Designing end-user adaptable interactive rehabilitation technology

Considering that youths with ID have less favorable transition outcomes than youths in the general population and that employment opportunities are even less promising the initial question was: *How to bridge the "gap" between what youths with ID "can do" and what they really "are doing" in employment sector?*
Method: The project E-IDEAS uses a mixed method that incorporates participatory research approach with qualitative research methods.
It addresses the current educational and career preparation context for youths with ID in Ireland through a transition program composed by three main activities:

1. Delivery of an Employment Preparation Curriculum (EPCv), developed using a person-centered approach.
2. Provision of an Individualized Internship, supported by job coaches of local organization (EmployAbility Galway) that provides real-life work experience.
3. Use of assistive technology (AT), including tablets and app AVAIL a mobile solution based upon the principles of ABA (Applied Behavior Analysis) enabling learners to develop life skills.

Five persons aged between 20–25 with mild to moderate ID (IQ 50–70) were recruited by a local organization (Ability West). The transition program started in January 2019, it lasts for 4 months and it will be extended until summer 2019.
Key results: The analysis of results is currently ongoing. A questionnaire on the quality of life (San Martin's scale) has been administered to participants at the beginning of the transition program and it will be compared with the data collected at the end of the process. Initial findings already emerged are:

- The provision of EPCv concurrently delivered with the internship reinforces learning and provide a safe environment where to discuss and ask questions.
- The adoption of AT leads to positive results that helps to achieve a long-lasting acquisition of skills to perform job-related tasks although it requires a continuous support.
- A strong partnership between different local stakeholders guarantees an effective transition towards job experiences.

Conclusion: The main practical implication of the research is that through a specific curriculum delivered concurrently with an individualized internship realized in real-work settings, it is possible to empower persons with ID for acquiring employment skills. Also, the adoption of AT reinforces what learned in classroom as well as tasks' execution during the internship. In this view, the research's results affect the AT field providing the opportunity to develop a technology learning environment that facilitates acquisition and exploration of job-related skills. Future perspective in terms of short and long-term impacts are:

- Improve employability for youth with ID.
- Help service providers in Ireland expand their community services.
- Definition of practical actions aimed at impacting on mind-set and common beliefs with respect to disability and employment.

Keywords: Empowerment, Intellectual Disabilities, Individualized Transition Program, Assistive Technology, Employment Skills
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Special Thematic Session 12
Developing Assistive Technology Together with End-users, Business, Healthcare and Knowledge Institutes – Challenges and Benefits

This thematic session focusses on the potential of living labs in supporting companies in further developing assistive technology in order to develop an effective, usable and sustainable solution of the real problems in health care. What is the benefit o f cooperation between companies with AT, knowledge institutes and health care organizations? What is the contribution of research institutes like universities and applied knowledge centers involved? And how do health care institutions themselves organize in order to improve the match between assistive technology developed and needs of in health care.
Chair: *Paulette Wauben-Penris*

Designing End-user Adaptable Interactive Rehabilitation Technology

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Background: Technology supported rehabilitation training after stroke has been a topic of interest for many years. While numerous solutions have been developed and evaluated, most of these solutions pertain to a limited set of exercises, pathologies and use cases.

Providing personalized solutions, and adapting to new or changing patient demands, is difficult for such technologies, since most of their functionality has been defined during a design phase that predates their actual use. This calls for technology that facilitates adaptation and customization to patient needs, without demanding skill and knowledge typically associated with designing or implementing new technology.
Method: In close collaboration with a clinical partner, we developed TagTrainer: an end-user adaptable technology for physical rehabilitation after stroke. In an iterative, user-centered process, therapists were involved in the design and implementation of the technology. TagTrainer consists of multiple interactive surfaces that detect objects outfitted with RFID tags, and provides visual and auditory feedback. The system is connected to a computer on which therapists can modify, expand or create exercises for individual patients. Any object of daily life can be integrated into an exercise, simply by attaching an RFID tag to it. TagTrainer was evaluated in four field studies in rehabilitation clinics for a total of 24 weeks. In all studies, we measured technology acceptance (UTAUT), interviewed therapists on their experiences in using TagTrainer, and analyzed the rehabilitation exercises that were created by the therapists.
Key results: Technology acceptance was moderate over the four studies, remaining relatively stable over the course of each study. Therapists created a total of 37 new exercises for their patients, showing that in principle they are able to adapt TagTrainer to the needs of their patients. However, through the interviews we also encountered several issues pertaining to the feasibility of implementing an end-user adaptable technology such as TagTrainer in a clinical context. Amongst others, the organizational model of clinics does not facilitate therapists in engaging in activities other than patient treatment. Additionally, therapists indicated that important efficiency benefits could be reaped from (partly) reusing existing exercises, but that judging the usefulness of exercises created by colleagues for a particular patient prevented them from doing so. Finally, the therapists voiced concerns about the impossibility to validate the effectiveness of each and every personalized exercise.
Conclusion: While the principle of an end-user adaptable technology for physical rehabilitation after stroke seems promising, deploying the technology in a clinical context has shown that there still are many challenges to be overcome. Furthermore, the studies have shown that even when clinical partners are involved in the development of a technology, non-technical and policy issues might arise upon deployment.
Keywords: End-user adaptable technology, physical rehabilitation, stroke, deployment study.
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‘Sharing is Caring’: What are the Main Legal and Ethical Challenges to be Looked at when Co-designing Assistive Technologies?

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Background: The way in which assistive technologies (ATs) are ideated and produced today has significantly evolved from the fashion in which they used to be done in the past. Over the recent years, new forms of bottom-up innovation and social collaboration for the co-creation of healthcare solutions have emerged. Such initiatives involve the interaction of a range of stakeholders, including designers, healthcare professionals, makers, fab labs, and end-users who – for different purposes or ideals – put together their efforts and knowledge in order to co-design and reproduce various types of ATs. One notable example of this new paradigm is represented by Careables.org platform – an initiative by the Made4You project. Its aim is to create an online platform to enable stakeholders possessing broad and diverse knowledge to share it for the subsequent co-creation and reproduction of customized healthcare solutions. Examples of ATs created in such a manner include 3D-printable prosthetics hands, wheelchair mounted environment controllers, learning supports, assistive phone cases, open lights for wheelchairs, to mention but a few. While social effects concerning co-designing initiatives clearly appear to be beneficial – especially in cases where a given AT does not exist on the market yet, it is too costly, or it has not been tailored to meet the needs of an individual – the ethical and legal requirements have only been partially addressed in the literature and have rarely been implemented in practice by the aforementioned stakeholders.
Method: Through this contribution we will outline the main legal and ethical requirements to be regarded when a healthcare practitioner, developer or an individual wishes to design, co-create or reproduce an AT through such a bottom-up approach. This contribution stems from a desktop research carried out within the context of the Made4You project by legal researchers of KU Leuven whose main focus was on the EU