Inclusión, discapacidad y educación

Enfoque práctico desde las Tecnologías Emergentes

Fernando Pesántez Avilés, Rafael Sánchez,
Vladimir Robles Bykbaev y Paola Ingavélez Guerra
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Towards an analysis of existing software for intellectual disabilities

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Abstract

The research of software products has revealed the degree of difficulty in finding existing software designed to help people with intellectual disabilities to improve their learning abilities. There are institutions that promote different applications, free download programs, and websites, but these resources are not categorized, they are just listed. The lack of specifications or guidelines to search for a software according to the person's needs makes complicated the use of these resources.

This work proposes the creation of an initial prototype catalog of software, analyzing the existing resources and the association of intellectual disabilities characteristics with the attributes of each existing software designed for intellectual disabilities.

In related works, we found that there are three aspects to be considered to develop the catalog: type of catalog, access, and specifications of the categorization.

First, it is important to distinguish between the types of the catalog. There are two types of catalogs or websites offering software solutions for intellectual disabilities: developer's own websites and promoters websites. Also, the developer catalog is socialized mainly in the country where is created because there are cultural and language factors while the promoter catalog collects software from different countries. Last, it will be a valued resource if the catalog includes multilingual software.

Second, the software access should not exceed the 3 to 5 clicks to access. Third, the users prefer to categorize the catalog by type of disability because they are familiarized with disabilities according to their background.

Keywords: Prototype, intellectual disabilities, software.

Introduction

Technology helps people with solutions to situations of daily life. The software has been developed to lower barriers of usability and accessibility for all the people.

In fact, a person with an intellectual disability has difficulty learning in the traditional way (Center for Disease Control and Prevention, 2016). However, there are institutions specializing in disabilities that use technology to support learning. These tools and programs do not eliminate learning difficulties but can help the person complete tasks independently or with less help (U.S. Department of Health and Human Services, 2014).

Software disability promotes a better quality of life for people with disabilities and their family. Through educational software will help to reinforce and improve the capacities of people with disabilities. However, there is not a digital catalog for searching educational software in Ecuador. Importantly, a previous work of Larco and Luján-Mora (Larco & Luján-Mora, 2016) has demonstrated that Ecuadorian therapists have very little access to software that exists on different websites, due to lack of information and marketing of them.

This paper is organized as follows. Section 1 presents an introduction. Section 2 presents materials and methods including review the information for intellectual disabilities, research the existing websites of software for people with disabilities, and Build an initial prototype as a recommend solution. Section 3 presents results and discussion. Finally, section 4 provides some final conclusions and directions for future work.

Materials and methods

This research uses a method based on Design Science Research (DSR), since it provides a high level of rigor. DSR is a research approach developed through the last decade (Ram, Hevner, & March, 2004) (Hevner & Chatterjee, 2010) (Gregor & Hevner, 2013). It has been used in several domains with Information Systems (Peffers, Rothenberger, & Kuechler, 2012).

According to Hevner et al. (Hevner & Chatterjee, 2010), DSR constitutes a pragmatic research paradigm that promotes the creation of innovative artifacts to solve real-world problems; thus, design science research combines a focus on Information Technology (IT) artifact with a high priority on relevance in the application domain. A part of this is to be able to reproduce prototypes and user-oriented evaluations of them (Campos et al., 2013). Taking as reference the guidelines and compliance of the DSR of the work (Montenegro, Murillo, Gallegos, & Albuja, 2016).

The phases considered for this analysis are the following:

1. Review the information for intellectual disabilities
2. Research the existing websites of software for people with disabilities
3. Build an initial prototype as a recommend solution.

Review the information for intellectual disabilities

For people with intellectual disabilities, there are particular and specific software that need to be considered and is mentioned by American Association on Intellectual and Developmental Disabilities (AAIDD) (Schalock, Borthwick-Duffy, Buntinx, Coulter, & Craig, 2012) including best practice guidelines on diagnosing and classifying intellectual disability and developing a system of supports for people living with an intellectual disability. Written by a committee of 18 experts, In-

tellectual Disability: Definition, Classification, and Systems of Supports (11th edition.

To give adequate attention to people with intellectual disabilities should be based on international models such as the International Classification of Functioning (ICF), disability, and health: children & youth Version (ICF-CY) of the World Health Organization (WHO)(World Health Organization, 2007).

