HEURISTIC EVALUATION OF ICT APLICATIONS FOR PERSONS WITH COMPLEX COMMUNICATION NEEDS

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The paper examines the case-study specifics of heuristic evaluation of the ICT-AAC application Slovarica for persons with complex communication needs (CCN) compared to the standard methods recommended. The application was developed following the guidelines of user-centred design (UCD) which is an approach to design that grounds the process in information about the people who will use the product. The expanded team of evaluators, who came from different research backgrounds, have performed the heuristic evaluation of the ICT-AAC functional prototype. The evaluators performed step-by-step walk through the application through the lenses of the different groups of potential users. The goal was for to discover how those groups of users prioritize features of the app and major pain points in the current information architecture. After the heuristic evaluation was tailored for persons with CCN, the detailed specification of an interface design improvement and methods for solving of technical problems was agreed between team members.

Key-words: *Augmentative and Alternative Communication**,** UCD, Usability, Heuristic Evaluation.*

Introduction

Augmentative and Alternative Communication, (AAC) is set of procedures and processes by which an individual's communication skills (i.e. production as well as comprehension) can be maximized for functional and effective communication. (ASHA, 1997-2013). Persons with complex communication needs (CCN) are individuals who are unable to use speech as their primary method of communication. While reasons for CCN differ widely, such as due to physical and/or intellectual impairment, Down Syndrome, or Autistic Spectrum Disease, AAC methods based on the use of graphic and textual symbols to represent certain objects, actions, or concepts, have been proven as highly beneficial (and in certain cases critical) for improving speech, literacy, learning, employment, and quality of life for persons with CCN. In the context of this paper, Information and Communication Technology (ICT) based AAC services refer to services utilizing specific know-how on symbol-based human-to-human and human-to-machine communication in a computer and networking environment (ICT-AAC, 2013). In the context of ICT-AAC, there is a lack of evaluation methods that assist developers in the creation of interactive electronic products, services and environments that are both easy and pleasant to use for the target audience – persons with CCN. The International Standard (ISO 13407: Human-centred design process) provides guidance on human-centred design activities throughout the life cycle of computer-based interactive systems named user-centred design (UCD). UCD is an approach to design that grounds the process in information about the people who will use the product, but the standard defines a

general process and does not specify exact methods. UCD is a multi-disciplinary activity which incorporates human factors and ergonomics knowledge and techniques. Applying ergonomics to the design of systems involves taking account of user's capabilities, skills, limitations and needs. Human-centred systems evaluate designs against those requirements and also support users and motivate them to learn. In the early evaluation stage, performed on a prototype, in order to identify as many accessibility and usability issues as possible, it is difficult to obtain actual or potential users to do the formal testing. For that reason, before conducting user-based evaluations, it is widely accepted to do a heuristic evaluation .

Heuristic evaluation of ICT based AAC services

Heuristic Evaluation is inspection-based method for evaluating usability promoted for its cost efficiency and ease of implementation. It consists of one or more experienced evaluators (3-5 recommended) applying an established set of guidelines as they review a given system. Evaluators may work as a group, identifying potential problems together, but then rating them individually and privately. Since it was originally proposed by Nielsen (Nielsen, 1995a), heuristic evaluation has been adapted in many ways: for different usability problems and different groups of users. For persons with CCN, due to the their different kinds of impairment, the list is not developed yet. Evaluators may conform to Guidelines for Developing an AAC-Enabled World Wide Web (Nicolle, 2004) and Guidelines on accessibility for disabled and older users, but those guidelines are not suited for ICT-AAC applications. In the Guidelines, expert-based methods are divided into preliminary accessibility reviews, which use a small number of key guidelines, and conformance evaluations for accessibility, which use the full set of Web Content Accessibility Guidelines (WCAG). Conformance is organized around four accessibility principles:

- Content must be perceivable
- Interface components in the content must be operable
- Content and controls must be understandable
- Content should be robust enough to work with current and future user agents (including assistive technologies)

In order to obtain effective heuristic evaluation of ICT based AAC services, the list of guidelines should be generated in accordance with information about users obtained before actual application development. The data should address the needs and abilities of the user, demands of the customary environments, educational goals, and related activities. Even though the assistive technology devices and services are considered for all persons with CCN, regardless of type or severity of disability (Tankersley, 2006), the assessments of assistive technology and applications are individual. Assistive technology needs are reassessed any time changes in the user, the environments and/or the tasks result in the user's needs not being met with current devices and/or services.

