Web content (ATAG)[18]. Accessibility problems are not just about ICT teaching platforms. Training by using ICT platforms needs to address accessibility and inclusion from both the perspective of technology and pedagogy. This is particularly true for students with disabilities. Accessible content is effectively used by people in the following

disability groups: Blind or visually-impaired, deaf, mobility impairments and learning with disabilities students. Good accessible design makes e-Learning more accessible for everyone, conversely, poor design can make content hard to access for all students with disabilities. There are a number of areas in which e-Learning can work to the advantage of students with disabilities when studying in education context. These revolve around the three areas of accessibility, flexibility, and disclosure. Online information can be made available in a variety of formats to best suit the person accessing it, whether this is visual through a screen displaying images or text, audio as spoken words and sound, or touch devices. For specific information on accessibility features and more about a usable and accessible platforms see examples Blackboard, Microsoft Lync, Second Life.

According to the Americans with Disabilities Act – ADA , online courses should be made accessible to students with disabilities but ADA has not provided any specific accommodation standards, it's up to each school to decide to what extent it will serve its students with disabilities. In a perfect world, online courses should be created using the concept of universal design, the idea Mostavailable e-learning systems for learners with disabilities are limited to deliver accessible learning contents. However, the learners with disabilities need the whole accessible platform environment and not only the accessible content. In fact, providing accessible content in a non-accessible learning environment leads to a non-accessible learning experience. In the following, we present the main limits of the available systems.

For example, courses should be design in navigating with keyboards, include in alt text, images and text on screen for clarity, create highly-usable course navigation, considerations when including audio and video in courses and ensure screencasts are totally accessible.

Online courses should be designed to be accessible from the beginning and implementing universal design principles at the outset avoided costs caused by the need to engage in a digital retrofit, also, design learning platform includes multiple learning modalities could very well be superior to in-person education for students with disabilities (<https://www.ruhglobal.com/wp-content/uploads/2017/01/Nabil-Eid-from-Syria-Middle-East-ICT-acces>).

Accessibility of ICT platforms and free courses, should introduce the challenge to decrease the digital divide helping students with disabilities who y use computers in different ways when taking part in training or may need alternative teaching methods.. Many online courses are not designed with accessibility in mind so students who do not disclose that they have a disability maybe disadvantaged. It also means that when students do request accommodation to access the learning environment it requires a process of design-redesign to accommodate the students, adding additional costs, so we need to understand the main.

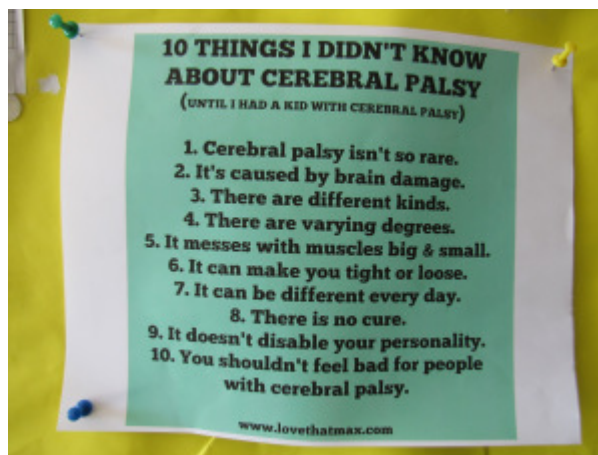
### **CASE STUDIED: CEREBRAL PALSY AND SUPPORTING TRAINING**

Christine Staple-Ebanks, founder and head of advocacy of the Nathan Ebanks Foundation explains: "Cerebral palsy is the most common physical disability in childhood and is also one of the least understood. There are over 17 million people living with CP worldwide, and 350 million family, friends and supporters who care about them." <https://petchary.wordpress.com/2017/10/06/world-cerebral-palsy-day-christine-staple-ebanks-says-quality-of-life-is-key/>.

Cerebral Palsy (CP) is the most common cause of motor disability in childhood and it can lead to a varied spectrum of clinical manifestations. CP comes from a permanent and non-progressive injury in the developing brain and it can occur during pregnancy, childbirth or after birth. Although there is no cure for CP the consequences can be minimized.

CP is not just a day-by-day reality it has a moment-by-moment impact in people's lives—not just in the lives of those with CP, but among families professionals , and educators as well who care for them.

