Developing a Mobile Application for Language Disabled Children with User Centered Design

Lizeth Islas, Víctor M. González, and Marcelo Mejía

Department of Computer Science, Instituto Tecnológico Autónomo de México,
Mexico City, Mexico
{ana.islas,victor.gonzalez,marcelo.mejia}@itam.mx

Abstract. This paper describes the design and implementation of an alternative communication device implemented as a mobile application for tablets. The application was developed applying user-centered design techniques and allows children between 3 and 12 years old with severe language impairments improve their communication skills with others. Several prototypes have been developed and evaluated with users. This paper summarizes the results and the advantages versus other apps.

Keywords: Alternative communication, language disorders, tablets, user centered design.

1   Introduction

In Mexico is estimated that over 5 million people with any kind of handicap exist, and 8.3% of this people have a handicap related with language disabilities [1]. A lot of children with language disabilities do not count with special education in the schools. Sometimes they are supported by special education teachers in Service Units and Regular Education Support. The tools that they have for the inclusion of language-disable children are, most of the time, made by the own teacher. We can find paper cards with drawings and pictures that allow expressing the children needs and wants. There are enormous opportunities to provide solutions through technologies that support them in solving their challenges of communication anytime and anywhere. The goal of this study is design and develop a mobile application oriented to language disabled children between 3 and 12 years old using techniques of user centered design and usability providing a tool for communication with the people. The inspiration of the app is based on the communication boards. Today many technologies are available on the Internet for use by people with different disabilities. However several barriers inhibit the commercialization and widespread use of this devices and applications, specially the training of the parents and teachers [2] and the elevate cost. Augmentative and Alternative Communication applications and devices are usually made for each person need and are quite expensive [3]. There are many apps that use different default pictograms and allow doing the basic communication avoiding high

costs. The apps that allow the use of your own pictures or pictograms are scarce. The most popular in the market and the most similar to our application is "TapToTalk". They have a free version of their app but, in order to customize it you need to pay a license. The license is expensive thinking in the Mexican market. The cost is about 99 dollars which suppose a cost of over 1200 pesos per year [4]. "TapToTalk" is an entire system that provides to the user the possibility of having it in several mobile platforms and in your PC [4]. The process to load a photo or an audio recorder is pretty complicated. Consequently, what do we offer like an added value? First of all we intend to reduce the cost of the application orienting it to just one mobile platform. On the other hand, the difference between the other apps and our app is the way of loading and configuring it. For example, with "TapToTalk" you need another app that allows to take the pictures and load them. Then you need to download the picture to your app. Also, the upload of the sounds is via Internet with a PC or in the case of the application for the iPad you need to synchronize it with your iTunes library in which the sounds you want to load must be located. The user is totally unable to edit or load anything of the app in real time. Also, the parents need to read a lot of manuals to do this. Our application is designed to avoid all of these issues. In the same app you can take the photos and edit the names. Similarly, you can record with the microphone of the device your sound and be able to use it almost instantly. We offered an added value based on simplicity by making our app totally centered in user and 100% usable. That will provide the kid the feeling of owning the application because he is going to be able to manage it almost by himself and making it usable will grant that people will be more interested in use it. Another advantage of our app is that we can use it also as a reading tool. It shows us the spelling of the word we are listening to and you can easily change it for a better fits to each user and their needs. We pretended to not only do another app for people with language disabilities; we pretended to create an app totally usable and centered in kids with language disabilities at low cost.

Fig. 1. TapToTalk Screen Shot (Source:"AAC|speech n stuff"
http://speechie.littlelioness.net/tag/aac/)

2   Methodology

At the first part of the work we made the design of the application. For this part we used a low and a high fidelity prototype. A specialist in language therapy helped us to select the profile of the kids that could help us with the evaluation during the work. We selected kids that don't have language disabilities and in a range of 4 and 5 years old. The reason why this was done was that they can give us a feedback of the evaluation; they can tell us what thing like or dislike about the application but they can't read yet, so they basically made the tasks using only the guide of what they see. This is a really important subject if we are trying to make a design and an application with red routes well defined and a very intuitive use for our little users. The design tests were made with 3 children. We used tools like the creation of persons and storyboard for supporting the tests and ensure that the kids understood the idea. We evaluated first the low fidelity prototype with the design that we thought was more appropriate for the kids and then a second test with the changes made to the prototype but in high fidelity, all of this based on the feedback that each child provided us. We were looking for a design that could be easy to use and understand and for that reason we made two tests with each kid. On the second part of the work we made new tests with 8 kids to find patterns of usage, difficulties of usage and how they envision the application in some situations of their lives. The tests were made using the app on the iPad. We used techniques of thinking aloud and cognitive walkthrough questions, that allowed us to find out why our users were making the choices they were making while interacting with the interface of the application. We recorded in audio the tests to analyze the behavior of the users. After that, we summarized the data collected and analyzed it to identify what we could do next to improve even more the interface of the application. Finally we report the results of the whole work and the next steps for the application.