In the scope of the ICT-AAC project, the assistive technology consideration process and results have been documented by the team of experts and include a rationale for the decision and supporting evidence. The team has been gathered from multidisciplinary scientists in the field of electrical engineering and computing, graphic technology, education and rehabilitation, speech pathology and psychology

from University of Zagreb. The first stage of this activity was to develop an internal project resource, documenting requirements identified in the early phases of the ICT-AAC project and current work in the area of UCD (see Figure 1). The assessment provided the ICT-AAC team with clearly documented recommendations in terms of quality of experience evaluation that guided decisions about the selection, acquisition, and use of assistive technology devices and services. The data illustrate that assistive technology is a tool to support achievement of goals and progress in the personal curriculum by establishing a clear relationship between user needs, assistive technology devices and services, and the user's goals and objectives.

Case study – ICT-AAC application "SLOVARICA"

ICT-AAC application Slovarica helps children with CCN to learn visual symbols and new phonological forms (see Figure 2). It contains a basic set of paired visual and auditory symbols. Such paired visual and auditory symbols may encourage, maintain and improve early literacy skills necessary for reading and writing, while users can create their symbols using photos or images. Spelling book contains a basic set of symbols that each user can upgrade with their own photos or symbols.

Materials and methods

On the basis of data collected by previous research and respecting the basic principle of heuristic evaluation, that is, the involvement of a small set of evaluators in order to identify most of the potential usability problems; the decision has been made to expand the list of evaluators for AAC applications with the AAC field's experts. Since the evaluators were coming from very different scientific fields, they had to be acquainted with the proposed list of heuristics and the whole process of heuristic evaluation. The application and it's user interface was designed in accordance to UCD process with previously defined users goals and tasks for target users on tablet devices (OS version 2.2 at least).

The first version of a digital prototype of the application Slovarica was developed iOS and Android platform in June 2013. In the next period of 40 days the evaluators performed the walk through the tasks in order to identify problems based on the set of the heuristic criteria. The expanded list of heuristics (A System Checklist by Pierotti) has been used. The guidelines checklist and consistency inspection showed that some of the guidelines developed for standard applications are proven not to be applicable for AAC applications, having in mind the specifics of the target population (vision, movement and cognitive impairments). Also, the different checklist should be used for the administrative settings (parents, speech-language pathologists, educators) and AAC user settings. After the heuristic evaluation was tailored for persons with CCN, the detailed specification of an interface design improvement and methods for solving of technical problems related to service installation and maintenance was agreed between team members.