According to Kats & Ponce (Katz & Lazcano-Ponce, 2008), the cognitive disability has as a subnormal intellectual functioning level as the common denominator. Besides, intellectual disability classifications are stratified by three age groups; finally, the authors contribute with the following Etiological factors on intellectual disability: Genetic factors, hereditary factors, and acquired factors.

On the other hand, AAIDD creates the conceptual framework of human functioning (Schalock et al., 2012)including best practice guidelines on diagnosing and classifying intellectual disability and developing a system of supports for people living with an intellectual disability. Written by a committee of 18 experts, Intellectual Disability: Definition, Classification, and Systems of Supports (11th edition. Finally, Schalock and Luckasson extend the Framework for Aligning Components of a Classification System (Schalock & Luckasson, 2015).

Research the existing websites of software for people with disabilities

It is important to analyze the existing resources to find out which characteristics will improve the usability of the software catalog. Table 1 summarizes the types of websites or catalogs:

Table 1
Types of websites or catalogs

Source	Country	Content and Use
ARASAAC http://www.arasaac.org/software.php http://aratools.catedu.es/	Spain	This site provides increasing and alternative communication systems. The categories are tools, activities, and developer. Create software in collaboration with three institutions. (2 to 5 clicks to access)
Orange Foundation http://www.fundacionorange.es/junto-al-autismo/soluciones-tecnologicas/	Spain	This site offers software specifically for Autism spectrum disorders (ASD). It provides a list of software with useful information of it. It also provides links to sites offering much greater detail of the software and download it. Foundation Orange collaborates with universities, experts, and other foundations to create these projects. (3 to 5 clicks to access)
CIAPAT http://ciapat.org/es/catalogo_escenario/TICSTecnologia	Argentina	A huge site (if you navigate to it all) that covers a technology center for people with different disabilities. Worth to read if you are looking for support products. It is classified by applications software and system software. CIAPAT collects software from other projects and foundations. (5 to 6 clicks to access)
Project DANE http://www.proyectodane.org/	Argentina	This site gives "inclusive apps," adapted to characteristics and needs. Activities and cognitive abilities classify it. Project DANE was developed by NGOs, academic institutions, and voluntaries. (3 clicks to access)
Wikinclusion http://wikinclusion.org/index.php/P%C3%A1gina_principal	Uruguay	A link to a very useful wiki made to improve the connection between technology and disabilities. It has three kinds of categories: competence for life, disability, and letters. In collaboration with UPS Ecuador and CIAPAT. (6 to 7 clicks to access, redirect to software website)
BJ Adaptaciones http://bjadaptaciones.com/	Chile	This site covers support products and solutions for disabilities with a variable category and subcategories. The site has payment products and applications. BJ Adaptaciones works with manufacturers and developers. (3 clicks to access)
My First App http://www.myfirstapp.com/MyFirstApp/Home.html	USA	This is an excellent site that covers cognitive and motor skills. Age categorizes this particular site and the applications are bilingual. Independent team developers. (3 clicks to access)

Source: By authors.

Two types of websites or catalogs offer software solutions for intellectual disabilities: developer and promoter. Developers design software for intellectual disabilities together with education specialists and technology programmers. Developers are institutions, NGOs, foundations and project's websites. They develop software, specially adapted to specific characteristics and needs of the people with disabilities. Promoters collect the software created by many developers in different countries. They shared the software by creating a catalog and categorization.

Two features are not considered in the existing websites. They are the rating and feedback of the software. Also, the catalog should consider the three-click rule for the access. The rule can help creating sites with intuitive, logical hierarchical structures (Testing the Three-Click Rule UX Articles by UIE).

Build an initial prototype as a recommend solution

According to Sommerville (2011), a prototype is an initial version of a software system that is used to demonstrate concepts, try out design options, and find out more about the problem and its possible solutions. User interface (UI) prototypes have several purposes (User Interface (UI) Prototypes: An Agile Introduction, n.d.). The analysis considers the process model for prototype development described.