3   Design Evaluations and Results

We used two different prototypes for the design evaluation. The first one is a low fidelity prototype. We made it with post-its, scissors, glue, colored sheets and stickers. This prototype allowed us to change the design immediately almost without expenses. In this way we could find the best data presentation for the user. We evaluated two simple tasks that the users must be able to finish really easily. In addition, we used the techniques of thinking out loud. This allowed us to know what the users are thinking when they are trying to complete the tasks. With these evaluations we were able to notice that the abstraction of an adult is pretty different from the abstraction of a kid. The kids (with or without language disabilities) are not able to differentiate semantic information that they have on words or letters, although they can read, but the kids with language disabilities also have less valid and more invalid phonological information [5]. We used storyboards to tell the story to the children. The tasks were: 1) Find and point a part of the body to communicate that it's hurting, and 2) find and point some food to communicate what you want to eat. What did we find with this

evaluation? Usually the kids got distracted very easily. We must put only the necessary things on the interface to avoid distraction. The letters in the principal screen are not too important, the image is the one that catches the attention and it must be clear. All the images must be consistent, maintain same patterns and format. At the beginning the application had to may buttons and options that are useless for the user. They need to have only the essential options in the screen, they must be easy to understand and easy to find or locate. Once, a kid couldn't end the task because he never found the "body" option.

Fig. 2. Screenshots of the flow for the category "My body" (Source: Screen shots from the app)

The second prototype was a high level one. This was made using a program called "Axure". This prototype allowed us to know if the flow of the application was correct, prove if the interface based on big icons distributed in columns was more intuitive than having too many options in the principal screen. The users did the same tasks than above but with the changes in the new prototype. The images were consistent, the letters were not too big, and the options were presented with big icons. The tasks that we evaluated were the same that the ones above. What did we find with this evaluation? The high level prototype caught the children attention very easily. The flow of the interface was pretty simple to follow, so they could manage it by themselves with no additional help. They could end all the tasks with no big problem. The distribution of the interface in big icons helped the kids to understand the options that were showing.

4   Usability Evaluations and Results

After the design evaluations we did a prototype design for the iPad. This prototype was programed in iOS. It has the basics categories of communication and has pre-recorded the sounds of the pronunciations. It doesn't have the option for loading the photos, just the icon that will allow this. First we asked the children look and navigate through the entire application, pointing and testing all the options and icons they wanted. After that we asked to the kids in this evaluation to do three simple tasks: 1) Find and point the option "Escuela" (School) in the app and point an object that you use regularly, 2) find and point a part of the body, and find and point a meal or food.

What did we find with this evaluation? We needed to implement more gestures in the interface; the kids are really familiarized with them. They could end the task without issues once they get a look to the entire app. In the case of practicing with the pronunciation, the kids only repeated the words they wanted to. We needed to do it in a more encouraging manner if we wanted that our tool help in pronunciation too. They were able to find quickly the option that let them reproduce the sound of the vocabulary.

5   Conclusions

With the test of design and usability we were able to identify several areas of improvement for our app. We found how the images must be distributed, how kids identify patterns really easy and how intuitive the gestures of the iOS system are. We noticed the challenges for children to understand the application with the low level prototype when we had big letters and no clear options. We saw evidence that often the ornaments in the images are not good because the kids get distracted. Although our system is small comparing it with "TapToTalk", we have a big chance of improving the way of presenting the information. Our system allows a direct and easy use by the kids from the first time. They don't need so much time to get to know it. It doesn't count with a menu with options to avoid distracters and to make it easier. The form of upload and customization of the sounds and vocabulary is as simple as taking a photo or recording with the own device. The parents or teachers don't need to have an Internet connection to get the photos uploaded. We have consistency in the pictograms that we used; we don't mix drawings and photos, we use only pictures to make sure the user don't get confuse. We are making a tool designed and developed for children. Each child has a unique temperament. Unlike many other aspects of children, temperament is unlikely to change over time, we need to understand it and make the app adaptable to avoid frustration problems and make their lives simple and easier.

References

1. INEGI, Censo de población y vivienda de México, México (2011)
2. Hasselbring, T., Williams, C.: The Use of Computer Technology to Help Students with Special Needs. The Future of Children 10(2), 102–122 (2000)
3. Braddock, D., Rizzolo, M., Thompson, M., Bell, R.: Emerging Technologies and Cognitive Disability. Journal of Special Education Technology 19(4), 49–56 (2004)
4. Tap to Talk ACC Information (2013), http://www.taptotalk.com/
5. Miriam, F., Lilly, D.: Naming difficulties in language-disabled children: preliminary findings with the application of the tip-of-the-tongue paradigm. Journal of Speech, Language & Hearing Research 40(5), 1026 (1997)