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Developing an Information System for Assistive Technology Apps

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Developing an Information System for Assistive Technology Apps

An Interactive Qualifying Project Report submitted to the faculty of Worcester Polytechnic Institute

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Abstract

The goal of this project is to create an easy, accessible way for Seven Hills employees to find apps to assist with the various needs of their clients. Most of the research the staff conducts are through peer review, so this service must include ranking and comments on the apps. To accomplish this goal, we have created the following deliverables:

- Assistive Technology App Database
- Written and Video Tutorials for the Database

This database contains over four-hundred apps that are searchable by various identifiers such as name, category, and disability. The database also has an internal ranking and comment system so employees can view their peer's opinions. The tutorials are for both users and administrators. They explain how to search, edit, and maintain the database.

Executive Summary

The objective of this project was to provide the Seven Hills Foundation with a centralized location to find and search for assistive technology apps they can use in their daily work. Previously, the apps the Seven Hills' AT Department recommended were spread over multiple documents in multiple locations; employees had difficulty finding apps to fit their needs and didn't feel confident in researching new apps on the app store. We achieved our goal through the following accomplishments:

1. Developed a methodology for finding useful apps.

2. Created a metric for ranking useful apps.

3. Developed a database of useful apps.

4. Created an interface to easily navigate the database.

5. Developed a manual to familiarize users with the interface functions.

To develop a methodology for finding "useful" apps we first had to understand the services provided by Seven Hills. To do this, we attended an AT Super-user meeting, where we were allowed to observe a pitch for a new AT service. Here we observed the questions asked by the super-users and developed an understanding of what the professionals look for when researching apps. We also took part in a site tour of another Seven Hills location in Worcester, giving us a look into the daily use of AT.

With this new background in AT apps, we began filtering through the list of over 200 apps scattered across various documents in the Seven Hills system. We deleted old apps that no longer exist, updated existing apps, and added new apps, filling in over nine unique fields for each app entry. The new list of over 400 apps was located on a Google Sheet which would then be exported to whatever service we decided to use.

At first glance, the easiest and best method to turn our database into a user-friendly interface was to use the Web-Database feature in Microsoft Access. Access had the functionality we required, and the accessibility through the existing Seven Hills SharePoint site. However, Microsoft canceled their Access Web Applications services for SharePoint, replacing it with the much less user friendly and less powerful (ironically enough) PowerApps. This, paired with a lack of familiarity with the capabilities of SharePoint, led us to the cloud-based database service Caspio. Caspio provided us with everything we needed; it could use many different search and filter functions, as well as include an internal ranking and comment system, as requested by the sponsor. Caspio is also a low-code development platform, therefore maintenance would be easier for someone without prior coding knowledge. With Caspio, we were able to create the interface (shown in Figure 1.1), as well as a request form to add apps and a page for admins to edit the site. Figure 1.2 shows the results after searching for an app.

Figure 1.1 - Front-End Interface

Figure 1.2 - Results Page

While Caspio provides a relatively simple interface, we also provided written and video tutorials for users and administrators. These tutorials highlight the various search and filter functions for users, as well as ranking and commenting on apps. The tutorials for administrators explain how to add and delete apps along with maintaining the website.

With the completion of the project, Seven Hills have what they requested: a cloud based centralized "search engine" for employees to research and find apps they may find useful. Future expansions for this project include adding more AT apps, adding more specific fields such as switch compatibility, or possibly transferring the database off Caspio onto an internally run server.

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1.0 Introduction

In 1975, the Education for All Handicapped Children Act (EHA) and the Individuals with Disabilities Act (IDEA) were passed to provide public schools the means to provide children with developmental disabilities the care and service necessary to give them an education. (History of the DD Act) Before these bills, the responsibility of educating a child with special needs or developmental disabilities fell solely on the parents. To fulfill these responsibilities, groups of parents started to form advocacy groups. This is how the Seven Hills Foundation came to be; a group of parents whose children had education requirements the public schools could not meet started advocating on their behalf, providing these children with the personal attention they required to lead a normal life. Since then, the Seven Hills Foundation has grown to be one of the best health and human service agencies in the country, giving personal care and the best education they can provide to their clients.

Seven Hills needs to be able to utilize constantly improving technology. The challenge lies with the sheer amount of technology with no qualitative means in place to support its claim of being "educational" (Lessons in the Quality of Learning). In the past nine years, the number of available iOS apps and games has grown from less than one thousand to over three million as of July 2017 (App stores: number of apps in leading app stores 2017). This rapid growth of easily accessible material can be overwhelming and has left the staff of Seven Hills hesitant in their ability to research and find quality apps to fit their clients' needs. As a result, Seven Hills Foundation in Worcester, Massachusetts reached out to Worcester Polytechnic Institute (WPI) to create a database to help find and filter educational apps for their services provided, including

but not limited to: Adult Day Health, Day Habilitation, Shared Living, Family Support Services, Respite Care for children and adults, Sports, Recreation & Leisure activities, and Career Development programs.

The goal of this project is to create an easy, accessible way for Seven Hills employees to find apps to assist with the various needs of their clients. This is necessary to address the problem of information overload, a phenomenon in which there are too many apps to sift through, making it difficult to recommend any one app to a client. We have accomplished this goal through the following outcomes:

1. Developed a methodology for finding useful apps

2. Determined a metric for ranking the quality of apps

3. Created a database for useful apps

4. Created an interface to access and navigate through this database

5. Wrote a manual that will teach employees how to make changes to the database

Further, assistive technology will make those with developmental disabilities feel increasingly secure during their everyday routines and boost their self-confidence and self-reliance.

2.0 Background

Seven Hills has been advocating for people with developmental disabilities since 1951. Over its 65 years, Seven Hills has had to adapt and grow to best fit their clients' needs. This includes the need to grow with the assistive technology industry. The growth in assistive technology has been so substantial and so sudden that it can be difficult to keep up with. In this chapter we will discuss developmental disabilities, assistive technology, and new advances in assistive technology that Seven Hills hopes to better utilize, as well as shed light on the potential areas our team can help improve, such as new accessibility features and ease of access for the apps themselves.

2.1 Developmental Disabilities

Developmental disabilities are misunderstood, and a stigma has grown around the topic. Often, people are unsure how to react to those with developmental disabilities and that can make both parties uncomfortable. This, unfortunately, can make everyday life extra difficult for those with developmental disabilities. The Seven Hills Foundation exists to combat this, and now has a list of programs used to assist with any difficulties clients could face. This growth continues to be necessary due to the vague nature of the term "developmental disability" itself. The Center for Disease Control's definition of a developmental disorder is a "group of conditions due to an impairment in physical, learning, language, or behavior areas. These conditions begin during the developmental period, may impact day-to-day functioning, and usually last throughout a person's lifetime." (www.cdc.gov) This term encompasses a variety of health issues, and so the areas of everyday life that a person with a developmental disability may have trouble with varies with

each individual. For the purpose of brevity, the remainder of this section will use autism

spectrum disorder for insight on education and career development. Autism is only one of many

developmental disabilities the Seven Hills Foundation provides services for, however the

symptoms seen in persons with autism spectrum disorder are not unique to just these clients.

2.1.1 Special Needs Education

One in every forty-five children in America have some degree of autism, according to a

recent study. Children with autism can have varying levels of verbal issues, repetitive behaviors,

and social skills. (www.autismspeaks.org) This makes learning in a traditional classroom

difficult. To manage these shortcomings, trained teachers try to provide special education to

nurture these qualities. However, sometimes children require even more care than the public

schools can provide, and this is common among all developmental disabilities. There is an extra

level of care and attention necessary for people with developmental disabilities to feel

comfortable and flourish in their learning environment. Advocacy groups, such as Seven Hills,

provide specified curricula and personalized care to combat the various needs of their clients.

2.1.2 Career Opportunities for People with Developmental Disabilities

According to The Arc, another advocacy group, "The majority of adults with intellectual

and developmental disabilities (I/DD) are either unemployed or underemployed, despite their

ability, desire, and willingness to work in the community" ("Employment Issues for People with

Disabilities" 2016). This is a huge societal issue. This large part of society cannot get jobs, and

not because of apathy. While this project's goal isn't to get legislation passed to resolve this

issue, there are means by which people with developmental disabilities can prepare and practice

applying for jobs, interviewing, and joining the workforce. These issues are why the Assistive

Technology Department exists within Seven Hills. The potential benefit of these AT apps is

immeasurable, providing this underutilized population with the skills and practice they need to

contribute to the workforce.

2.1.3 Self-Advocacy and the Positive Effects It Produces

Studies have shown that self-advocacy has great positive effects for members within the

group. In fact, self-advocacy groups tend to develop in a similar manner despite forming in

different environments. The experiences of the members of these self-advocacy groups were

strongly characterized by a change in both respect of their opportunities to participate in a wide

range of activities and their abilities to create new positive self-identities. One of the most

common ways that self-advocates described their groups with was with collegiality and a sense

of ownership and control, showing that feeling in charge of one's own life is a great motivator

and source of positive reinforcement for those with developmental disabilities (Anderson, 2017).

One example of a form of self-advocacy comes in the form of the Kentucky Youth

Advocacy Project (KYAP) model. This self-advocacy model is designed specifically for students,

but its effects include increased self-worth and independence due to self-monitoring with

minimal adult supervision, which will then propagate into their adult life as they can now look at

more complex problems and understand how to break them apart into small, attainable goals

(Kleinert, 2010). The KYAP Model is broken up into four steps:

1. Training adult supervisors
2. "I Can" Day

3. Goal planning and monitoring

4. "I Did It" Day

In the first step, the adult participants are trained in a model known as the self-determined learning model of instruction (SDLMI), which is an evidence-based model for teaching students to identify, plan, and implement self-selected goals which served as the basis for the KYAP model. The SDLMI has three primary phases, in which the student selects a personal goal, develops an action plan to achieve that goal and identifies potential barriers, and self-evaluates progress and adjusts his or her plan or goal as needed. Problem solving, self-monitoring, and self-evaluation are key to the SDLMI model. The SDLMI model was chosen as the basis for the KYAP model because it has a clear, sequential approach to teaching self-advocacy and self-determination skills, and has supportive effectiveness research (Kleinert, 2010).

In the second step, the students are oriented into the program with what is known as "I Can" Day. The adult supervisors introduce students to the concepts of choices, goals, plans, and self-monitoring. During "I Can" Day, students work in small groups with their adult supervisors in selecting a personal goal they want to achieve. Each student then receives a 'KYAP My Goal Book'. The goal books are written in student-friendly language (with one version for elementary school students and another version for older students), and include space for the students' own photos and pages on which students record their interests, the names of the important people in their lives, lists of their favorite things and things they do not like or that are difficult for them, and a set of activities they would like to do or things they would like to learn to do. By the end of

"I Can" Day, participating students have selected a goal that they wanted to achieve, and each student shared his or her personal goal (Kleinert, 2010).

In the third step, students begin the process of achieving their goals. The biggest part of this step is formulating a plan to complete these goals. This plan is split up into four parts: goal actions, barriers, barrier actions, and when. Goal actions involve what actions will directly help in achieving the goal. Barriers are things that will hinder the students from achieving their goal. Barrier actions are what the student plans to do to circumvent these barriers. When is simply when the student plans to do each step. Naturally, some students create goals that cannot realistically be achieved during the program; as a result, part of this project is for students to learn which goals are reasonable and which goals need to be modified. Larger goals have their scope reduced so that they can be achievable during the program while also working towards their original larger goal. Recognizing and figuring out how to overcome barriers, and learning how to develop realistic goals, are important steps in self-advocacy (Kleinert, 2010).