Prototyping Plan - Establish Prototype Objectives. In this phase, the following objectives were carried out:

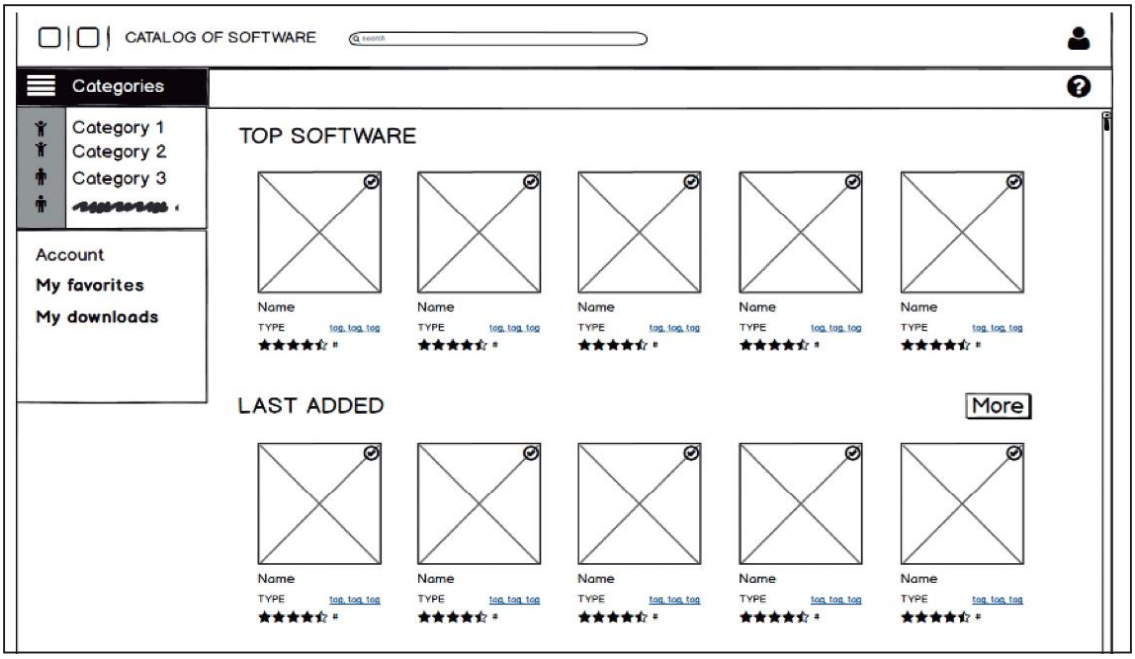
a. Create an interactive catalog for the search and download of educational software.
b. Establish a categorization for the educational software.
c. The design of the catalog should be a user-friendly interface.
d. The catalog needs a community feedback area of the users for the improvement of the educational programs.
e. The catalog language is Spanish.

Outline Definition - Define Prototype Functionality. In this phase, the following the prototype functionality were carried out:

a. It is important to detail the description and requirements of the software.
b. The user should only need to do two steps or click to download the software.
c. The user should have direct access to the categorization and the programs.
d. The development and distribution of the programs are very important for the learning and improvement of people with disability, and they should be available for everybody.
e. According to the requirements, a mock-up is created to validate functional system requirements. The mock-up is created with Balsamiq.

Figure 1 shows the mock-up index.