Issues which can be improved by the use of ICT are Quality of Life and wellbeing; it means helping people thrive, and adults find enjoyment and fulfillment in life. It is about providing the supports necessary to give children with CP access to education and developmental opportunities.”



**Fig. 1: 10 Things I Didn't Know About Cerebral Palsy Source:**

**<https://petchary.wordpress.com/2017/10/06/world-cerebral-palsy-day-christine-staple-ebanks-says-quality-of-life-is-key/>.**

Access to medical and therapeutic care available based on ICT is essential to helping people with CP live the best possible life. But these services and supports are not readily available in many countries, and for the few specialists who are here they will tell you that the take up of their services due to a number of reasons including low awareness and some families not having the resources to pay for these services.

Healthy eating habits is one of the most important factors that contribute to the wellbeing of the general population. It is also relevant the fact that everyone has different nutritional needs, hence the importance of proper nutrition and the support of a nutritionist.

Individuals with CP, as well as any other person, must have a healthy and balanced diet. However, in some cases, there may be a need to make some adjustments in their eating habits, but it always needs to be based on the principles of a complete, varied and well-balanced diet.

The major food problems associated with CP are: underweight/ malnutrition; overweight/ obesity; constipation; gastro-esophageal reflux; dehydration; dysphagia; chewing and swallowing difficulties; monotonous diet; deficient supply of macronutrients and micronutrients.

Physical inactivity, along with unhealthy diets, are some of the risk factors for non-communicable diseases that gave rise [35] to the 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Non-Communicable Diseases.

For this reason, aggravated by the high worldwide rate of physical inactivity as well as obesity, [34] WHO (2011) adopted the "Global recommendation on physical activity for health", an example that was followed by WHO Europe and many European states.

WHO (2006) recognizes that people with disabilities are less physically active in relation to people who do not have any disability.

Physical activity and sports and diet are closely associated and contribute to "wellbeing". One of the objectives of the United Nations (1982) World Programme of Action Concerning Disabled Persons is to improve living conditions and social inclusion.

Due to the needs identified in the population with CP, the "CP-WELLBEING - Development of a Training Program for Improving the Wellbeing of Persons with Cerebral Palsy through Inclusive Eating and Physical Activity and Sports" was elaborated with the main objective of increasing the competences (attitudes, skills, knowledge) of the collective around CP (persons, families, professionals and volunteers) about how to implement inclusive eating and physical activity and sports with a global Wellbeing and Quality of Life approach, through an innovative e-training program.

### APPLICATION

The Project CXP-WELLBEING is developed within the ERASMUS+ PROGRAMME 2016 (www) and the stakeholders involved in the execution of the Project are AVAPACE, Fundació Lluís Alcanyís Universitat de Valencia de la Comunitat Valenciana (CUNAFF), Federação das Associações Portuguesas de Paralisia Cerebral (FAPPC), IL CERCHIO Società Cooperative Sociale Consortile, Hrvatska Udruga Radnih Terapeuta (HURT), Westfälische Hochschule Gelsenkirchen, Bocholt, Recklinghausen (IAT).

