

# A Visual Task Manager Application for Individuals with Autism

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## ABSTRACT

In recent years, use of mobile computing has expanded rapidly, both in terms of audience and function. Men, women, and children of all ages, with a huge variety of interests and needs, all use and often depend on the mobile devices they carry. Ordinary people use mobile devices for different purposes ranging from leisure to organization to teaching and learning. Special needs groups have also found many ways to use mobile devices to enhance their abilities and enrich their lives. One such group is the autistic community. This paper describes a project idea to design and implement a mobile application that would allow adults with autism to complete their work with minimal supervision.

## INTRODUCTION

For decades, the autistic community has relied on bulky text-to-speech devices to help them communicate and learn. Many of these devices have limited portability and are quite expensive – from \$5000 to \$10,000. Recently, software applications such as Proloquo2go provide comparable features to individuals with autism spectrum disorders (ASD) while at the same time offering portability and affordability. While many methods for teaching autistic children have been adapted to mobile software format, there is a shortage of software intended specifically for adults who otherwise would be capable of being employed, or even become exemplary workers when given the chance. The authors have identified a need to design and implement an application to aid working adults with autism so that they may successfully complete their work with minimal direct supervision.

## Background

Autistic [2,3] people are generally visual learners, and may have difficulty taking verbal instruction. This is in part because they have problems making generalizations or making abstract connections. In addition, autistic people can have difficulty filtering extraneous sensory information and sometimes have problems with fine-motor control. Mobile technology, in the form of smartphones like the iPhone and the Android, and tablets like the iPad, utilize many forms of technology that can greatly enhance the lives of people with autism. Features like geolocation and mobile broadband access, as well as the minimal size and weight of the devices themselves, enable easy portability and widen the range of places where access to technology is possible. Touch screens on mobile devices can make them more accessible for people with fine-motor control issues than their non-mobile counterparts, which often require the use of a mouse and/or cursor. The inclusion of a camera within the mobile device can aid in personalization, something which is important for autistic individual that have difficulty generalizing situations across multiple locations.

In many ways the most important feature is the creation and use of applications on the mobile devices. The rise of user content creation for technology, especially in terms of mobile apps, greatly increases the range of possible uses of technology. As normal users have a chance to give their input

into what is needed, it allows for the creation of new and specialized applications targeted at specific groups. Furthermore, many applications allow for user customization, thus offering greater ability for personalization.

## **MOBILE TECHNOLOGY**

The autistic community has jumped at the opportunity to develop apps specialized for the specific needs of people with the disorder. Many involved transferring the techniques already used in teaching autistic children into a mobile format. In many cases, this has not only made them more portable, but also increased the effectiveness of the techniques. Other apps have been developed to aid autistic people in other areas that had not yet been truly addressed successfully in areas such as safety, music/sensory therapy, and visual schedules.

### **Existing Apps**

To aid autistic individuals, a number of applications have been developed for mobile devices. Mobile technology cuts down on the costs of bulky devices that often lacked portability. A number of methods have been developed for teaching autistic children communication, language, social skills [8], and academics, but these techniques still have some problems that have not yet been dealt with.

Recently, mobile devices like the iPad have been able to offer solutions to these problems. Apps such as Proloquo2Go [13] and the Grace Picture Exchange [9] have been developed to perform the same functions as PECS [14], the Picture Exchange Communication System, and the original text-to-speech devices. Proloquo2Go converts about 8000 symbols and text into speech, which it then reads aloud on an iPad's speakers. The app is user friendly and easy to customize, making it invaluable for autistic children with difficulties in generalizing from situation to situation. The Grace Picture Exchange app performs a similar function for transferring the PECS system into a mobile tech format. Rather than carrying binders full of laminated photo cards, all of the necessary images are contained within the application, greatly easing the portability concerns. Proloquo2Go costs only \$190 and Grace Picture Exchange only \$43. Even adding the price of an iPad, iPhone, or iPod Touch, using these apps in place of the original methods is much more affordable.