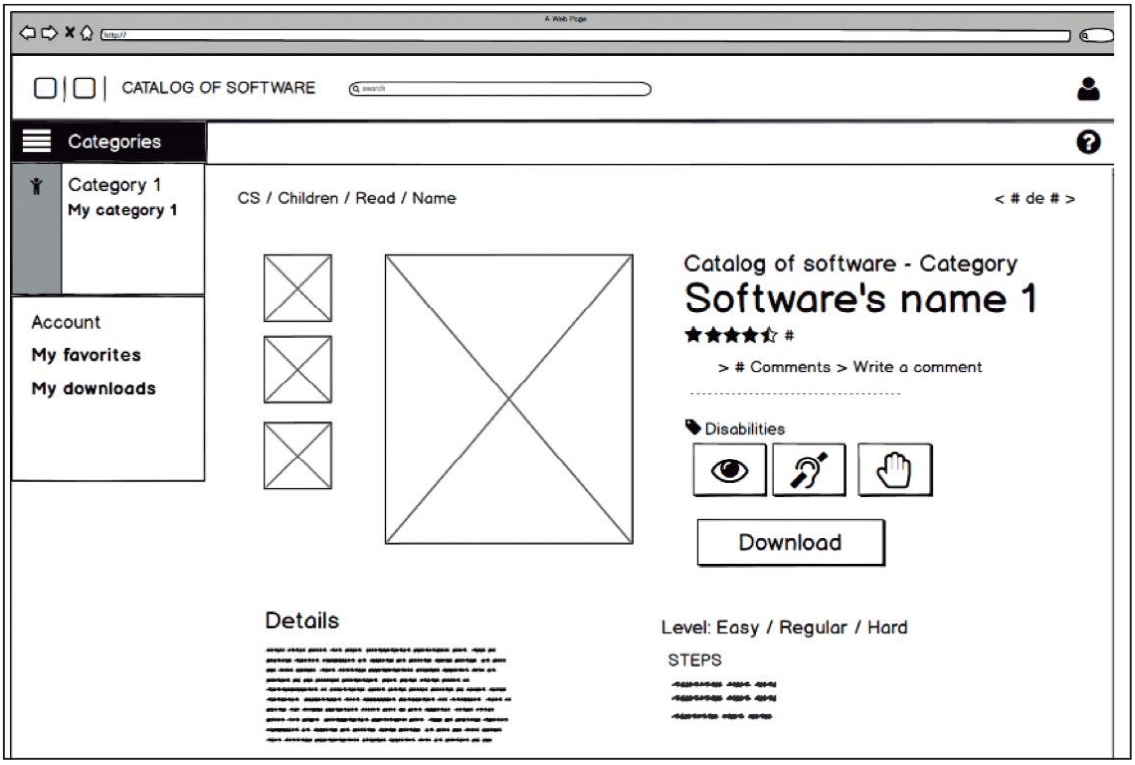
Figure 1
Mock-up index interfac



Source: By authors.

Moreover, Figure 2 shows the mock-up index.

Figure 2
Mock-up program interface

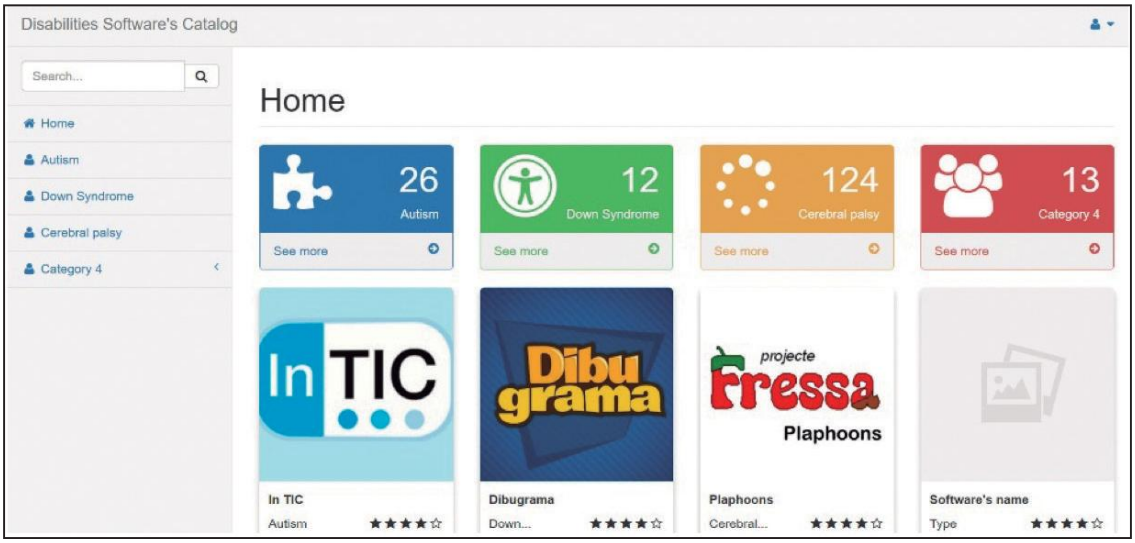


Source: By authors.

Executable Prototype - Develop Prototype. An initial prototype was created using as a framework Bootstrap to specify navigation, interface, and information design.

Figure 3 shows the index interface of the catalog. The index interface has the categorization and the software.