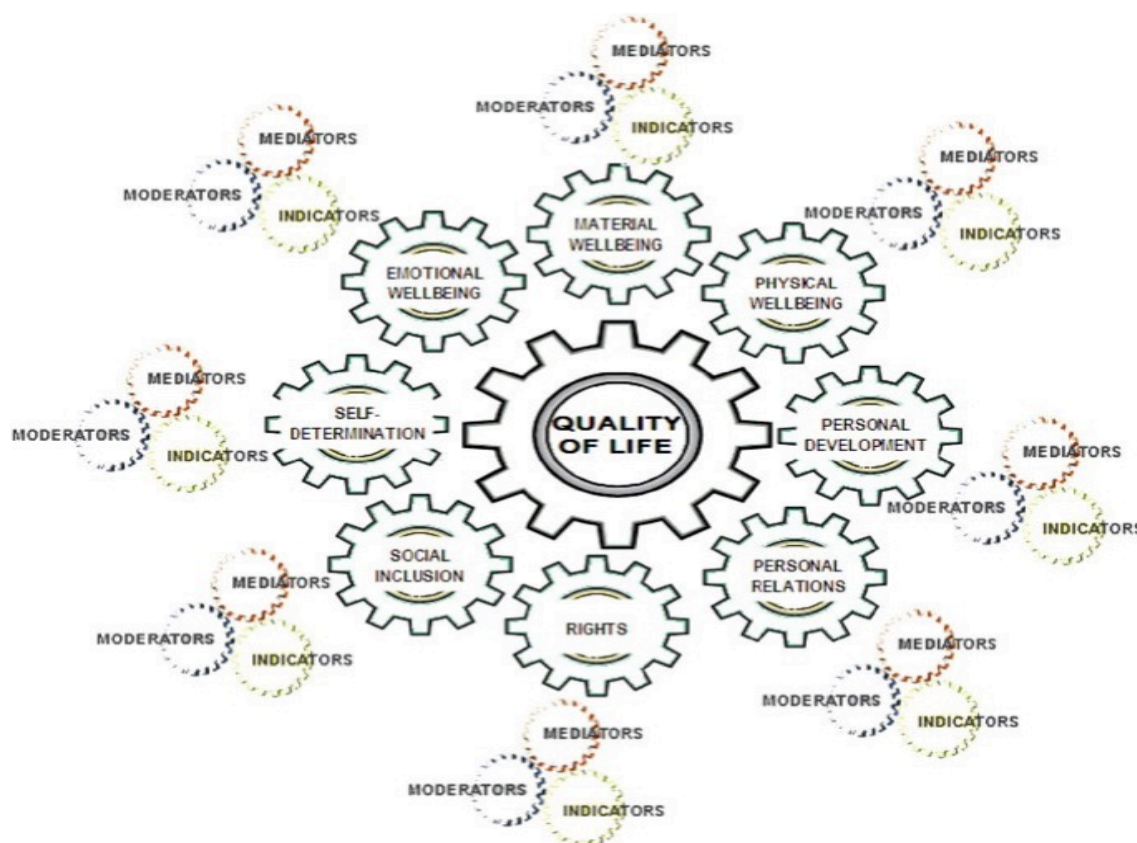
The Teaching Guide developed within the project to realize online and face-to face inclusive training with people with CP, families, professionals and volunteers will be the document for professionals that will guide the teaching/learning sessions as well as the form in which the concepts will be explained to the people with CP involved in the Project, for increasing their Wellbeing and Quality of Life through the implementation of inclusive eating and physical activity and sports.

Through the execution of this Project the next results were raised, which have been overcome throughout the execution and implementation of the training;

- **Co-Created Methodological Guide** was developed, with the direct participation of End Users, with the main objective of determining the key contents, methodologies and tools needed for creating and improving the critical competences of persons with Cerebral Palsy and their supports (families and professionals) for increasing their Quality of Life through inclusive feeding and integrative and adapted physical activity.
- **Training Materials** addressed to persons with Cerebral Palsy, families and professionals for facilitating the implementation of inclusive feeding and integrative and adapted physical activity.
- **Designed Experiential e-Training Activities** addressed to persons with Cerebral Palsy, families and professionals for facilitating the implementation of inclusive feeding and integrative and adapted physical activity.
- **Development of an ICT Platform**, including awareness, training contents and tailored and adapted ICT-Games solutions for supporting the implementation of Training Materials and Designed Experiential Training Activities.

Through the project both the content of the training and the expected results are focused on three main pillars, the first of them being inclusive feeding, in second of them inclusive physical activity and finally the influence of both on the quality of life of the person, which we focus on the dimensions of quality of life that determines the model of quality of life of Shallock et al.

[17], among the which we find the emotional, material and physical well-being as we can see below in Figure 1.



**Fig. 2: Model of quality of life [17]**

In this process of creating the CP-WELLBEING training, it seemed appropriate to do a pilot, where you can check both the contents and the materials used were appropriate for the implementation of the training.

This piloting was carried out in all the participating countries of the project, using all of them, the same satisfaction questionnaire. This satisfaction questionnaire was carried out using a Likert scale where 1 was in disagreement and 5 totally agreed. It gathered their satisfaction with regard to their expectations, the knowledge and skills acquired, their training needs, the contents of the workshop, the trainer, the work as a team and the dynamics throughout the formative activity, the space, the time, the space for personal reflection and the general assessment.