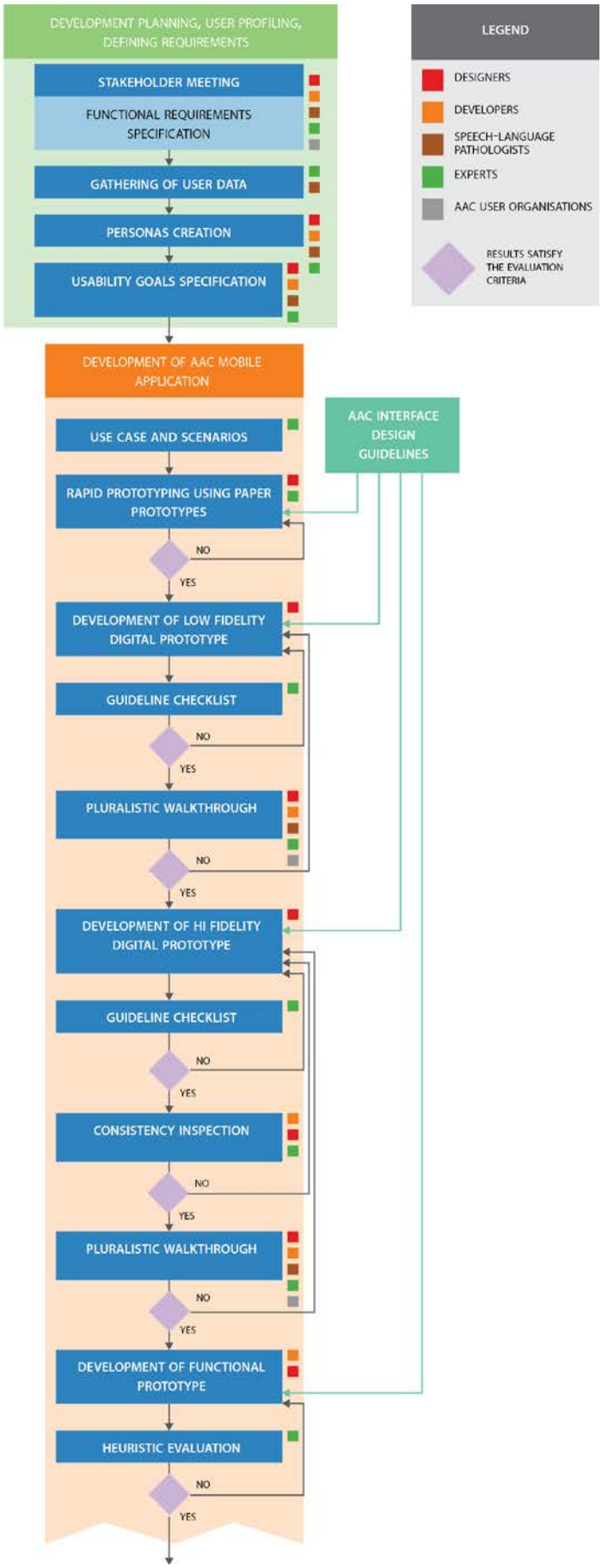

Figure 1. ICT-AAC application UCD process diagram

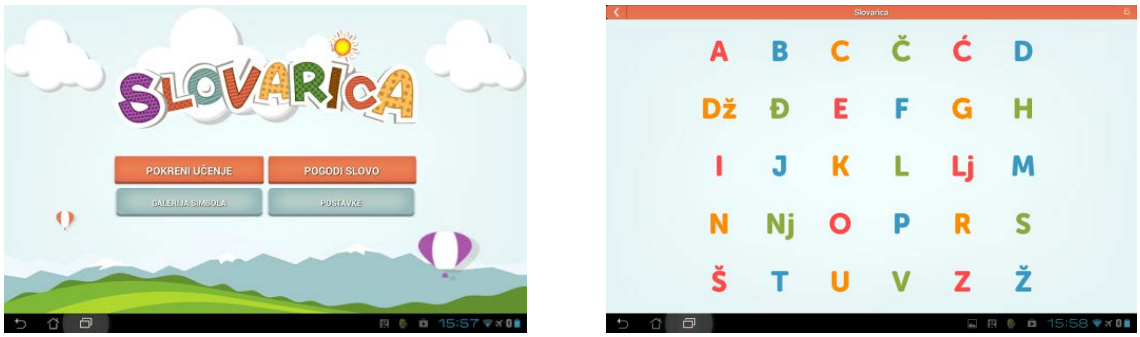

Figure 2. The second version of application Slovarica

Conclusion

The Slovarica case study research has shown that, in the context of ICT-AAC, the specific methods of UCD have to be adjusted in the way that needs further elaboration. One of the examples is the list od guidelines for heuristic evaluation which is a method that had not been previously used for testing the usability of applications aimed for persons with CCN. Some of the guidelines developed for standard applications are proven not to be applicable for AAC applications, e.g. icon labelling, colour coding, etc.. In order improve the accessibility, the expanded team of evaluators, who came from different research background, have concluded that a new set of guidelines, suited specifically for the heuristic evaluation of the ICT-AAC functional prototype and it's different settings, has to be developed.

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