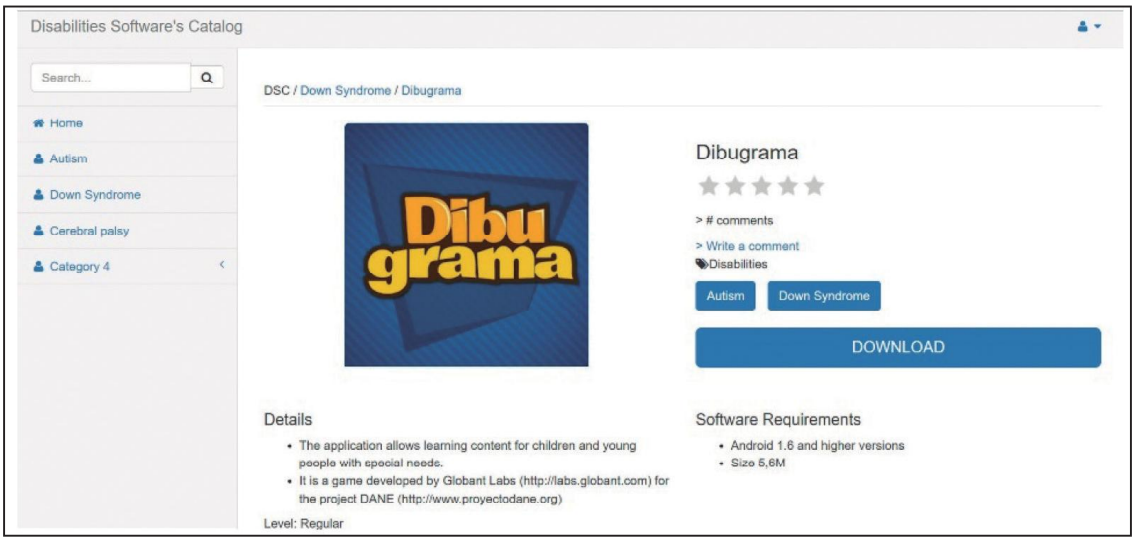
Figure 3
Index interface with bootstrap



Source: By authors.

Figure 4 shows the program interface with the details of the software.

Figure 4
Program interface with bootstrap



Source: By authors.

Evaluation Report – Evaluate Prototype. The evaluation of the prototype is detailed in the results and discussion section.