All this material can be consulted on the website <https://www.cpwel.eu/> where the teaching guide, the presentations and the execution guide of each of the training activities are available to the public. The teaching guide details the activities that can be found in the private spaces of the participants of the supporting ICT platform.

The CP-Wellbeing platform support the 8 e-training activities i.e. for Training Activity 1 some issues: (<https://www.cpwel.eu/en/workspace/training-activity-1-quality-of-life-model/>)

- Referring Content: A welcome text, Slideshow presentation of training activity 1, Execution guide of training activity 1 as PDF (only seen by the trainer), Explanation text for the homework, Link to homework of training activity 1, Questionnaire, Healthy habits annex as PDF file



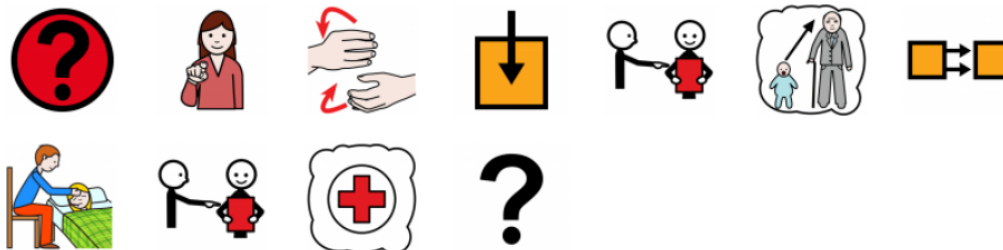
- The platform supports the participants at Homework

### Homework Training Activity 1

Logout Training\_A Logout

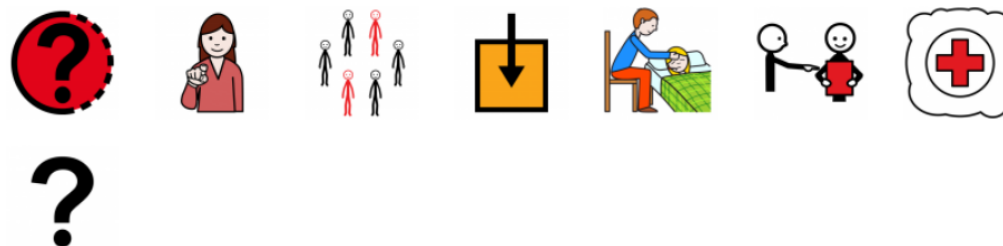
1. What are the habits of your daily life that you follow to take care of your health?

Annex of healthy habits in eating and physical activity. [1]



I walk 20-30 minutes every evening and I eat a lot of vegetables and fruits.

2. How do you participate in carrying out those habits? [2]



Back to select participant

Fig. 3:

[\(https://www.cpswell.eu/en/workspace/training-activity-1-quality-of-life-model/questionnaire/\)](https://www.cpswell.eu/en/workspace/training-activity-1-quality-of-life-model/questionnaire/)

#### ***View for the participant:***

The participant can see the ten questions in his language and in image language. She or he can answer them in the fields below the image language.

When the participant visit the site again, she or he can change or add something to her or his answers.

#### ***View for the trainer:***

When a trainer open this site, she or he can select if she or he want to see the homework of all participants she or he has, or she or he select one of them.

Now the trainer click on “Send selection” and the answers of the selected participant(s) will be show.

## At Diary

Login: [training\\_x](#) [Logout](#)

### Diary of X Training

Diary entry deleted.

New entry:

Save new diary entry

Date: 16.05.2018

[Edit](#) [Delete](#)

Date: 10.05.2018 - Last edited on: 16.05.2018

[Edit](#) [Delete](#)

### *View for the participant:*

When a participant open her or his diary, she or he can make new diary entries for homework or other things. She or he can edit existing entries or delete them.

### *View for the trainer:*

A trainer can see the entries of her or his participants, after she or he selected one or all of them.

## Validation questions

### *View for the participant:*

A participant see one validation question for each training activity and she or he can select one of the two given answers. When she or he visit the site again, she or he can change her or his answers.

**Manage participants (*only see by a trainer*)** First, the trainer must select if she or he want to create a new participant or if she or he want to edit or delete an existing one.

When the trainer want to create a new participant, she or he must fill in the fields "Last name", "First name", "Login name" and "E-Mail". Then she or he click on "Create participant" and the new participant is create. The participant will get automatically an e-Mail with the login name and a generated password (Login name with first letter in capital and last letter an exclamation mark).