In the fourth and final step, students participate in a celebratory day known as "I Did It" Day. This event serves as an opportunity to share their accomplishments and reflect on their goal planning and progress. Each student presents his or her goal, explains the steps to the goal, and describes his or her success. The students are given a template before participating in the program for how they could format their presentations and how to present their goal reports; students and teachers were often much more creative than the templates provided. Each student receives a plaque at the end of the "I Did It" Day, indicating that he or she was a successful "Self-Advocate". Participating teachers receive materials to help them continue the process for

the following year. Research has determined that all participants in the program were satisfied with its results and would like to see its continued implementation.

Leaders of self-advocacy groups tend to have similar experiences, both leading their peers and motivating their desire to seek out positive change (Caldwell, 2010). Four major themes emerged in the process of leadership development within the leaders of these self-advocacy groups: oppression towards their disabilities and resistance to their desires, environmental supports and relationships with people willing to help, learning leadership skills and tapping into their own potential, and advanced leadership opportunities that let them thrive regardless of their disadvantages (Caldwell, 2010). Self-advocacy movements provide pathways for resistance, connections with a disability community, and a space to form a positive disability identity (Caldwell, 2010).

While self-advocacy and its effects may seem tangential to the primary purpose of this project, the relevancy of self-advocacy in the context of AT apps cannot be understated. The primary function of every AT app in an abstract sense is to promote self-advocacy. These apps are designed to help people with some disadvantage overcome it on their own. Once somebody can overcome these disadvantages on their own terms, then they can live their lives more confidently. Ultimately, this fits into the goal of Seven Hills Foundation: get people to a state of confidence and self-advocacy as efficiently as possible and get more people to say "I can" and "I did it" who otherwise wouldn't have the confidence to make such bold statements.

2.2 The Seven Hills Foundation

The Seven Hills Foundation is an integrated health and human services network that prides itself on its exceptional integrated clinical, educational, and community-based supports to both children and adults with disabilities and other significant life challenges. The organization is dedicated to their work in passionately helping people see what they can do, believe in themselves, and achieve their dreams. The mission of Seven Hills Foundation is to promote and encourage the empowerment of people with significant challenges so that each may pursue their highest possible degree of personal well-being and independence. The Seven Hills Foundation currently has more than 160 locations in Massachusetts, Rhode Island, and seven other countries abroad. Seven Hills is the premier provider of comprehensive supports for people with significant life challenges.

It is the mission of the Seven Hills Foundation to allow those with developmental disabilities to thrive and live independently wherever they can. As such, Seven Hills offers multiple programs at over 160 locations throughout Massachusetts and Rhode Island. With over 3,700 professionals under their employment, Seven Hills is determined to provide the best support and services to the over 45,000 children and adults with disabilities and life challenges. Seven Hills supports another 17,000 women and children in developing countries through their eleven affiliate organizations (http://www.sevenhills.org/).

2.2.1 The Context of Our Project

Seven Hills is trying to expand into providing care via Assistive Technology (AT) smartphone and tablet applications. One of the greatest advances in recent years is the

development of AT software in our mobile smartphones, one of the most prolific electronic devices in recent years. However, due to the vast amount of phone apps available on any given app store, the people at Seven Hills are understandably apprehensive of the time-consuming and resource-intensive task of sifting through all of the apps and finding the ones that can truly help their clients, without even mentioning which apps are even available for certain devices (not all iPhone apps have an Android port, some apps are only really effective on a tablet, etc.). One of Seven Hills Foundation's goals is paving the way for greater access to an increasingly large array of assistive technologies (http://www.sevenhills.org/). We plan to address this by making a user-friendly database to find AT apps without having to search through the unspecialized and much broader database that is a typical app store.

2.3 Assistive Technology: Apps

Assistive technology is any piece of technology that is used to "increase, maintain, or improve the functional capabilities of persons with disabilities" (www.atia.org). This project's focus is only on apps that can assist in completing those goals. As of January 2015, there were more than 80,000 apps under the "educational" category. According to Kathy Hirsch-Pasek in "Putting the Education in "Educational" Apps," the majority of these apps are untested and unregulated. Given that a percentage of the problems faced by those with disabilities are verbal, social, and repetition based, many believe that apps and games are instrumental in helping these people develop at their own pace. There is not yet a place that specifically holds educational and assistive apps for people like the clients and employees of Seven Hills to utilize.

2.3.1 How AT Apps Help, and their Cost-Effectiveness

Assistive technologies are an important class of supports to bridge the gap between a person's competencies and the demands of a variety of educational and community context (Douglas, 2012). With the rise of smartphones, assistive technology hardware can now be effectively emulated as software, broadening the range of people who can access such invaluable tools (Douglas, 2012). This expanded consumer population is important since it can introduce more people to AT apps that can serve as an equalizer for people with developmental disabilities.

Apps have the potential to support students with intellectual and related developmental disabilities (I/DD) to fully benefit from educational opportunities in school and to successfully navigate challenges associated with employment and community living in their adult lives (Douglas, 2012). According to the Children's Supports Intensity Scale (Child-SIS), there are seven primary areas in which assistive technology can help students (Douglas, 2012):

- Home Life Activities: grooming, eating, dressing, sleeping, cooking, doing chores, and entertaining oneself

- Community and Neighborhood Activities: shopping, attending and participating in events, using various transportation methods, and complying with laws

- School Participation Activities: activities associated with participating in the school community

- School Learning Activities: activities associated with acquiring knowledge and/or skills while attending school

- Health and Safety Activities: maintaining physical and emotional wellness, communicating problems, protecting self from abuse, and avoiding hazards

- Social Activities: activities that pertain to social integration with others, both children and adults

- Advocacy Activities: activities related to acting as a causal agent in one's life; making choices and decisions; and availing oneself of leadership opportunities including making choices and decisions, solving problems, setting goals, and managing and knowing oneself

From a sample of 508 apps, nearly half (218, or 42.9%) were determined to help in all seven areas, almost three fourths (369, or 72.6%) are available on iPhone, iPad, and iPod Touch, and more than half (293, or 57.6%) were between $0.01 and $4.99, with almost a quarter (108, or 21.2%) being free (Douglas, 2012); more detail can be found in Figure 2.1a, while the details mentioned can be found in Figure 2.1b. Moreover, because a single mobile device can store many different apps, students with I/DD do not need to juggle multiple devices for different purposes (Douglas, 2012). The wide availability of mobile technologies, the ease of purchasing Augmentative and Alternative Communication (AAC) apps, and the relatively low cost of smartphones (compared to traditional specialized devices) have resulted in substantial changes to the ways in which individuals with complex communication needs and their families access AAC solutions (McNaughton, 2013). For most cases, a single smartphone or tablet with many AT apps is far more cost effective than getting a specialized device, having comparable satisfaction rates between the two (Ismaili, 2017).

Summary of Distribution of Apps

By Device Type	# (%)
On all three devices	369 (72.6)
Only iPhone and iPad	1 (<0.01)
Only iTouch and iPad	1 (<0.01)
Only iPhone and iTouch	0 (0.00)
Only iPhone	1 (<0.01)
Only iPad	136 (26.7)
Only iTouch	0 (0.00)
iPhone	371 (73.0)
iPad	507 (99.8)
iTouch	370 (72.8)

By Area	# (%)
All seven areas	218 (42.9)
Home Living	371 (73.0)
Community and Neighborhood	359 (70.6)
School Participation	483 (95.0)
School Learning	498 (98.0)
Healthy and Safety	323 (63.5)
Social	270 (53.1)
Advocacy	237 (46.6)

By App Cost	# (%)
Free	108 (21.2)
$0.01– 4.99	293 (57.6)
$5–9.99	32 (6.2)
$10–24.99	31 (6.1)
$25–49.99	32 (6.2)
$50–99.99	2 (<0.01)
over $100	10 (1.9)

Note: Total # of Apps = 508

Figure 2.1: Summary of Distribution of Apps from a Sample of 508 Apps (Douglas, 2012)

Summary of Distribution of Apps (from a sample of 508 apps)		
Category	#	%
On iPhone, iPad, and iPod Touch	369	72.6
Fulfill All Seven Areas of Children's Supports Intensity Scale (Child-SIS)	218	42.9
Free	108	21.2
$0.01-4.99	293	57.6

Figure 2.2: Abridged Version of Figure 2.1, Showing Only Relevant Information (Douglas, 2012)

2.4 How People Search for and Rate Mobile Apps

Typing in keywords in an app store or search engine to find apps is considered searching for apps. The overall rating of a mobile app is dependent on what the users think of it. This section will focus on both efficient and inefficient ways to search for mobile apps, and the pros and cons to different kinds of rating systems.

In regard to searching for apps, searching the app store in its entirety is not the only way to find apps. If searching by category, certain types of apps can be filtered out. This allows the user to search for only, say, apps for blind people, or apps for those with academic disabilities, et cetera. Using filters enables the more appropriate apps to be easily found. Other ways include sorting apps by popularity, rate of popularity growth, category, and more as they appear in their respective app stores. With the popularity filter, the apps that people use most will be at the top. With rate of popularity growth, apps that are on the rise will be displayed. This filter will likely contain apps that just hit the market and were critically acclaimed. Using this in combination with searching by category, more useful and efficient apps can be discovered.

While searching for apps, there are many criteria to consider, including:

A. Feedback and error correction opportunities

B. Systematic curriculum organized with logically sequenced skills

C. Adjustable individual preferences (e.g., pace, level, time, goal)

D. Content displayed in various formats (e.g., text, graphics, spoken words)

(Ok, Kim, Kang, & Bryant, 2016)

Take an educational app for instance. An app that can give feedback and correct errors (mathematical, spelling, etc.) allows the user to learn from his or her mistake. This is important to have as we don't want any bad habits being formed. For criterion B, it is crucial that the content of the educational app is organized in such a way that the material builds off what has already been covered up until the current point, thus allowing more difficult and applied problems to be introduced. Criterion C has a few main points: Is the material getting too hard too fast? Is there enough time to solve this problem? Is there a goal? Give the user something to work towards. Finally, how is the app presented? Are there flashy, obtrusive elements all over the screen? How easy is it to access this feature or that feature? Could it be made easier? If the user of this app was blind, it would be helpful to accommodate for that with auditory output. On the contrary, for those who appear to be very interested in what is on the screen, it would be nice to give them visual representations of what they're learning.
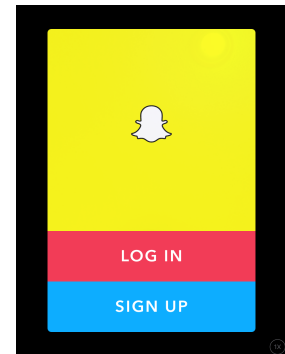
When searching for apps for iPad, it is important to take note of whether the app in question is optimized for tablet use. All apps will run on iPad, however not all will take advantage of its screen space, and run at iPhone resolution, which is not ideal. The following figures demonstrate the situations users may face, using the Snapchat and App Store apps:
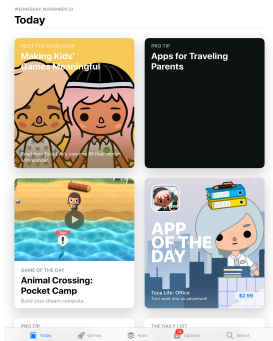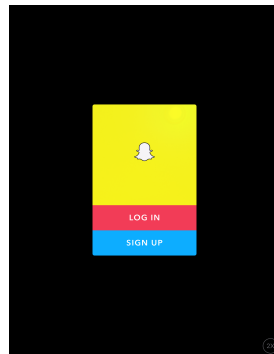
Fig. 2.3   Fig. 2.4   Fig. 2.5

Figures 2.3 and 2.4 show the App Store and Snapchat apps, respectively, running on iPad Pro

10.5-inch. The former takes advantage of the entire screen space, while the latter does not. Figure

2.5 demonstrates the way in which the app can fit on more of the screen via 2X zoom, but this

results in blurriness, and a lower-quality user experience. Ideally, during our research for mobile

apps, we have steered clear from what is seen in Figures 2.4 and 2.5 and looked for the apps that

are optimized for iPad, as seen in Figure 2.3.

        iPads are extremely powerful devices for assistive technology, and with them comes

access to AT apps that help those with developmental disabilities with their daily life challenges.