Since autistic people often have problems forming grammatically correct sentences, language development apps for mobile platforms such as Sentence Builder [17], Question Builder [15], and Conversation Builder [5] work on teaching the same sentence structure lessons that are normally included by the human speech therapist. Other apps such as Answers: Yes/No [1] and My Choice Board [12] work on helping to teach choice making skills, something else that often causes difficulty for autistic children. These apps use visual and intuitive interfaces which lend themselves well to an autistic individual's visual learning style, thus improving the effectiveness of the lesson.

Apps made to teach other forms of academics take advantage of visual interfaces to make effective use of discrete trial training [20]. Autistic people require structure and systematic procedures in order to learn. This forms the basis of discrete trial training, but is difficult for a human teacher to replicate. Humans do not naturally use the same words and tone of voice every time they repeat an instruction or a response. Computers, on the other hand, do. By transferring academic teaching to a computer instructor, autistic people can receive the structure and repetitiveness they need to learn.

Apps for teaching social skills, another thing autistic people have great difficulty learning, have also been created. One app called Stories2Learn [18] uses a visual and customizable interface to make social stories more accessible to autistic learners which can be enhanced using an image-based story on the device.

The possibilities for social learning through mobile devices encompass far more than just apps. Social networks like Facebook and Twitter, accessible through the mobile device, provide the perfect training opportunity for autistic people. The training an autistic person needs to learn correct sentence

structure, as well as the tendency to require structure and rules in their activities, places them in an environment where they write and speak in a stilted manner. Short, simple tweets and Facebook posts give them the opportunity to practice more natural language.

There is also the social benefit that results from the ‘coolness factor’ of owning a mobile device. “Because of their widespread use, people with ADS who use these tools do not look different from their peers and almost automatically become ‘cool’ ” [16]. Autistic individuals who are nonverbal or have limited speech might be treated differently or regarded with disdain if they carry a bulky text-to-speech device or a binder full of picture exchange cards. By bringing a common and popular device like an iPad or a smartphone instead, s/he can fill his communication needs without sacrificing, or possibly even improving, his social standing among his peers.

Finally, visual schedules [4,6,19], or schedules that use pictures and images can convey the tasks to be performed. For autistic people who require structure and order in their lives, and who absorb information visually better, these schedules are perfect. They are also far more easily created using customized mobile technology.

### **PROBLEM: FEW APPS FOR ADULTS**

Unfortunately, while there are many mobile applications made for teaching and aiding children with autism, there is a shortage of software intended specifically for adults. A communication app like Proloquo2Go is usable for individuals of all ages, and certain lower-functioning autistic adults still require teaching software even after school age. But many adults with autism would be capable of being employed, and can be exemplary workers. They almost always require a great deal of direct supervision, however, either by a job coach or the employer. Furthermore, it is usually quite difficult to find or receive funding for a job coach, and most employers are not happy about the prospect of providing such direction themselves.

### **PROPOSED WORK**

To this end, the authors plan to develop an application to make up for these problems. This application will be targeted towards adults with autism and will help to lessen the amount of supervision necessary for the adult to be employed. This will be done by creating an application that can, in many ways, act as the supervisor. The creation of an application that meets the design goals of visual, intuitive, and mobile interaction makes it ideal for usage by autistic individuals. Since mobile devices already cater to a large portion of the population, the proposed design leverages such devices in support of autistic adults.

### **Visual Task Manager for Adults with Autism**

This application will be developed for the iPad2 on the iOS platform. The authors plan to develop the intended application using HTML5 [10,11]. At its core, the application will be a visual schedule with easy to understand instructions. One important major feature required in the application will be the ability to split each task into small ‘inner steps’. Once a step is done, it can be ‘checked’ off to signify its completion. This is extremely useful to an autistic adult who tends to take things literally and does not generalize well. Understandably, people with these difficulties will not always recognize the unspoken portions of a task they are instructed to perform. A simple example would be if an employee working in a restaurant is told to clear the dishes from the tables. Without specifically being told to wait until the customers were done before starting, they might clear the plates away before the customers were finished eating. The intended application will display those unspoken steps, giving the employee all the information he needs to perform the task correctly.

