

Supporting Digital Inclusion and Web Accessibility for People with Cognitive Disabilities

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Abstract. The topic of digital inclusion and web accessibility for People with Cognitive Disabilities has increased over the COVID-19 pandemic times. The LIVE IT project is attempting to shed some light into this. This piece of work uses insights gained from focus groups and interviews that were held to assess the needs analysis and the existing knowledge gap of this societal problem. To this end, preliminary results of user engagement with digital tools and web services as well as their evaluation are presented herein.

Keywords. Inclusion, Web accessibility, Cognitive Disabilities, Living Labs, Co-creation

1. Introduction

The COVID-19 pandemic has brought into light the existing scarcity of people with cognitive disabilities (PwCD) in web accessibility [1][2] while the urge for digitalization in many aspects of daily life increased [3][4][5]. The definition of “web accessibility” indicates that websites, tools, and technologies should be developed and designed in a way that people with any aspect of cognitive impairment or deficit can use them [6]. Research shows that cognitive impairments bring limitations and restrictions in the conceptualization of information and usual activities [7], which increases reliance and dependency on other people, for instance, carers, to act on behalf of PwCD during quarantine. Although there has been some effort in digital design of technologies that can be beneficial to PwCD [8][9][10][11], differences in digital inclusion between subgroups of diagnosis and impairments, for instance, autism, aphasia, ADHD (Attention deficit hyperactivity disorder), and relevant limitations in people with physical impairments, like visually impaired people, remain unresolved [12][13]. Co-creation sessions which include a wide range of participatory practices for design and decision making with stakeholders and users [14], may be a key tool that reflects the perspectives and voices of PwCD and provide new opportunities to tailor new services to the needs of the cognitive disability community. In this paper, we outline the methodology

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followed in the LIVE IT project and we provide the first evidence from preliminary data collections that seem to shed some light into the web access problem of PwCD.

2. Concept building blocks

Living Labs, as a new model of co-creation design practice, is an innovative approach relying on intensive user involvement through co-creation, using real-life settings and a multi-stakeholder approach [15]. Co-labs are considered as interdisciplinary services centers aiming to enhance the provision of accessible online services without barriers and exclusions acting as areas of social innovation for the exchange of skills, resources, and results. The use of co-labs and Living Labs methodology holds a central role in the LIVE IT project and leads the co-design processes as a way of innovative and user-centered nature participatory approach. It is believed that such practices can upgrade the web accessibility of PwCD and offer insights on how existing tools may become beneficial for persons with a wider range of impairments.

3. Methods

Participant inputs were gathered through multi-center focus groups and interviews. An online assistive toolkit was developed to provide suggested web accessible tools and services to the participants while requesting their prompt evaluations during the co-creation sessions. The whole process was ethically approved by the Ethics Committee of the Aristotle University of Thessaloniki (Greece), no. of vote 247165/2021, chairperson: Dimitrios Stamovlasis.

3.1. *Open Toolkit*

The LIVE IT toolkit consists of three main tabs. Each tab focuses on a specific aspect of the project goals. It is an assistive tool not only for PwCD but for caregivers, helpers, family members as well as stakeholders. The first tab is the “Catalogue and Stakeholders”, whose main purpose is to help the users of the toolkit locate the nearby stakeholders that may be of interest. This is highly important because PwCD and their caregivers or family members often try unsuccessfully to locate a stakeholder. The second tab is the “Advisor tool and Guidelines”. On this tab, a user can find a complete list of available services and tools for specific tasks to complete which are sorted by the IT platform and the lists are filled with the output of the co-design scenarios that took place at partners’ Labs. These lists will also be fed by Hackathons’ output, where the scenarios were tested, and tools were evaluated by the users themselves. Another important feature of the advisor tool is that it provides ratings for each tool. The last tab is the “Online Community and Makerspace”. It links all the social networks and Living Labs’ communities to build up the online community of the project. Thus, every user feels connected to a wide network of peers and relevant stakeholders where assisting technologies can be helpful. The toolkit is available through a web browser, while it is highly portable and accessible from a vast variety of devices from smartphones to desktop PCs (Personal Computers). The toolkit is being constantly evaluated during the series of co-Labs’ sessions, Hackathons as well as Makerspace activities.

3.2. Co-Creation Sessions

At the first stage, focus groups with observation processes or semi-structured interviews were held. Eleven students (adolescents and young adults between the age of 15-24) with cognitive difficulties as well as their teachers and various healthcare specialists participated, pointing out the difficulties they face in their interaction with digital technologies. As a next step, co-creation sessions were implemented, where 10 students with major cognitive disabilities (adolescents and young adults between the age of 15-24) with the help of their teachers interacted with the Open Toolkit. This is an ongoing process where data will be collected during the planned hackathons.