There are apps that allow people with verbal impairments to have their voice translated into clear

text, and to allow those who are blind get assistance and have someone else be their eyes, and to

allow those with nonverbal challenges understand how speech works without using words. There

are also two popular functions that iPad can offer as an AT device, including but not limited to:

Assistive Touch and Switch Control.

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1) Assistive Touch allows the user to change up how gestures work on the device. For instance, if he or she has issues pinching to zoom, Assistive Touch allows for a different, customized gesture to be used in place of that.

2) Switch Control allows for the pairing of various kinds of Bluetooth devices to help facilitate the process of using the iPad. Like Assistive Touch, these devices allow an alternate way of interacting with the iPad, but with the use of physical adaptive switches. A few examples of what can be done with a switch include squeezing it, strapping it to your arm and contracting your muscle, blowing into it, and, of course, flipping a switch!

(Ok, 2017)

In the case of autism spectrum disorder, this proves to be useful in the cases of communication and social skills. For those with nonverbal challenges, a switch could be used to form words and sentences to get across the message the individual is trying to convey. This can be done with switch access scanning. This allows the individual to, for instance, use one switch to select among the items (in this case, letters) and use another to select that item (in this case, a letter). This teaches them the social skills they need in order to fluently have a conversation with someone else, without having to verbally speak.

2.4.1 Keywords Used When Searching for Accessibility Apps

The Mobilewalla system, for instance, gathers information from popular app stores (including the Apple App Store and Android Market/Google Play) and processes the data to easily display it on a simple user interface and query handler (Datta, Kajanan, & Pervin, 2013).

This has been applied to the Seven Hills project, as we've been able to learn the techniques used to efficiently present relevant apps to our clients with daily requirements.

Keywords are weighted, that is, searching for a mobile app is more than matching given words to apps. When searching, it is important that the titles of the apps are relevant to the search terms, more so than the description (Datta et al., 2013). Weighing keywords helps narrow down results, without blatantly disregarding the importance of descriptions, as not everything is contained in an app's title. Manipulating keywords may become necessary if the provided keywords don't receive many matches (Datta et al., 2013). For instance, "voice translator" may be changed to something like "speech translator" or "voice decoder" if necessary. This will increase the chances of the search resulting in a greater number of app suggestions.

2.4.2 Rating the Quality of an Accessibility App

Many parents and teachers randomly select apps to use in their environments. They do not take the time to evaluate it for what it is, and because of that aren't getting the quality a true educational app has to offer (Ok et al., 2016). To avoid this, a rubric for those with learning disabilities can be used to identify strengths and weaknesses in areas like objectives, content level, examples, progress monitoring, navigation, and visual and auditory stimuli (Ok et al., 2016). Such a rubric is represented by the following:

Section 1: Information	Name of App	Sample App
	Price	$0.99
	Publisher	Sample Publisher
	Content Area	Mathematics
	Objectives	To practice addition, subtraction, multiplication, and division
	Type of App	Educational
Section 2: Evaluation	Objective	5/5
	Strategy	4/5
	Examples	4/5
	Feedback	5/5
	Navigation	5/5
	Visual Stimuli	3/5
	Font	5/5
Section 3: Grading	Earned Points	31
	Total Points	35
	Score	88.57%

Fig. 2.6: An evaluation rubric for instructional apps for teaching students with learning disabilities

(Ok, et al., 2016)

Section 1 focuses on the general information about the app in question. What is its name? How much is it? What is its main purpose? Within that main purpose, which subtopic(s) can be found in the app? As for Section 2, this dives into the opinion of the "grader" (the user!). It lists several different categories and has boxes for scores, on things like how well the app achieves its objectives, the app's strategy, its theory and practice, audio elements, and appearance. Section 3 relates to the overall grade of the app. How well did it do given the user's criteria? This can be used as a prototype for the kind of criteria that Seven Hills employees could use to select

accessibility apps, partially satisfying the hesitation they face to research them. When examining

the quality of a mobile app, it is imperative to acknowledge its purpose for creation. If one is

looking for an app related to speech recognition, but comes across one for the blind, that does not

mean the latter is of poor quality and should not be considered when evaluating an app (Ok et al.,

2016). There are several apps that are made for the same purpose, and one of the main challenges

faced while trying to find the right app is that the user simply cannot try them all. Having certain

criteria in mind beforehand and "grading" each app can greatly increase the likelihood of finding

the most appropriate app.

2.4.3 Cost-benefit of an Accessibility App

It has been empirically proven that the idea of the freemium strategy – a strategy in

which an app or service is offered for free, with additional in-app purchases allowing more perks

and features – may be more beneficial than paying for an app outright (Liu, Au, & Choi, 2015).

Some customers feel that they should be able to try a mobile app at no cost before potentially

buying its full version (Liu et al., 2015). With freemium apps, the app is provided at no cost,

however extra features and/or subscription options come at an additional fee (referred to as in-

app purchases on the iPad platform). Apps can range from free to $299.99 (e.g., AAC Essentials)

and upwards. It is possible that most of the people who choose to download a free mobile app

would not purchase it if it was not free (Liu et al., 2015).

2.5 Background Summary

Developmental disabilities are a large group of medical ailments causing people to have difficulty in social, emotional, mental, and physical aspects of everyday life. While the government provides some aid, it is impossible to fulfill the individual and specific needs of those with developmental disabilities. This is where advocacy agencies found their niche.

The Seven Hills Foundation is one of the largest advocacy agencies, with over 160 locations in the New England area. It is Seven Hills' mission to give people the tools that they need to thrive on their own. In this way, the clients of Seven Hills become self-advocates, capable of standing up for themselves and living an independent life.

This is where assistive technology apps come in. Assistive technology apps have become more accessible as smartphones and tablets become more accessible and affordable, giving those with disabilities an unprecedented opportunity to thrive. The quality and affordability of these options will only continue to rise, which is why it is so imperative that organizations like Seven Hills have a way to effectively and efficiently sift through these apps and find the ones that their clients need most.

The journey of searching for mobile apps contains many paths, including using the right search terms to find the useful apps most applicable to the situation at hand, and using filters while determining a set of criteria to rate each app. The latter can be followed by the use of a rubric and giving each app a score to determine if it is worth recommending or purchasing if it has a cost. Apps that support assistive technology features like Assistive Touch and Switch

Control greatly aid those with mobility issues and allow them to perform the tasks on their

devices that everyone else can.

3.0 Methodology

The goal of this project is to create an easy, accessible way for Seven Hills employees to find apps to assist with the various needs of their clients to address the problem of information overload, a phenomenon in which there are too many apps to sift through, making it difficult to recommend any one app to a client. We have accomplished this goal through the following objectives:

1. Develop a methodology for finding useful apps.

2. Create a system to rank apps found to be useful.

3. Create a database composed of all apps found.

4. Develop an accessible interface for the database.

5. Provide a manual/video for teaching others to access and edit the database.

This project was performed at the Seven Hills Worcester site, located at 81 Hope Avenue, Worcester, MA 01603. The project took roughly seven weeks, from mid-January 2018 to early March 2018. In these seven weeks, we plan to produce all requested deliverables. If we accomplish this early enough, we hope to test our methodology with client interviews, but that exceeds the scope of our project currently.

The remainder of this chapter will outline the methods we used to achieve our objectives, collect our data, and analyze our findings.

3.1 Developing a Methodology for Finding "Useful" Apps

There are many programs at Seven Hills that currently use assistive technology (AT), from Adult Day Health (ADH) to recreation for all ages. This wide range of potential uses for assistive apps makes it difficult to find a specific factor to determine "usefulness." To understand what both clients and faculty find useful, the team will be conducting surveys, semi-structured interviews, and observing programs taking place at the project location.

3.1.1 Observation in the Field

The Seven Hills Foundation offers many unique programs to assist with the various needs of their clients, including Adult Day Health, Children's Clinical & Behavioral Health, Family & Community Support, and many others. (http://www.sevenhills.org/programs/adult-day-health) The common factor between all these programs is the use of assistive technology. Rather than spend time observing each program, we had the opportunity to observe a meeting of the AT Super-Users, as well as take a tour of the Goddard Hill location. This meeting consisted of the most prominent AT users in all New England. Field notes form this meeting shed light onto the professional's method of finding useful apps. This meeting was invaluable for both giving us an inside look at the app discovery process as well as set a good foundation for employees to survey. The tour of Goddard Hill also provided good background for how and in what setting this AT was in use.

3.1.2 Surveys

ADH is one of the many services Seven Hills provides that make use of AT. A large percentage of programs take place at the client's home. To understand the impact of AT in these

programs, the team distributed surveys formed after we obtained contacts from the AT super

users group. The survey contains questions with specificity about the technology and open-ended

questions about the programs themselves. There are also questions on user preferences, to better

tailor our project to the employee's taste. With these surveys we wished to confirm the data

collected from the observation, as well as potentially shed light on issues only seen on home

visits rather than on site. With the data collected from these methods, we wanted to understand

what constitutes a "useful" app and be able to apply that into finding and researching new apps

for these various programs.

3.2 Creating a Metric for Ranking Apps

As of 2017, there are 2.8 million apps available for android users, followed closely by the

2.2 million apps available on the Apple run App Store (www.statista.com). The sponsors have

asked to focus only on the iOS (Apple) apps, so we will only be researching android apps if time

allows it.

In order to make our ranking system more accurate for the purposes of Seven Hills

employees, we will include an internal system to our database. This will only allow employees to

rank the apps with a thumb up or down, which align with our sponsors request. There will also

be a hyperlink to the store where the app is available which will show the regular ranking system

out of five stars. With both the internal and international ratings available, a better review of the

app is acquired.

3.3 Creating a Database

This objective focuses on the process of developing the database using the information gathered in the previous objectives and explaining how to link this information into a user-friendly interface that both the sponsors and the clients can use. There is no single right way to make a database, but there are an infinite number of ways to make a bad database. There are, of course, guidelines that helped with the construction with the database, which were used extensively throughout this part of the methodology.

3.3.1 Discern what information is needed within the database

The first step of creating a database is figuring out what information is needed. This included what users want to query by, what non-querying information they want to see, and other conceptual level problems. Design requirements were determined by both the previous objectives and from the project details given before the start of the project; such requirements served as a baseline for the project, with more requirements discerned from our own research into what standardized information is available for all apps.

