Alenta: A Practitioner's Case of Technology Usage to Support Special Needs of Populations with Cognitive Disabilities

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Abstract. Alenta is a special education school in Madrid, Spain that is pioneer on the use of digital technologies to provide solutions for some of the educative issues of individuals with cognitive disabilities. In this paper we describe the trajectory of the center and its approach, which came to be at the vanguard of technological solutions for children, teenagers and adults with cognitive impairment. We also describe the main systems that Alenta has helped validate and provided design assessment, in order to portray an example in which practitioner's role goes beyond pure final testing.

Keywords: Assistive technologies · Collaborative design · Cognitive impairment

1 Introduction

Alenta started its trajectory in 1967 as a special education school for people with intellectual disabilities with the aim to provide support to achieve social inclusion and the fulfillment of their rights. As the school started growing and the number of students increased, Alenta started developing services and creating special centers focused on the particular needs of the adult life. Thus, Alenta has currently a Daycare center for adults with strong support needs, an Occupational center in which they are trained in labor activities and a Service of Housing Entrepreneurship that includes a residence and two supervised apartments where they have developed a pioneer experience in terms of employability of people with cognitive disabilities. Furthermore, they built a Special Employment Center that provides job positions to people with cognitive disabilities in several services such as gardening, maintenance, cleaning or cooking. For this purposes, Alenta has been including several methodologies, programs and innovative experiences sin their activities by means of continuous training of their staff, participation

in professional forums and collaborations with other entities, companies and universities. Using technology as a personal support tool has been the central aspect of specialized intervention in Alenta, and their professionals have worked on it from different perspectives: internal endowments, project management, professional formation, research collaboration and software development.

1.1   Most Common Issues and Technological Solutions

The starting point of any technology-based solution that aims to support the activities in the center is always the very individual with cognitive disabilities. Since they are the very target of the intervention, the support they need is designed and built in order to improve their relationship with the environment, their learning capacities and self-awareness. The philosophy of the center relies on the premise that every individual has a great potential that can be developed, so in order to do that, every available tool should be studied, every market niche identified and every possible adapted proposal that might help achieve a certain goal developed. Digital technology offers many answers due to their multimedia and interactive features, which allow adaptation to individual needs, displaying information in a way that can be more accessible and adjusted to several inter-action styles. Some usual needs in which digital technology has proven to be helpful for this purposes are:

Communication: There is a considerable number of individuals that have not developed oral communication skills or not at a sufficient level to ensure ade-quate conversational interaction with their peers nor the exercise of their right to express themselves. Information technologies opened a major way of assistance by means of systems based on Alternative and Augmentative Communication (AAC) [6]. AAC software relies on the use of pictures and adapted text that, unlike Hand Signed Language (HSL), are universal and do not require the interlocutor to learn specific codes. Regarding analog commu-nication systems based on images, AAC software offer a handful of advantages such as the amount of language that can be stored and processed or and the speech synthesizing, which allows more functional, practical uses in several contexts.

Understanding of environment, tasks and time: Cognitive impairment is often invisible in society, but it implies a lack of comprehension of the context and of the expectations that other people put on an individual, that is to say, what are they supposed to do in certain contexts. Compensation strategies for these purposes include anticipation or explanation (signage, visual indications, captions, etc.), which have a predominantly static nature that hinders its application to extended contexts and diverse situations.

Autonomy and self-management: Besides understanding the environment and the activities that are carried out in it, autonomy is another desirable feature. Regarding cognitive disabilities such as intellectual impairment or autism spectrum disorders, there is a clear need of support that help these individuals guessing what to do and which strategies ought to be employed at

a certain moment. Some examples of technological support in these matters are alerts, sequences of activities that show the steps that belong to a task or guiding applications to provide wayfinding. Communication facilitators are also included in this category.

Self-regulation: Many individuals in the autism spectrum or with other intellectual disabilities manifest high anxiety levels. Causes such as lack of environment and social situation understanding, high requirements or personal frustration may lead to this inner state. Cognitive challenges related to the executive function are also relevant regarding self-regulation due to the difficulty to inhibit socially inadequate behaviors. Emergent technologies such as wearable devices offer several possibilities to detect anxiety episodes [1]. This devices can also help individuals with cognitive disabilities regain calmness by means of relaxation strategies that are presented in a normalized manner and using similar devices than those used in the mainstream, hence reducing social stigma.

Access to academic learning: The last aspect in which people with cognitive disabilities require significant support is their access to learning. For this purpose, school materials and methods have to be adapted in order to improve their comprehension and management. These adaptations consist of: (a) better presentation to achieve better accessibility, (b) individualization of contents and (c) adjusted time patterns via adapted intervals and repetitions to ensure the acquisition of knowledge. Some existent applications and digital materials allow selection of resources that are adapted to individual need [7]. Additionally, authoring tools allow the generation and customization of didactic materials that include methodological aspects that ease learning processes for these individuals 4.