For edit or delete a participant, the trainer select her or his name, click on "Send your choice" and she or he see the data of the selected participant. The trainer can now edit the given data or delete a participant.

When the trainer click on "Delete participant", she or he will be ask again if the selected participant really should be delete.

**Mailing (only see by a trainer)** A trainer can send a mail to one or all of her or his participants. First, she or he select one or all participant and click “Send selection”.

Then she or he can enter a subject and the text. The trainer can upload an attachment file to send with the e-mail. The uploaded file must be from type doc, docx, pdf, png, jpeg or jpg. With a click on “Send mail” the mail(s) will be send.

On the platform there are games i.e. for TA1

### Game: Fresh food

Logout: training\_x Logout

We learnt that **food can come straight from nature** (fresh food) or it **can be modified in a factory** (processed food). Fresh food is more likely to be healthy than processed food, that is why we need to identify what food has been modified in a factory in order to read the label and check whether is healthy or not.

**Now is your turn to say what is fresh and what is processed.** You will see pictures of different types of food and you will have to place them in their correspondent box, *fresh* or *processed*, depending on if they come straight from nature or have been modified in a factory.

**Click on a food picture and drag it to the box** (fresh or processed) **where you think it belongs to**, if you are right, the picture will stay in the box, but if you are making a mistake, the food picture will go back to its place.

Try as many times as you need and ask for help if there is anything you do not understand :-)



## CONCLUSION AND FURTHER WORK

People with disabilities experience a significant digital divide in all countries. The phenomenon of digital divide observed among the population of persons with disabilities is aggravated by the relatively slow uptake of accessible ICT platforms and e-training. The Internet may be a source of opportunities for people with disabilities both in terms of accessing information and increasing social inclusion. However, it seems that current strategies aimed at improving Internet participation of this population are not fully effective both on a national level and European one. Wide implementation of guidelines enabling easier access to Internet content and to the persons with disabilities such as WAIG should be an element of public policy and made obligatory for websites run by public institutions.

## ACKNOWLEDGE

The paper describes objectives and outputs of the European Erasmus+ project CP-WELLBEING.