Sponsor-provided requirements have already been made available to us, such as the need to have a searchable database that is easy enough for anybody at Seven Hills to operate and is *not* hosted on premises; we were specifically asked to develop a cloud-based application so that the IT staff did not have to maintain the database on site. Some requirements are logically assumed and can form constraints on our data, such as price having to be a positive number with two decimal places (or, alternatively, currency, a specialized data type for monetary values), having a unique non-null name, having a non-null developer, and being associated with a single

standardized app store category. These assumptions were clearly stated in the conceptual design of the database; these assumptions are not universally constant, but they are consistent within the context of this project. Previous objectives were completed to a reasonable degree in order to have access to information about what users want to know and how users query the database. When we had sufficient information, we began construction of a conceptual model to understand the optimal way to construct our database.

3.3.2 Efficient Use of Preexisting Systems

Another key factor that we needed to consider was what systems are already in place at Seven Hills Foundation. This required a quick meeting with IT management to see what systems they have and what is compatible with what they have. When research showed us that the optimal solution, Microsoft Access Web Applications, was discontinued, we had to search for another solution for hosting the database and creating forms with which the database could be accessed. We eventually settled on using a system called Caspio, which was a cloud-based platform as a service that could provide the functionality that we sought. This functionality included hosting the data itself in the structure that we defined, accessing this data regardless of where it is being accessed from, searching the data using multiple parameters, inserting new entries into the database, having new entries be requests and not direct inserts into the database, editing the data in the database, and creating user-friendly forms for data access.

In a typical relational database, we would have developed an Entity-Relationship Diagram (ERD). While we did develop a possible ERD for use in this project, we found that a relational database was unnecessary and hard to implement, especially with the current system at

Seven Hills Foundation and the discontinuation of Microsoft Access Web Applications. We instead decided on using a single table with all of the information stored in it. While initially decided for the restraints of SharePoint, it translated well into Caspio. As such, an ERD was not necessary for this project, and this otherwise vital step for a relational database was skipped, as this project used a nonrelational database.

3.3.3 Create the database

During this project, we quickly learned that raw SQL (or any SQL) was unnecessary for this project. Initial designs were handled in Microsoft Access, which provided a front-end design interface for databases, and even served to create prototype forms (which would later serve as the basis for more concrete designs). When we realized that we would not be using a relational database, we focused all database design and raw data storage in a Google Spreadsheet for ease of access and portability.

The ability to port a Google Spreadsheet into an Excel Spreadsheet into an Access Database proved to be useful, as Caspio can take an Access Database as an input and generate the back-end structure for the cloud-based database. The Google Spreadsheet held all the apps that we researched and found throughout the project. As we were tipped with more apps, the spreadsheet grew. What was initially a spreadsheet from a single source of approximately 200 apps, some of which no longer exist, grew into a spreadsheet of over 400 apps, found from our own research and a concatenation of multiple documents created by Seven Hills Foundation employees, from information that could either be redundant (app either already in our spreadsheet or referenced in a separate document) or obsolete (app no longer exists in the app

store), centralized into a single location, all of which were confirmed on the app store. This spreadsheet was effortlessly translated into a Caspio database, which could then be accessed by anybody with the link to the database via a form.

3.3.4 Designing Forms for Accessing and Editing the Database

In order to access elements in the database, we needed to create forms that would serve as a user interface for ease of access. The front-end interface consists of a collection of text entries, dropdown menus, checkboxes, and radio buttons, with the results able to be sorted by different parameters. Once the data is entered, the Caspio backend handles the rest, showing results that match the parameters of the search.

A similar structure exists for password-accessed 'admin only' forms, where authorized users can insert new entries to the database, update existing entries in the database, and delete entries from the database. Tutorials (mentioned in Section 3.5) explain what information is required for any given data entry, as well as where to find the information from the app store. We followed proper design principles to ensure that the front-end application is functionally appealing and aesthetically unobtrusive to as many users as possible. Any problem that an individual user will have with using the interface should be covered in the video tutorials and written manual.

3.4 Creating an Interface to Access the Database

This section will go into detail about one of the deliverables of this project: a way for Seven Hills Foundation to use what we will have created. This includes the implementation of a web interface, accessing the web interface, and user experience.

3.4.1 Front-end Interface

We have developed a web interface to act as a front-end system to access and modify the contents of the database. Rather than using a programming language and building the whole interface, the database management system Caspio has helped us create an interface. With it, we were able to secure and manage access to the information in the database, share it throughout Seven Hills Foundation, and create databases that don't require any special programs in order to use them. This is extremely convenient because this method allows the database to be accessed from a web browser, and on multiple devices.

3.4.2 Accessing the Web Interface

Briefly mentioned in the last subsection, the web interface can be accessed from a web browser. After publishing the database, a special link is given that leads to the web database! The following two figures demonstrate a generic example of this:
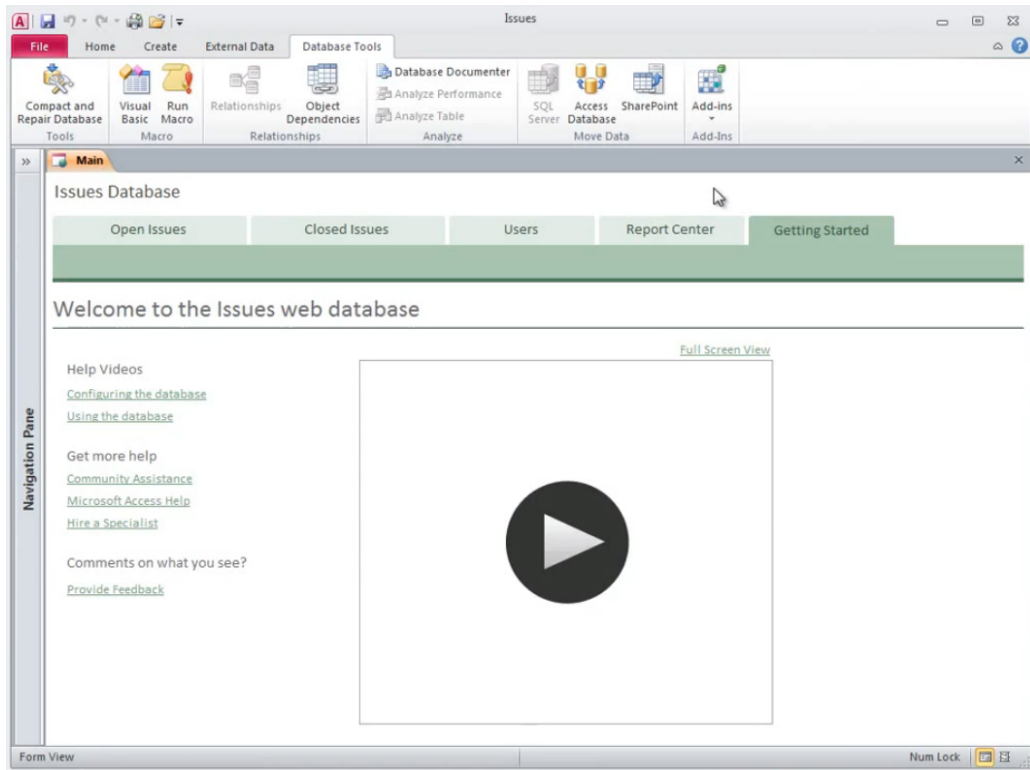
Fig. 3.1 - Web Database
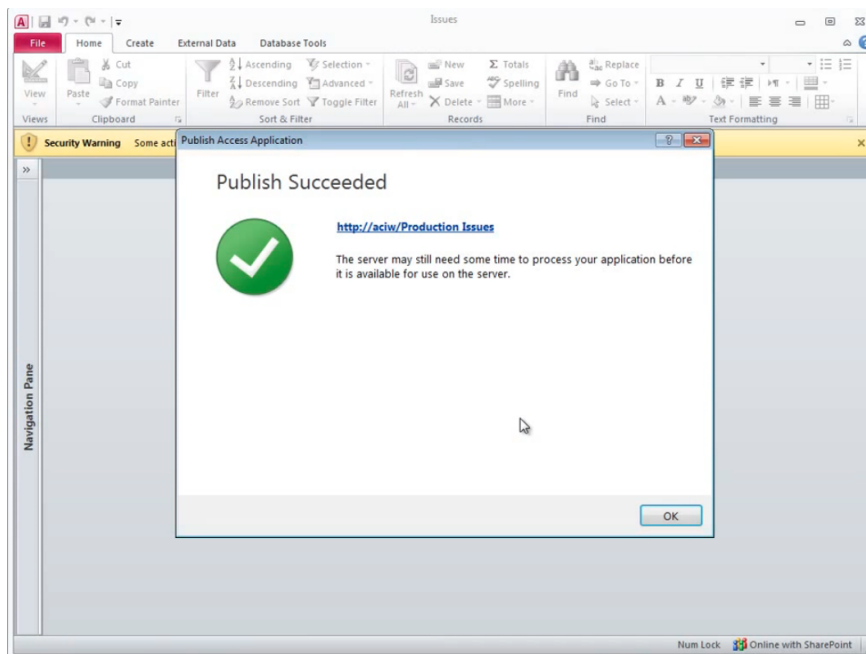
Fig. 3.2 - Publishing the Web Database

Figures 3.1 and 3.2 (Access 2010 Build And Publish Web Databases 1) respectively show a successfully published database and what a web database could look like in a web browser.

There are two kinds of permissions/roles associated with this: user and administrator. The user only has read access. In other words, users can search but cannot make any changes to the database itself. Administrators have full read and write access. This includes design changes and functionality changes, among other things. Administrators must be very careful, as one wrong move can corrupt the database. For the purpose of this project, we recommend the Seven Hills Foundation employees be the users, with the Assistive Technology Department staff playing the role of the administrators.

3.4.3 User Experience

Satisfaction of the user is one of the most crucial pieces of the web interface objective. We wanted to present the data in a clean and clear way, that allows easy navigation throughout the interface. This includes, but is not limited to, an easy way to filter by a person's ability, while avoiding multiple menus and submenus to achieve that. We also wanted to avoid flashy and obtrusive elements that could result in discomfort and irritation. While it is impossible to guarantee no problems, it was a personal goal of ours to ensure minimal complications. We then planned to use the remaining period of the term, after execution, to collect feedback on the web interface from Seven Hills staff by giving them the final link. Questions pertained to what they thought of the appearance, navigability, and features, and how we could have made it better if need be.

3.5 Writing the Manual

The main goal of the manual is to provide instructions that explain how to bring all of our deliverables together and use them in tandem. This section will address how we planned to incorporate documentation as a deliverable, and how it will benefit those who use it. Along with the user experience of the web interface, we want this to be easy-to-understand, without hindering the process of learning how it works.