4. Results

The preliminary qualitative results of the co-creation sessions are presented in Table 1.

Table 1. The qualitative results by each co-creation session

Means of Data Collection	Indicative Results
Focus Group Session with people with cognitive disabilities and their caregivers (observation, focus group and semi-interviews)	(a) People with major cognitive disabilities (people in autism spectrum with comorbidities, cognitive disorders and down syndrome) struggle during their interactions with digital devices (b) They need constant help and guidance of caregivers and teachers during this interaction (c) The digital interaction framework needs to be as structured as possible, because they have difficulty in understanding abstract concepts such as the internet environment, etc. (d) Serious games can be beneficial. Participants were more familiar with this digital environment
Interview with caregivers of persons with dementia	(a) The persons with dementia could be benefited from danger detecting devices in their home environment and devices that alert caregivers or personal assistants or include panic buttons (b) The persons are not able to learn to interact with digital devices and media, because of memory loss. The use of internet and digital devices should be supported by their caregivers (c) Platforms like YouTube are more acceptable by the persons
Interview with caregivers of persons with cognitive disability	(a) There is intense “technophobia” and unfamiliarity in their family environment (b) PwCD could benefit from a digital assistant (c) PwCD like interacting with embossed surfaces and buttons (d) The persons with cognitive disabilities face great difficulty in figuring out how to operate devices
Interviews with people who have been diagnosed with ADHD and a caregiver of a person with ADHD	(a) Some devices for spelling, text-to-speech or speech-to-text services, digital calendars, note-taking and digital applications are used by people with ADHD in their digital interactions to accomplish their tasks and help them (b) Unrestricted internet use could worsen the symptoms of ADHD or may worsen the existed attention deficit of the people that have been diagnosed with ADHD (c) Online tools, however, have the benefit of aiding in completing the activities of individuals and making those activities more efficient

During the first of the hackathon series, the participants evaluated text and voice converters as well as voice recognition services of platforms to be more useful in the context of the project. Tools with autocorrection functions in words were not evaluated

as very functional. In most of the tools, the guidance and support of the teacher is crucial for the participants’ interaction to be achieved. The results of the first hackathon are presented in Table 2.

Table 2. The results of the evaluation of the digital tools during the 1st of the hackathon series

Tools evaluated	1 st Hackathon results
Azure Microsoft Speech to text	It has been proven useful, as it was sensitive to the detection of sounds and words and even when people did not pronounce the words clearly, but also because they provide the choice of their native language
Text-from-to-speech	This tool offers a lot of options (shrink, zoom, clear the content, etc.) which could be proven useful for people with comorbidities, such as visual impairment. Most of the students managed to make proper use of the voice command that the tool offers
Google Chrome voice function	The advantage in the use of that tool, as it is described by most of the students and their teachers is that it automatically displays the suggested web pages according to the spoken word
On-Screen-Keyboard (OSK)	This tool has not proven functional in the co-design / co-creation sessions because the vast majority preferred the conventional keyboard
Autocorrect in Windows 10	The tool made small corrections to written words. The students who participated reacted positively with it in co-working / co-design labs
Coloradd.net	Though amusing for students to interact with it and change colors and backgrounds of words, according to teachers it has not proven useful
Myaccessangel.com	It was used under the guidance of teachers. Most of the students who took part in this session used its various options, such as changing the font or font size, but according to the teachers did not seem to like it
Contrastchecker.com	Students who took part in the sessions used that tool under the guidance of the teachers and they manage to make color changes both in the "background" and in the "foreground" of the words. According to their teachers, however, this tool has been proven a useful asset for the students in the case of completing suggested scenarios

5. Conclusions

This paper presents the first insights of the LIVE IT project’s results which are expected to expand in the next few months. The role of teachers or caregivers in the interaction of people with cognitive and neurodevelopmental disabilities plays a central role in their life. The difficulties that they and their caregivers face when using digital technologies were highlighted during the interviews analyzed herein. The simple interface of the Toolkit and the structured working scenarios where participants could easily interact was proven to be a useful methodological (good) practice. Due to the problems that people with cognitive disabilities face in the production of written and spoken language, digital tools and applications could probably be used to assist them in their life. These findings are related to the sample of participants in the collaboration sessions, who were people with neurodevelopmental disorders, such as cognitive disability, people on the autism spectrum with comorbidity, and people with Down syndrome, while the data were collected in the first half of the project. The results will be complemented with new insights and knowledge generated by the series of hackathons and webinars planned by the partnership over the next few months of the project realm.

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