## References

- Abazi, A., Fetaji, B., Dixon, H. 2008. The application of technology in enhancing multicultural and multilingual aspects of education: Digital divide into digital opportunities. Information Technology Interfacts, ITI 2008 30th International Conference on IEEE.
- Andes, S. M., Castro, D. 2010. Opportunities and innovations in the mobile broadband economy. Information Technology & Innovation Foundation, September 14.
- Arrigo, M. 2005. E-learning Accessibility for blind students, Recent. Bélanger, F., Carter, L. 2010. The digital divide and internet voting acceptance. Digital Society, Vol. IDCS'10, No. IEEE, pp. 307-310.
- Broadband Commission for Digital Development, G3ict, IDA, ITU, Microsoft, The Disability, 2013
- Hamburg, I., Lütgen, G. 2018. Digital platforms to support feeding, physical activity and training by cerebral palsy. In Archives of business research 6, No. 3, pp. 120-128.
- [http://g3ict.org/resource\\_center/publications\\_and\\_reports/p/productCategory\\_whitepapers/id\\_297](http://g3ict.org/resource_center/publications_and_reports/p/productCategory_whitepapers/id_297).
- [http://www.who.int/disabilities/world\\_report/2011/report.pdf](http://www.who.int/disabilities/world_report/2011/report.pdf)
- Klomp, R., 2004. A literature review of the accessibility of e-learning for students with disabilities. Unpublished manuscript. Retrieved December 17.
- Laabidi, M., Jemni, M., 2009. PBAE: new UML profile based formalism to model Accessibility in e-learning systems. International Journal of Engineering Education 4(25), pp. 646-654.
- Laabidi, M., Jemni, M., 2010. Personalizing accessibility to e-learning environments, in: The 10th IEEE International Conference on Advanced Learning Technologies, Sousse, Tunisia, July 5-7, 2010.
- Omole, D. W. 2013. Harnessing information and communication technologies (ICTs) to address urban poverty: Emerging open policy lessons for the open knowledge economy. Information Technology for Development 19(1), pp. 86-96.
- Polykalas, M. 2014. Assessing the evolution of the digital divide across the European Union. Web and Open Access to Learning (ICWOAL), International Conference on, 2014.
- Raja, S., Imaizumi, S., Kelly, T., Narimatsu, J., Paradi-Guilford, C. 2013. How information and communication technologies could help expand employment opportunities. World Bank, Washington, DC.
- Samant Raja, D., Narasimhan, N. 2013. Inclusive disaster and emergency management for persons with disabilities: A review of needs, challenges, effective policies, and practices. The Centre for Internet and Society and G3ict, Bangalore, India.
- Samant Raja, D., Adya, M., Killeen, M., Scherer, M. 2014. Bridging the ICT and ICT-AT digital divide for work: Lessons from the United States. Proceedings of the 1st Entelis Seminar, Bologna, Italy, November 27, 2014. <http://www.entelis.net>.
- Samant, D., Matter, R., Harniss, M. 2013. Realizing the potential of accessible ICTs in developing countries. Disability and Rehabilitation: Assistive Technology 8(1), pp. 11-20.
- Sampson, D. G., Zervas, P. 2011. Supporting accessible technology enhanced training: the eaccess2learn framework. IEEE Transactions on Learning Technologies 4(4), pp. 353-364.
- Schalock, R. L., Keith, K. D., Verdugo, M. A., Gomez, L. E. 2010. Quality of life model development and use in the field of intellectual disability. In R. Rober: Quality of Life
- Sloan, D., et al., 2006. Contextual Web Accessibility - Maximizing the Benefit of Accessibility Guidelines. In: W4A: Proceedings of the 2006 international cross-disciplinary workshop on Web accessibility (W4A).
- Spence, R., Smith, M. L. 2010. ICT, development, and poverty reduction: five emerging stories. Information Technology and International Development 6 (Special Edition): pp. 11-17.
- Spiteri, C., Raffaele, D., Smith, S. 2015. Mitigating the Digital Divide for Distance Learning Students in Developing Countries, SOCIN 2015.
- Starcic, A. I., Bagon, S. 2014. ICT-supported learning for inclusion of people with special needs: Review of seven educational technology journals, 1970-2011. British Journal of Educational Technology 45(2), pp. 202-230.
- Staric, A. I., Kerr, S. 2014. Learning environments – not just smart for some! Computers Helping People with Special Needs, Lecture Notes in Computer Science 8548, pp. 520-527.

Telecentre.org Foundation, and UNESCO. 2013. The ICT opportunity for a disability inclusive development framework.

The Global Initiative for Inclusive ICTs, & Disabled Peoples' International. 2013. Convention on the Rights of Persons with Disabilities 2013 ICT Accessibility Progress Report. <http://g3ict.org/design/js/tinymce/filemanager/userfiles/File/CRPD2013/CRPD%202013%20ICT%20Accessibility%20Report.pdf>.

The Global Initiative for Inclusive ICTs, & International Telecommunications Union. 2014.

UN Department of Social and Economic Affairs. 2013. World Population Ageing 2013. <http://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2013.pdf>.

UN Department of Social and Economic Affairs. 2013. Accessibility and Development – Mainstreaming disability in the post-2015 development agenda. <http://undesadspd.org/Home/tabid/40/news/392/Default.aspx>.

United Nations Enable. (n.d.). Disability and employment. <http://www.un.org/disabilities/default.asp?id=255>.

United Nations Enable. 2015. Latest developments. <http://www.un.org/disabilities/index.asp>.

User Agent Accessibility Guidelines 1.0., 2013. <http://www.w3.org/TR/WAI-USERAGENT/> (July 2013).

Vincente, M., Lopez, A. J. 2011. Assessing the regional digital divide across the European Union-27, Telecommunications Policy, Vol. 35, No. 3, pp. 220-237.

W3C Web Accessibility Initiative, 2013. <http://www.w3.org/WAI/gettingstarted/Overview.html> (July 2013).

Web Content Accessibility Guidelines, 2013. <http://www.w3.org/TR/WCAG10/> (July 2013).

WHO (World Health Organization) and World Bank. 2011. World Report on Disability.

World Bank. 2008. Social inclusion through ICT for Tunisian disabled. [http://web.worldbank.org/archive/website01055/WEB/0\\_CO-93.HTM](http://web.worldbank.org/archive/website01055/WEB/0_CO-93.HTM).