It is important to develop a manual to ensure that there is something to rely on when either things go wrong, or the way in which something is done is unbeknown to the user. It is crucial that all skill levels are accounted for, as not everyone has the same experience with technology, let alone a web interface accessing a database of mobile apps. There are several sections, split between two manuals (one user and one administrator), addressing the following main features of the interface:

1. Accessing the interface

2. Searching the system

3. Adding to the database

4. Editing the database

5. Maintaining the system

3.5.1 Video Instruction

We have provided Seven Hills Foundation with tutorial documentation in the form of a video, that will allow them to easily access, edit, and navigate through the database. To deliver this to them, we shot a video using an iPad Pro 10.5-inch, going through each component of the

interface, and used the screen recording feature present in iOS 11 (see Fig. 4) along with the

device's microphone in order to use the iPad and deliver verbal instructions simultaneously.
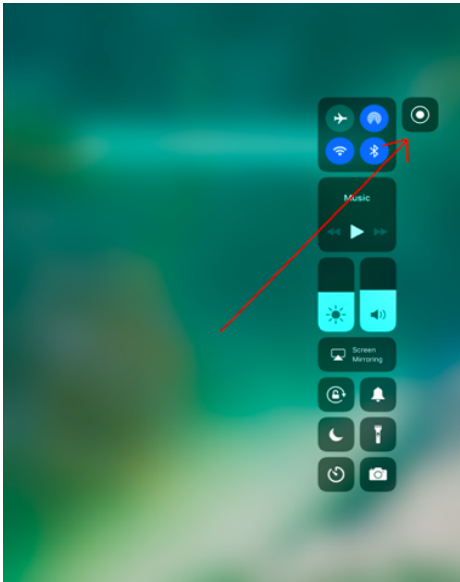
Fig. 3.3 - Screen Record on iOS 11 (taken on iPad Pro 10.5-inch)

3.5.2 Standard Procedures

The most standard form of documentation is written instructions, whether it be a physical

hard copy or electronic copy (for instance, a PDF file). Generally speaking, documentation is

important because it is the only discernible piece of the project that represents the deliverable in

question. In this case, it is the only way to give the user an idea of how to interact with the web

interface, assuming the user has no prior knowledge with it. As a result, we have provided Seven

Hills both a written and video form of documentation.

4.0 Results

This chapter contains the results and completed deliverables of our project. These include:

- Field Notes from Observation: The analysis from the field notes and conclusions we made to direct our research can be found in section 4.1.

- Survey Results: Using charts and graphs form our survey responses, the user's app and interface preferences are analyzed in section 4.2.

- Database Overview: Section 4.3 contains information on the formation, hosting, and interface of our AT App database.

- Written Manual & Video Tutorial: Details concerning the formation and distribution of the written manual and video tutorial can be found in section 4.4.

Each of these categories will be explained in more detail below.

4.1 Field Notes

Assistive Technology is used throughout the various programs that Seven Hills conducts. In order to make this process faster and simpler, we did not observe any sessions that involved clients. We observed the AT Super-Users meeting and a school tour of the large Seven Hills building at Goddard Hill.

At the AT Super-Users meeting, we sat in on a developer pitching his AT software to the group. While the software itself will not be included on the database, the information gathered

from this meeting was very insightful. We were introduced to the professional vocabulary used while searching for assistive technology. From this meeting we were able to ask better questions on our survey, such as asking the importance of language, data collection, voice output, and the ability to print from app.

At the Goddard site tour, we were able to view the facility where most of their day programs are held. Here we saw the various uses of AT in their programs, including music, art, and recreation. While there, the type of apps we saw in use were video and music streaming apps. From this we concluded that the specialized apps we were focusing on are not the apps typically in use during day-to-day work; the more specialized apps were typically for certain clients who specifically need help in a given area that the specialized app handles. After this observation, we focused more on finding apps with a more general intended use.

4.2 Survey Results

With our knowledge gained through observation, we created a survey to understand the AT user's search habits and interface preferences. This survey, which can be found in Appendix C, was created through Google Forms and emailed to over 70 employees. It was sent out January 31, 2018 and the deadline was February 4, 2018. There were 26 responses in total. The survey responses and conclusions made are shown below.

4.2.1 Current App Usage

The first question on the survey was intended to find which apps are the most used currently at Seven Hills. From the responses, scheduling and communication apps were very popular, while the more specified categories such as written expression and mechanics of writing were hardly used. With the data from this question we focused our research on finding more helpful scheduling and communication apps.
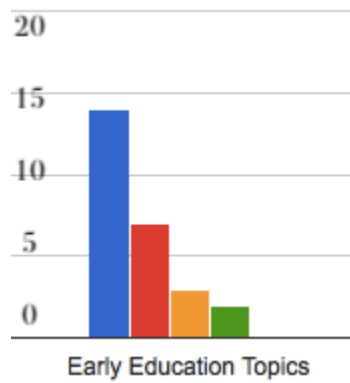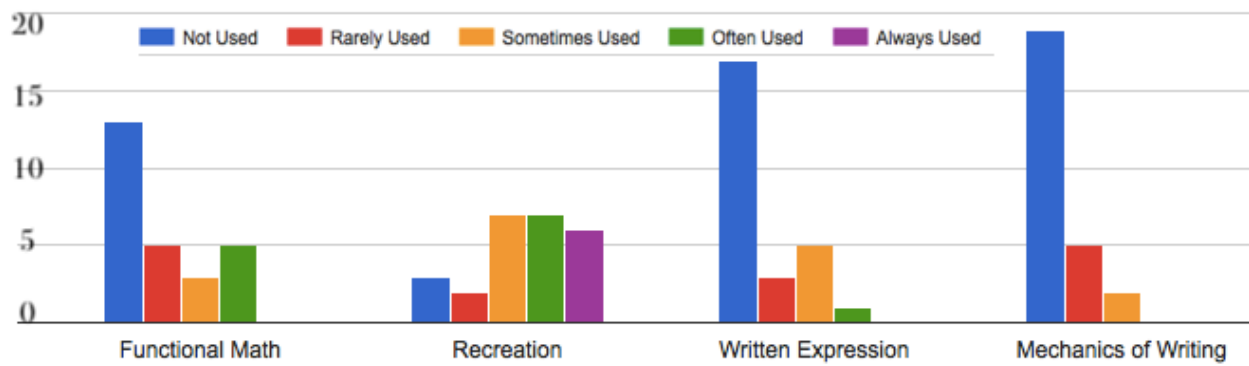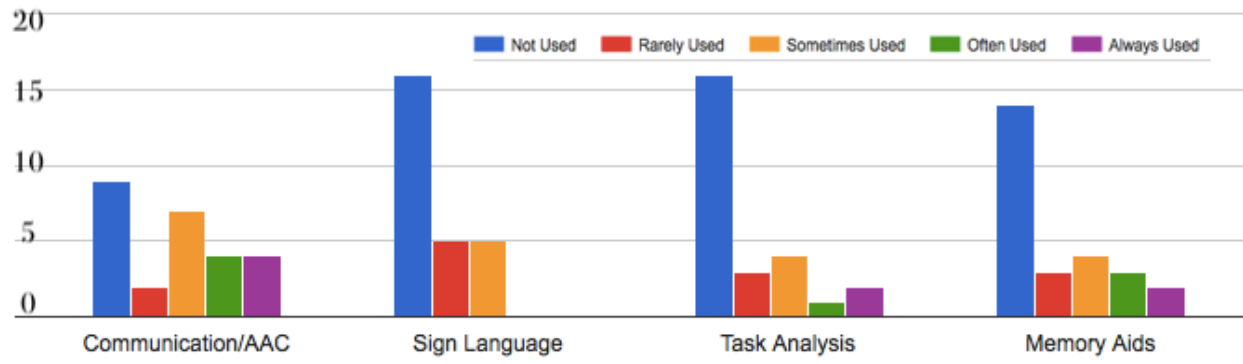
How frequently do you use apps in the following categories?
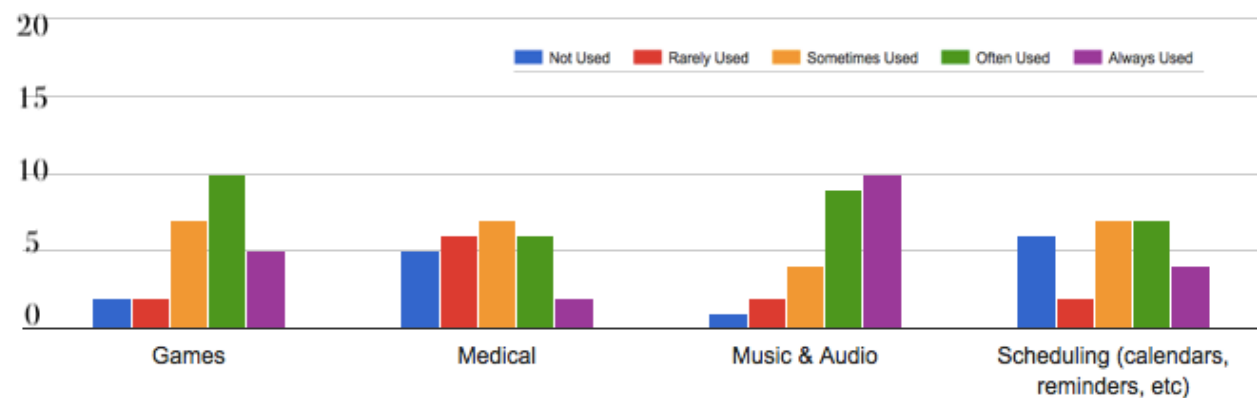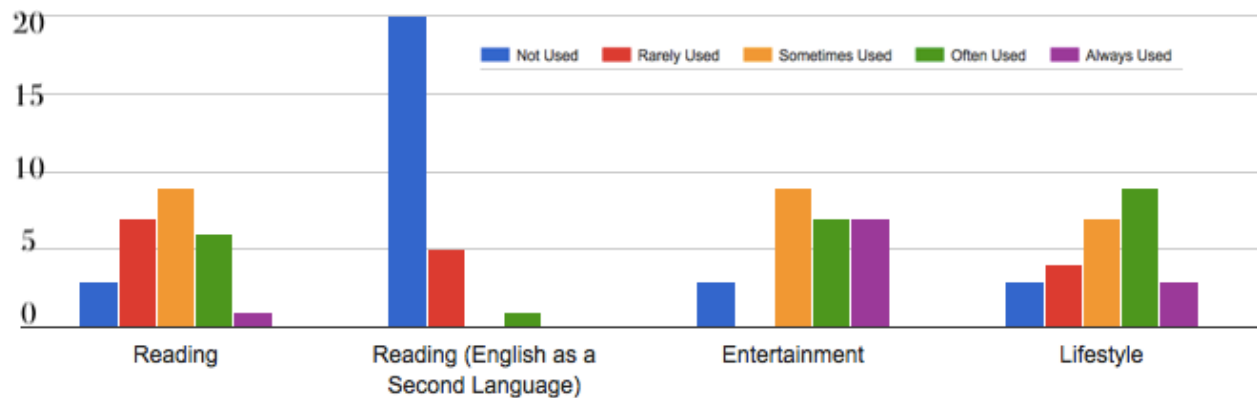
Figure 4.1

4.2.2 Categories of Interest

The survey respondents were asked what categories they would like to see more of to further focus our research. From the graph below, we concluded that we should focus on finding more reading, scheduling, and communications apps.

Which categories of apps would you like to see more of in this database? Select all that apply.