Figure 1 shows the initial step for an example task of making a pie crust. At this point (step 1), there are options to view a short video, indicated by the video image, or to view smaller inner steps, as

indicated by the question mark image. If the autistic individual needs to see more details on how to accomplish this step, he can choose the question mark option (see figure 1). The result of choosing this option is shown in figure 2. However, if the individual is confident of performing this step without looking at the inner steps, perhaps having done this many times before, he can simply select the right arrow. This will take him to the next step of the task, which would be step 2 (not shown in our example).



Figure 1: Tasks in iPad2



Figure 2: Smaller Inner Steps

Sometimes, a particular step may be quite 'big' with sizeable instructions. In our example, this big step (step 3 shown in figure 3)<sup>1</sup> can be broken down into sub-instructions. Note that there is only one checkbox to signify the completion of this 'big' step. Additionally, steps that have already been completed are listed at the bottom of the screen; in this case, steps 1 and 2. At the final step of the overall task (see figure 4), all the completed steps are listed.



Figure 3: Bigger step broken down



Figure 4: Final Screen

<sup>1</sup> Images are taken from allrecipes.com

Another feature to include in the application will be a communication system that allows for both image-based and text-to-speech communication. This will enable the user to communicate his needs without the need to exit the application to use a different communication app. It will also have the ability to include spoken or image-based prompts for the autistic adult, something that often is left to the job coach or supervisor.

The application will also include a number of customization options, such as allowing for different views on the schedule; option would be list view, grid view or a table view; making item sizes and colors adjustable to suit the needs of the individual using the app; and user interactivity.

The supervisor or job coach will be able to create job-specific schedules and tasks that can be loaded into the app. In using this application, they will be able to add certain restrictions such as setting a clock timer, and using functionality such as enabled user data entry or a creation of a summary report. The ability to set the level of control while making changes or updates to the schedule would allow the app to be used for both high and lower-functioning autistic adults.

Wireless Internet functionality will be included in the app for the purpose of loading user created schedules and tasks without syncing to a computer. Editing functions such as Cut, Copy, and Paste, as well as data entry, will also make entering the tasks directly possible.

Other functions such as the ability to create video or animation or the inclusion of photo slideshows will enhance the ability of the schedule to accurately convey the inner steps of a task to the autistic individual.

## **METHODOLOGY**

At this time, we are collecting and analyzing requirements for the proposed mobile application. Actual design and implementation is not expected to start until January of 2012 due to a grant proposal that is currently under review. A preliminary design phase will see us generate use cases and investigate possible scenarios for usage. After details of the use cases and scenarios are elaborated, development of the user interface and prototyping of the application functionality will begin. Upon completion of actual implementation, we will conduct usage testing with one or more test subjects. After the test results are obtained, they will be assessed, at which time the design and implementation of device functions will be adjusted accordingly based on results of the usage tests. An actual working prototype application is expected by the end of April 2012.

## **CONCLUSION**

The development of mobile technology has opened new doors of opportunity for many people. Special needs groups such as the autistic community have taken advantage of this technology to create a number of specialized applications that can help improve and enhance the lives of people suffering from the disorder. These apps have certainly proved successful and valuable in helping them live full and healthier lives. However, having analyzed the apps that are currently available, the authors determined that there is still a need for applications targeted towards autistic adults seeking employment. To this end, a plan has been made to address this need by creating a new application for the iPad2. This would allow adults with the disorder to work with minimal direct supervision from their employers. Actual design and development of the application will begin in January 2012, and the authors have high hopes that the proposed application will prove helpful in improving the ability of autistic adults to obtain productive employment.

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