2 Technology and Cognitive Accessibility

If there is a field in which digital technology has made a positive impact on the lives of people with cognitive disabilities and ASD, that is cognitive accessibility.

Cognitive accessibility can be defined as the right to understand the information available in our own environment, to dominate the communication that is established within it, and to be able to participate and engage with the activities that are carried out in it without discrimination on grounds of age, language, emotional state or cognitive abilities. The concept of *environment* in this context means the space, surrounding objects, services and activities [10].

Technology and cognitive accessibility go hand in hand regarding several scenarios. First, web services can ease the access to information by means of diverse strategies that, in our case, would be centered on the simplification of information, the use of easy reading standards, usable interface design and including visual support.

On the other hand, technology can enhance cognitive accessibility in other environments such as spaces and activities, becoming a paramount support to improve the relationship with the mentioned environment and to increase personal autonomy. This can be achieved through mobile technologies that allow

users carry adapted and understandable information that allows them to interpret what happens in their surroundings. Augmented reality and wearable technologies stand as innovative elements that can help to a high extent this sort of accessibility.

3   Alenta and Technologies for Personal Support

Although the usefulness of technology for special intervention and personal support has proven to be significant, it is necessary to emphasize the fact that they cannot be used nor implemented in an arbitrary manner, but included in larger intervention frameworks that involve methodological and functional approaches, as well as technological tools to develop them.

In Alenta, this is not only implemented through specific projects but taking individuals with cognitive disabilities as reference for the creation of apps and tools, and ensuring their participation in the implementation process.

Building on this, Alenta has established collaborations with the Escuela Politécnica Superior of the Universidad Autónoma de Madrid and the Escuela Técnica Superior of the Universidad Rey Juan Carlos, which crystallized in the following actions:

– Show to undergraduate students the impact of their work on society aiming to motivate the development of applications and systems targeting cognitive-disabled populations.
– Spread the concept of 'Universal Design' as an approach to build new environments, products, technologies, information services and communication possibilities that are more accessible, understandable and easy to use. Desirably, this goal is to be achieved in the most natural, general and independent way possible, not having to turn to adapted or specialized solutions [2].
– Collaborate in the testing of apps and systems developed by the students of the aforementioned universities in order to validate the efficacy of their proposals in terms of the existent needs of support.
– Offer ideas of new apps and web services in order to provide solutions to the needs of the individuals with cognitive disabilities that are detected in the daily activity of children, teenagers and adults in the center.
– Participate actively in the development of such apps and technological resources contributing with the professional perspective about people in need of special support in the cognitive area, allowing their very participation in the design, development and testing.
– Contribute actively in research centered on the use of technology on disability with the participation of students, users and professionals in order to provide use evidence and proper practices that are reproducible in other environments and entities.

These are some of the specific collaborations that have been carried out in Alenta with the mentioned universities:

– Universidad Autónoma de Madrid
  - Active participation in the testing of *AssisT-Task* [4], an application for support in daily-life tasks and *AssisT-In* [9], an application for support in indoors wayfinding.
  - Active participation in the validation of *Leo con Lula*, an application for the support of the acquisition of global reading skills for students with autism [3].
  - Participation in the design, implementation, evaluation and testing of *Taimun-Watch* [8], a smartwatch system for the emotional self-regulation of individuals with autism, funded by Fundación Orange.
– Universidad Rey Juan Carlos
  - Active participation in the testing of *Hoy te cuento*, a system developed to ease creative thinking with the creation of stories and comics in tablets [5].
  - Active participation in the testing of *DEDOS*, a system for interactive tables for the creation of digital content for people with special needs.
  - Participation in the design, implementation, evaluation and testing of *Blue Thinking*, a programming environment assessed with cognitive accessibility criteria focused on the development of the executive function of individuals with autism, funded by Fundación Orange.

4   Conclusions

After years of experience and joint collaboration, there is evidence of the need of interdisciplinary collaboration in the design and development of technological resources that allow the integration of several approaches in order to provide personal support for people with cognitive disabilities.

Knowing the cognitive accessibility needs of this population is the fundamental starting point for technology development, since that is the way in which functional and pragmatic designs that respond to their actual needs.

Moreover, the participation of individuals with cognitive impairment in the several project phases has an undeniable value due to the contribution they make and the detailed information they provide in terms of interaction and usability. Developing technology with people instead of for people has proven to be the better way to ensure successful results in our center.

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