20 responses

Category	Count
Reading	13 (65%)
Reading (Engli...	3 (15%)
Entertainment	7 (35%)
Lifestyle	6 (30%)
Games	8 (40%)
Medical	9 (45%)
Music & Audio	9 (45%)
Scheduling	12 (60%)
Communicatio...	12 (60%)
Sign Language	11 (55%)
Task Analysis	9 (45%)
Memory Aids	10 (50%)
Functional Math	4 (20%)
Recreation	7 (35%)
Written Expres...	3 (15%)
Mechanics of...	1 (5%)
Early Educatio...	3 (15%)
Apps for childr...	1 (5%)
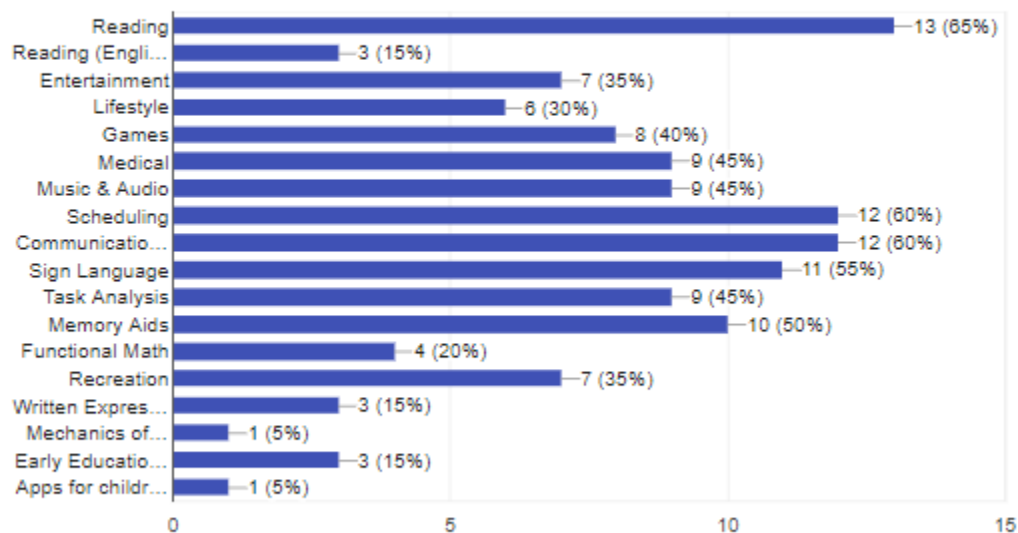
Figure 4.2

4.2.3 Search Habits

We asked the question "Rate the following parameters on how important you consider them while searching for apps" in order to understand the relevant information to show in the search results. Results show that fields like developer or languages offered are not as important as the cost or rating. Special features of apps such as voice output or data collection are shown to

be important to the employees as well, however there are too few apps that have this feature and there is no effective way to get the information from either app store for efficient data entry into the database.

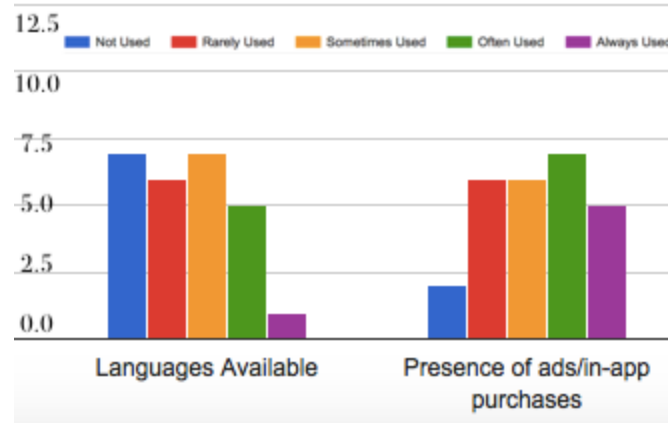*Rate the following parameters on how important you consider them when searching for apps*
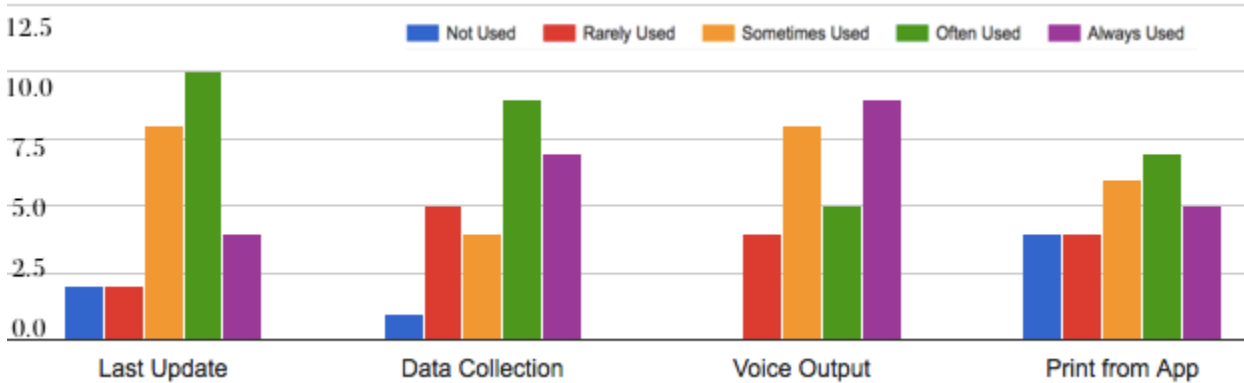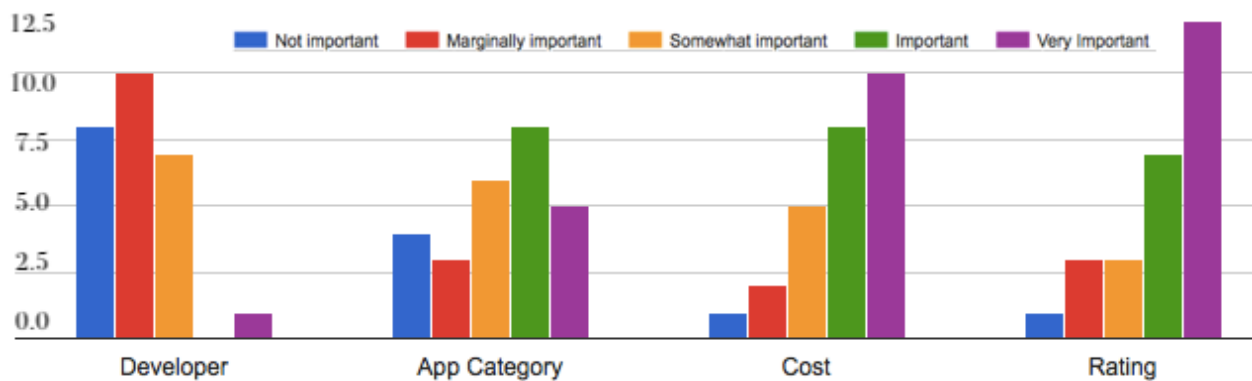
Figure 4.3

4.2.4 Interface Preferences

The following questions were asked to better understand the interface preferences of our target audience. After extensively testing the capability of our interface, we found the best search options, open response and combo box. As shown below, most respondents only care about getting results, not how they find them. Similarly, 45% of respondents wanted their results shown as blocks, while 45% didn't care. Therefore, we have decided to put the results in block form.

Would you rather search certain categories (i.e. reading/ESL, recreation, etc) by open response text or from a list of distinct choices?

22 responses

- Open response
- List of distinct choices
- Whichever gives me what I'm looking for

68.2%

27.3%
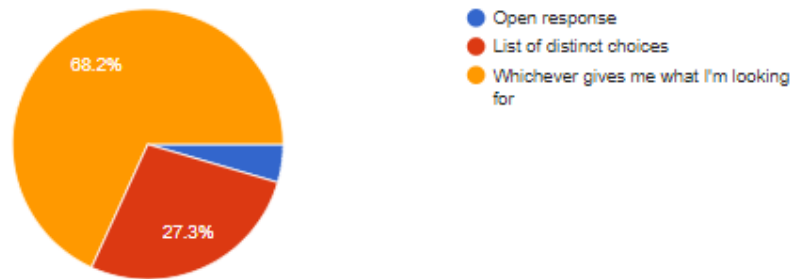
Figure 4.4

Would you rather view search results as distinct blocks of information or in a traditional spreadsheet format?

22 responses

- Blocks of data
- Spreadsheet
- Doesn't matter
- Display in a visual format that is easy to read and see

45.5%

45.5%
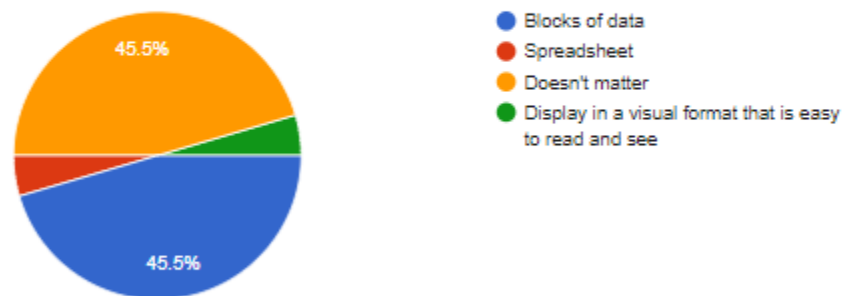
Figure 4.5

4.2.6 Survey Analysis

The goal of this survey was to focus our app research to relevant categories for Seven Hills employees as well as to custom design our interface to the preferences of the user. With the data we collected we implemented the following changes:

- Focus research on finding more communication, reading, and scheduling apps.

- Create descriptive sub-categories for communication apps to create more specific search terms.

- Make category search bar a combo box with distinct choices.

- Show our results in block format

4.3 AT App Database

From the very beginning of this project, the sponsors requested that the database should be hosted remotely so as not to add on-premise maintenance to the workload of Seven Hills's limited IT team. Our initial plan was to use a cloud-based SharePoint site, as it would likely have the intra-corporate support for Microsoft Access databases. We would have used a pre-existing Seven Hills SharePoint site or a new one using our sponsors' new subscription to Office 365. However, further research into this option proved that Microsoft did not support its own products, since Microsoft has begun discontinuing the Microsoft Access Web Applications service from SharePoint, which would have automatically exported a Microsoft Access database into a SharePoint site. Upon this revelation, we began searching for workarounds and alternatives.

The database currently lives on Caspio, an online database hosting platform that has been

hosting over one million apps since 2000 (www.caspio.com). With Caspio, we can have

everything in the cloud as opposed to a server at one of the Seven Hills locations. This means

that its easily-accessible interface does not require one to be on Seven Hills property, though it is

most accessible from either the Seven Hills AT resource page, which can only be accessed by

employees, or from the written manual, which is also hosted on the Seven Hills AT resource

page. As a means of justifying this approach, we looked at all IQPs done for Seven Hills

Foundation, dating back to Winter 2015. There are 3 that are similar and involved databases and

interfaces:

1. D Term 2016: AT Solutions

    a. Their approach: MySQL, ExpressJS web framework, AngularJS framework,

        NodeJS web server

    b. The issue: Not hosted on the cloud (a request made by our sponsor for this

        project). This database cannot be accessed outside of Seven Hills.

    c. Some recommendations by this project team: Increase the search functionality

        while searching and implement a dictionary check for categories.

        (Bingel, Cornwell, DiMilia, Meersman, & Tran, 2016)

2.   C Term 2017: AT Expo

    a.   Their approach: Google Sites

      b.   The issue: Not enough functionality, i.e., poor search functionality (specific strings needed and can only search by name); no way to implement ranking system; not sufficient for long-term use.

      c.   No database-related recommendations provided.

(Buckner, Martin, Tran, & Vigliotta, 2017)

3.   D Term 2017: Community Outing

      a.   Same approach and issues as C term 2017; see above.

      b.   A recommendation by this project team: Encourage the utilization of the comment section of the website.

(Chace, Dozier, Farley, & Mastascusa, 2017)

Caspio is able to implement these exact recommendations set forth by past IQP teams. Notably:

- Increasing search functionality while searching: For the D Term 2016 project, if you don't know exactly what you're searching for, you won't find it while performing a search. For our project, we are able to show results that contain what is entered in the search field, e.g., using the argument "math" will result in all apps that contain the word math, as opposed to searching for an app that matches exactly that argument.