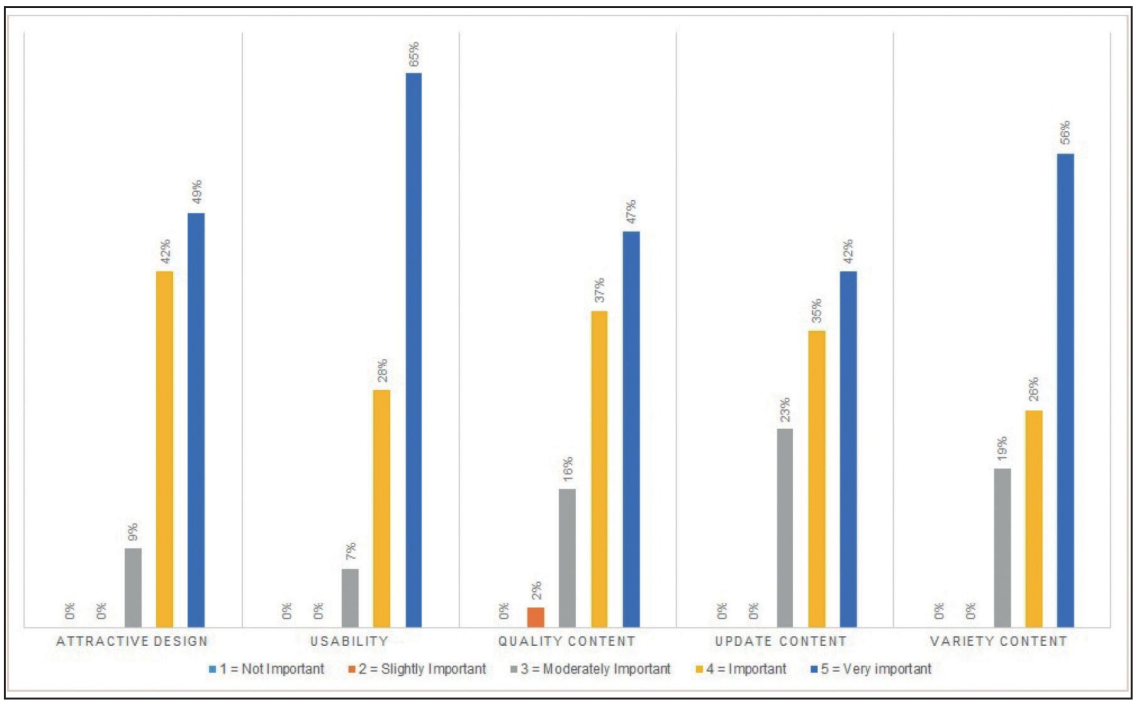
Results and discussion

The analysis was used to evaluate and improve the initial prototype, to be experienced and criticized by the user. The main purpose was to determine the usability and categorization of the catalog. In the evaluation, 43 users participated in an online survey.

Results

The users were asked to rate the characteristics of a website on the importance, and the results are shown in Figure 5:

Figure 5
Importance of website characteristics



Source: By authors.

The first question, asked the users if they would consider using the catalog. The users answered yes 95% and no 5%.

About how often the users were going to use the catalog, would use weekly 53% of people.

The researchers were interested in finding out the best categorization for the educational software. The results show:

1. By age = 12%,
2. Children, teenagers, and adults = 23%,
3. Type of disability = 56%,
4. Type of software = 9%, and
5. Learning skills (e.g. Language, Environment, Mathematics) = 0%

Finally, the comments and suggestions the users:

- A special interface for blind people should be added like sounds.
- Distribute by age and disability. Financing for the project.
- Improve the prototype, add levels of accessibility and more applications.
- Should display videos and guide use.
- The project should be more socialized and free access.
- It should be open to implementing the develop and the announcement of other programmers interested in the problem.
- Categorized according to the type of program, for example, if it is for computers or mobile applications.
- They should investigate more about the different disabilities that are existing to be able to make a great classification and help these people.
- Differentiate the graphical environment for each type of user. For example, one interface for the assistant of the person with a disability and another for the people with disability. The second interface should be very simple and graphic.
- Good project, keep going.

- The software should help a people with hearing impairment.
- Categorized by the degree of disability presented by the person, subcategory by skills and then disability. Do not consider the chronological age situation.
- Add activities for pure and associated disability and multiple disabilities.

Discussion

The top three characteristics of a website for the users who participated in the analysis were usability, variety content, and attractive design. Usability, a variety of content and attractive design were cited as very important characteristics with 65.56 and 49 percent, correspondingly. It is necessary to note that 47 and 41 percent of the users answered it is very important the quality and update of the content extend the life of a website.

Based on the results it was clear that 95 percent of interviewed users considered about using the catalog of software in the future. About the frequency, five users think over using the catalog at least twice a year, and 8 of them to at least twice a month. In fact, 28 will use weekly, and nine users will use it daily. Importantly, more than half of the interviewed users, 56 percent, answered the categorization should be by type of disability. The people selected a categorization by stages or age in 23 and 12 percent.

Conclusions

The research of programs and software for intellectual disabilities has revealed three aspects to be considered to develop the catalog: type of catalog, access, and specifications of the categorization.

First, it is important to distinguish between the types of the catalog. As we mentioned above, two types of catalogs or websites offer

software solutions for intellectual disabilities: developer and promoter. Also, the developer catalog is socialized mainly in the country where is created because there are cultural and language factors while the promoter catalog collects software from different countries. Last, it will be a valued resource if the catalog includes multilingual software.

Second, the software access should not exceed the three-click rule.

Third, the users prefer to categorize the catalog by type of disability because they are familiarized with disabilities according to their background. Furthermore, the ICF could be used to categorize the catalog because it relates the intellectual disabilities and software.

Future project is proposed to determine a taxonomy that involves the characteristics of intellectual disabilities, considering clinical and social approaches. It is important to associate the taxonomy with the purpose or attributes of each software designed for intellectual disabilities.

Finally, the ultimate goal is to have a recommendation system that is nurtured and available via web to all people interested in supporting the learning of people with intellectual disabilities.

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