- Implementing a dictionary check: With dictionary checks, we are able to dynamically view elements from the database in the form of dropdown menus or autocomplete text fields.
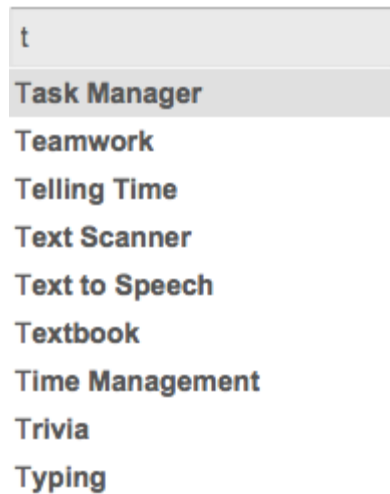
Fig. 4.6 – Sub-categories beginning with "t"   Fig. 4.7 - Disabilities
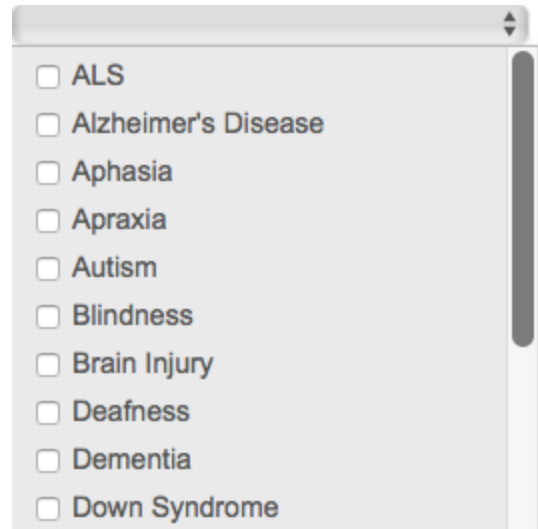
The options have *not* been manually entered and have been pulled directly from the table. As new entries are added, these will automatically update to reflect the changes.

- Encouraging the utilization of the comment section of the website: With Google Sites, both the C Term 2017 and D Term 2017 projects are only able to accept comments from users with Google accounts. This is not ideal, and we approached this by adding comment sections for each app via an HTML block, that allows the user to enter his or her name without the requirement of creating any type of account, or to remain anonymous (although comment authorship is encouraged).

There are two main pages the users can access (plus one additional page for administrators). These are the search form and the submission request form, seen below, respectively:

Fig. 4.8 - Submission Request Form

Fig. 4.9 - Search Form

The search form is the method of finding new AT apps, while the submission request form is a

means of adding a new app to the system and requires approval from administrators. While

searching, the user will be presented with information about each app, including its name,

developer, cost, targeted disability if applicable, an option to rate the app (a Seven Hills internal

ranking system), an option to comment on the app, and more. Upon the submission of a potential

new app, the administrators will receive an email notifying them that a new request to the system

has been made, with instructions on how to approve or delete the request (and have the user

resubmit if needed). The edit form (as seen below), the third page for administrators only, allows

each entry to be updated and deleted, and is the page to be used to approve or delete new app

requests.

Fig. 4.10 - Edit Form

See the manual in the appendix for more information on how to use these forms and the various

types of information presented to the user.

4.4 Written Manual & Tutorial Video

The scope of this project was only seven weeks, so we had to put measures in place to

assist the sponsor in the upkeep and maintenance of our deliverables. To do this, we created both

a written manual and a video tutorial on how to access, search, edit, and maintain the database

and interface. Both the document and the video will be held on the Seven Hills AT site because it

is the most accessible to the employees. Both were created with structure based off other

Microsoft service tutorials and videos. The written manual can be found in the appendix. The

video tutorials can only be found on the Seven Hills internal site.

5.0 Conclusion

The goal of this project is to provide employees of Seven Hills with an easy, accessible way to find apps to help with the various needs of their clients. To accomplish this goal, we created an online database using Caspio, a Platform as a Service. This service allowed us to import a spreadsheet with over four-hundred unique apps, including all necessary information such as developer, price, category, et cetera. With this information in the web platform, Seven Hills employees can now find any approved AT app in a centralized location, as well as request new apps to be added and view peer reviews. This localized app store will reduce the problem of "information overload" reported by employees. We also provided Seven Hills with written manuals and video tutorials for both users and administrators to sustain and grow the project after implementation.

Using our add request form, administrators can easily add any app they want. Being a cloud-based service, the current interface uses the free version of Caspio. If the search engine continues to see increased traffic, upgrades to the service can be purchased through Caspio. Potential for future projects include finding a better free cloud-based service and transporting the table there as well as better incorporating AT apps and the search engine into daily activities at the Seven Hills Foundation.

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Appendices

Appendix A: User Manual

AT App Search Engine User Tutorial
By the WPI Project Team
Version 2.0

Preface
This document shows how to access, operate, and request additional apps for the Assistive Technology App Search Engine. This service uses Microsoft Access and Caspio Web Platform. Internet access is required for using this service.

Organization of the Tutorial

Accessing AT App Search Engine
- Navigating to the web service

Searching AT App Search Engine
- Applying filters
- Using search fields
- Sorting Results
- Ranking Results
- Leaving Comments

Adding Requests to AT App Search Engine
- App Insertion
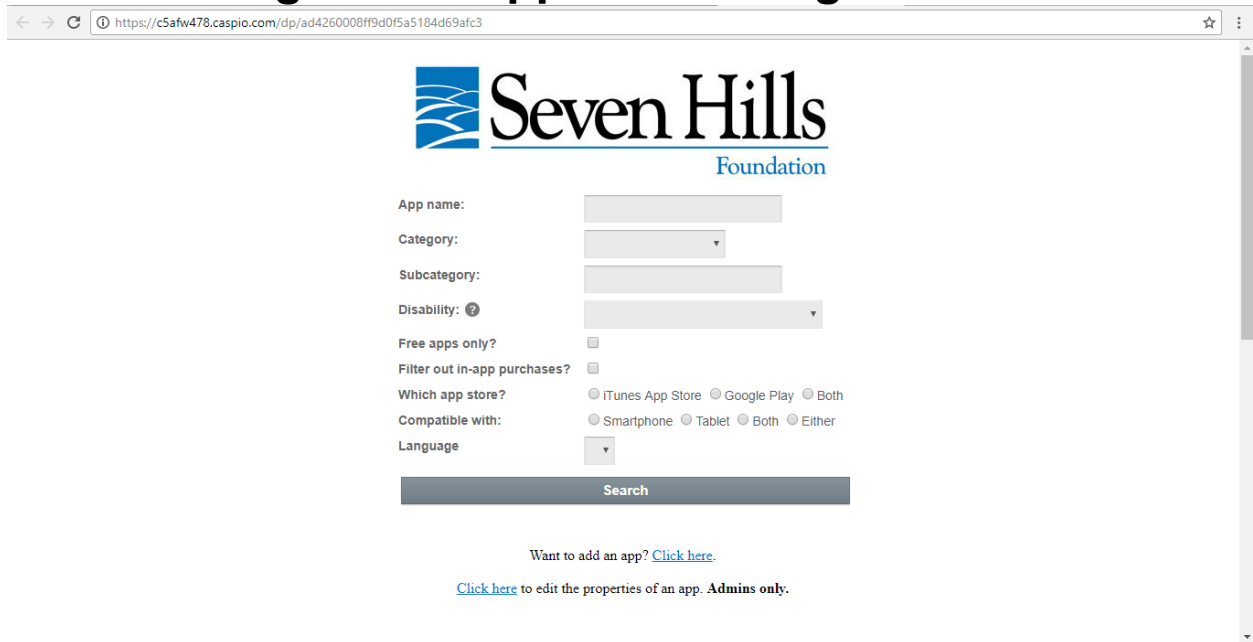
1.Accessing the AT App Search Engine

The public version of the search engine is hosted through the Caspio Web service. This allows it to be held at the following link:

http://bit.ly/2HPmoHy

By following this link you will be sent directly to the search form. The search engine works on any device so long as it is accessed in a web browser.

2. Searching the AT App Search Engine

Once you have navigated to the page shown above, you have the option to search for any AT app on the search engine. You can search by the following fields:

App Name- Standard search bar to search for the name of an app

Category- Drop-down menu to search for traditional categories found in the app store

Subcategory- Search bar with autofill features to search for more specific types of apps

Disability- Drop-down menu listing certain types of disabilities with apps made specifically for these disabilities

Language- drop down menu of available languages

You can also apply different search filters. These filters are applied with the buttons below the search fields. You can filter by clicking the buttons for the following parameters:

Free Apps Only- Checking this option shows only the free apps that fulfill entire doc the other parameters

Filter out In-App Purchases- Checking this option removes all apps with in-app purchases

App Store- These radio buttons specify which app store you want the apps to be from. Pressing both (the default when nothing is selected) shows all options regardless of which app store they are in.

Compatibility- These radio buttons specify what device the app is compatible with. Pressing both means that the app is on both smartphone and tablet; either (the default when nothing is selected) gives all options regardless of device compatibility.

App Name: 360 Thinking Time Tracker **Developer:** Kristen Jacobson **Cost (USD):** $2.99 **Device:** Smartphone, Tablet ⊞ View Details	**App Name:** AAC Evaluation Genie **Developer:** Hump Software **Cost (USD):** $12.99 **Device:** Tablet
App Name: abc PocketPhonics Lite **Developer:** Apps in My Pocket Ltd **Cost (USD):** $0.00 **Device:** Smartphone, Tablet	**App Name:** ABC Talk With Me! **Developer:** DigSee.com **Cost (USD):** $0.00 **Device:** Smartphone, Tablet
App Name: Aiko & Egor: Animation 4 Autism **Developer:** See Beneath Inc **Cost (USD):** $0.00 **Device:** Smartphone, Tablet	**App Name:** APDD PS & LASS - Friends **Developer:** Linguisystems **Cost (USD):** $19.99 **Device:** Tablet
App Name: Apraxia RainbowBee **Developer:** Virtual Speech Center Inc. **Cost (USD):** $26.99 **Device:** Tablet	**App Name:** ASL Dictionary Sign Language **Developer:** Software Studios LLC **Cost (USD):** $5.99 **Device:** Smartphone, Tablet

After searching, you will see the results of your search in blocks like these, showing the name, developer, cost, and device of the app. Hover over the app that you want and click View Details for more information on that app.

Q Search Again

App name	Aiko & Egor: Animation 4 Autism
Developer	See Beneath Inc
Store	iTunes App Store
Category	Education
Subcategory	Educational Game
Disability	Autism
Cost (USD)	$0.00
In-app purchases	1
Supported devices	Smartphone, Tablet
In a bundle	No
Language(s)	English
Link	Click here to see more details about Aiko & Egor: Animation 4 Autism

Rate this

👍 0 👎 0 ⓘ

When a user clicks View Details, they will see this screen. It has all of the data from the initial search, as well as the store, category, subcategory, disability (if it specifically supports one), in-app purchases, bundle availability, languages, and store link of the app. Users can click on the link to go to the app store. Users can also rate the app within the search results using the thumbs up and thumbs down buttons.

Users can also comment on apps, acting as an internal review system. When commenting, it is not required to leave a name or email, but leaving your name is highly encourages as it makes it easier for the admins to validate the quality of an app.

You are encouraged to leave your name for comments. Email is optional.

Comments

There are no comments posted yet. Be the first one!

Post a new comment

Enter text right here!

Comment as a Guest, or login: 🔥 intensedebate   Ⓦ WORDPRESS.COM

Name   Email

Submit Comment

When downloading or purchasing an app, always use your best judgment. Read the description of the app on the store page, read the reviews and notice the ratings, both in the search results and on the store. When emotionally charged, people tend to rate and write in the extremes; human emotions can get in the way of an objective review. Many apps also don't have a rating, as there are not enough reviews on the app store to have a consistent rating. These unrated apps could be diamonds in the rough, or unpolished and glitchy services that were abandoned by their developer. If you find such an app, don't forget to rate and review it both on the app store and in the search result, as somebody else could use your opinion for their own judgments.

If you use an app that you found with this search engine, make sure to return to the app in the search engine to rate and comment so that other users can make informed decisions.

Requesting Paid Apps
Paid apps are delivered to Seven Hills iPads via the Maas360 MDM program/apps catalog on every iPad.

Step 1. Once you determine which apps you need and how much they cost, you will need to ask your supervisor or manager to create a PO (Purchase Order) for the total amount and have them send that PO # to Jean Des Roches.

Step 2. Once approved, you will have to send an email to Jean Des Roches with the following information:
a) The app name(s)
b) The cost per app
c) How many you wish to purchase
d) The names of the iPad(s) where they are to be installed

Step 3. Once Jean finalizes the purchases and sends the apps to you, she will notify you via email.

3. Adding Items to the AT Search Engine
Below the search button, there are two extra links to access the editing functions.

The first one links to the add apps interface, which is a public form for recommending apps. The second one links to the actual editing interface, which requires an admin login.

As shown in the image above, the fields marked with a red asterisk are required. The request is sent to the admins; once approved, it will show up in the search results publicly.
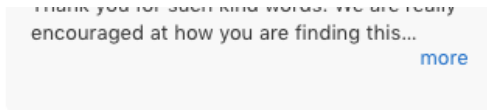
Most of the information for the apps are publicly available on the app store in some form. The following section will help you find the information from the iTunes app store.

App Name: The first bit of information on the app. It is in bold. Please copy the entire name of the app when filling the form out, as many apps have similar names and by doing so keeps the search results consistent.

Developer: The link is usually under the name, however, it is not necessarily the info immediately under the name, as some apps have brief descriptions underneath the app name. Like with app name, please copy the entire developer name (not the link itself). While people will not search by developer, this is still important information for each app.

encouraged at how you are finding this…

more

Information

Seller	Microsoft Corporation
Size	292 MB
Category	Productivity
Compatibility	Requires iOS 10.0 or later. Compatible with iPhone, iPad, and iPod touch.
Languages	English
Age Rating	Rated 4+
Copyright	© 2017 Microsoft Corporation. All rights reserved.
Price	Free

Developer Website ↗   App Support ↗   Privacy Policy ↗

Category: Scroll down to the bottom of the app store (if in a browser) past the user reviews until you reach Information. The category of the app is how it is organized within the app store under incredibly generalized rules.

Subcategory: For this parameter, the user must use their own judgment, typically by reading the app's description. This parameter exists due to the vague nature of the Category parameter and a personal desire to help users find apps using a more specific parameter that the app stores' generalized categories.

Disability: Like subcategory, this requires the user's own judgment. The developers of the search engine have decided to only add disability fields if the app clearly states (in either the name itself or in the description) that the app specifically helps the given disability. This is because there are many apps in the search engine that can help in a general sense, but are not tailored for a specific set of disabilities. If the app is for a disability not currently in the given list, include the 'Other' option in your selection and type the disability into the 'Other Disability' field; if there are multiple disabilities that you wish to add in this field, please separate them with commas.

Cost: How much the app costs to download (not necessarily how much the app costs to use). This can be found either at the top of the page under the rating (if there is a rating), or under Information at the price parameter.

In-app purchases: A yes or no question. If an app has in-app purchases, it will either state so next to the price at the top of the page or under the price in the Information section of the page. We don't specify what the in-app purchases are simply due to how many there can be for one app and how different they can be in functionality, ranging from purchasing the full version of an app, purchasing a subscription to a service, getting in-app credit, unlocking extra features, removing ads, etc.

Store: Which store you are viewing the app in. Both isn't an option simply because the differences in functionality, price, and version differences for a single app can desync the app's properties in the search engine.

Device type: Which device the app is for. The information is clearly stated in the Information section under Compatibility. Alternatively, if there are screenshots of an app on a specific device (found immediately before the description, under the app name and other header information), then it is available for that device.

Store Link: Copy the entire URL from the top of the browser when on the app store (assuming you are in a browser and not the app store itself). This makes it easy for a user to find an app in the search results and immediately go to the app store from the search results. If you are in the iTunes app, press the ellipsis button and press copy link.

In a bundle: When searching for apps, you can sometimes find a collection that includes the app that you want. If a bundle exists that has this app in it, click on the checkbox to state that it is in a bundle.

Language: The languages that the app is available in. We only record the following languages: [INSERT LANGUAGES HERE]. This is because some apps have extensive lists of languages offered, some of which we don't expect to be very common. The languages offered are found in the Information section beneath the compatibility. If the app supports a language not currently in the given list, include the 'Other' option in your selection and type the language into the 'Other Language' field; if there are multiple languages that you wish to add in this field, please separate them with commas.

DIFFERENCES WITH GOOGLE PLAY:

Evernote – Take Notes, Plan, Organize

🛡 Editors' Choice

Evernote Corporation   Productivity

★ ★ ★ ★ ⯪ 1,478,410 👤

E Everyone

Offers in-app purchases

ⓘ This app is compatible with your device.

🔖 Add to Wishlist   **Install**

ADDITIONAL INFORMATION

Updated
February 7, 2018

Size
Varies with device

Installs
100,000,000 -
500,000,000

Current Version
Varies with device

Requires Android
Varies with device

Content Rating
Everyone
Learn more

Interactive Elements
Users Interact, Digital
Purchases

In-app Products
$1.00 - $99.99 per item

Permissions
View details

Report
Flag as inappropriate

Offered By
Evernote Corporation

Developer
Visit website
Email appstore-evernote-android@evernote.com
Privacy Policy
305 Walnut Street
Redwood City, CA 94063

Category: Google Play uses different categories than the iTunes app store. For the sake of the search engine, we have decided to primarily use the iTunes app store categories. Please use your best judgment when translating the Google Play store's category to the iTunes store category.

Languages: Unfortunately, the Google Play store does not record the languages the app is offered in.

Cost: If an app is free, then the green button will say "Install"; otherwise, the button will show the price of the app.

If using the Google Play Store App, extra information can be found by pressing Read More in the description.

When you successfully fill out the form, the request is made. The app **IS NOT** automatically added to the public search results. It simply sends a request to the admins to approve the app. Once it is approved, then it will show up in the public search results. If you'd like, you can use the final text box in the request form to explain to the admins why you want this app added to the search engine.

Appendix B: Administrator Manual

AT App Search Engine Admin Tutorial
By the WPI Project Team
Version 1.0

Preface
This document shows how to edit, maintain, and add to the Assistive Technology App Search Engine. This service uses Microsoft Access and Caspio Web Platform. Internet access is required for using this service.

Organization of the Tutorial

Accessing AT App Search Engine
- Navigating to the Web Service

Editing AT App Search Engine
- Admin Login
- Admin Search
- Admin Results
- Approving, Updating, and Deleting Entries
- Where to Find an App's Information

Maintaining AT App Search Engine
- Back-End Mechanics
- Adding a New Disability or Language
- Moderating Comments
- Managing User Accounts

1. Accessing the AT App Search Engine

The public version of the database is hosted through the Caspio Web service. This allows it to be held at the following link:

http://bit.ly/2HPmoHy

By following this link you will be sent directly to the search form.

2. Editing the AT App Search Engine

Editing the database is an admin only function. It can be accessed by using the second link underneath the search button of the search form. Going into the edit form requires an admin login.

App name: [   ]

Approved apps? ○ Yes ○ No ⦿ All

Search

Once the admin has logged in, they will see the admin search form. It is incredibly simplified, since the admin should have the name of any given app in the database. The Approved Apps database lets the admin filter between apps that are pending approval and apps that are already made public in the database, or simply show all the apps in the database.

App name: ▷ Solitaire
Developer: Finger Arts
Cost: $0.00
Device: Smartphone, Tablet
Approved Yes

⤷ View Details

App name: 30/30
Developer: Binary Hammer
Cost: $0.00
Device: Smartphone, Tablet
Approved Yes

App name: 360 Thinking Time Tracker
Developer: Kristen Jacobson
Cost: $2.99
Device: Smartphone, Tablet
Approved Yes

App name: 4 Forms

Upon using the admin search function, they will see the results of their search. The system shows the admins the name, developer, cost, and device of the app, as well as if it has been approved to be on the public database. Hovering over the entry and clicking View Details shows all of the app's data fields, giving the admin the ability to update the app in the database or delete the entire entry. In order to approve the app in the public database, check the box next to 'Approved?' and press the update button.

Q Search Again

App name:	360 Thinking Time Tracker
Developer:	Kristen Jacobson
Category:	Education ⬍
Subcategory:	Time Management
Disability:	⬍
Cost:	2.99
In-app purchases?	0
Store:	⚪Apple iTunes ⚪Google Play ⚫iTunes App Store
Device:	⚪Smartphone ⚪Tablet ⚫Both
Store link:	https://itunes.apple.com/us/ap
In a bundle?	☐
Language	English
Approved?	☑

Update

Delete

Back

Editing the database has similar field behavior as searching and making add requests.

When approving an app to be viewed in the public search results, it is important that the information in the data entry be consistent with the app store it was obtained from. Most of the information for the apps are publicly available on the app store in some form. The following section will help you find the information from the iTunes app store.

Seeing AI `4+`
Talking Camera for the Blind
Microsoft Corporation

★★★★½ 102 Ratings
Free

App Name: The first bit of information on the app. It is in bold. Please copy the entire name of the app when filling the form out, as many apps have similar names and by doing so keeps the search results consistent.

Developer: The link is usually under the name, however, it is not necessarily the info immediately under the name, as some apps have brief descriptions underneath the app name. Like with app name, please copy the entire developer name (not the link itself). While people will not search by developer, this is still important information for each app.

> Thank you for such kind words. We are really
> encouraged at how you are finding this...
> more

Information

Seller	Microsoft Corporation
Size	292 MB
Category	Productivity
Compatibility	Requires iOS 10.0 or later. Compatible with iPhone, iPad, and iPod touch.
Languages	English
Age Rating	Rated 4+
Copyright	© 2017 Microsoft Corporation. All rights reserved.
Price	Free

Developer Website ↗   App Support ↗   Privacy Policy ↗

Category: Scroll down to the bottom of the app store (if in a browser) past the user reviews until you reach Information. The category of the app is how it is organized within the app store under incredibly generalized rules.

Subcategory: For this parameter, the user must use their own judgment, typically by reading the app's description. This parameter exists due to the vague nature of the Category parameter and a personal desire to help users find apps using a more specific parameter that the app stores' generalized categories.

Disability: Like subcategory, this requires the user's own judgment. The developers of the search engine have decided to only add disability fields if the app clearly states (in either the name itself or in the description) that the app specifically helps the given disability. This is because there are many apps in the search engine that can help in a general sense, but are not tailored for a specific set of disabilities. If the app is for a disability not currently in the given list, type the disability into the 'Other Disability' field; if there are multiple disabilities that you wish to add in this field, please separate them with commas.

Cost: How much the app costs to download (not necessarily how much the app costs to use). This can be found either at the top of the page under the rating (if there is a rating), or under Information at the price parameter.

In-app purchases: A yes or no question. If an app has in-app purchases, it will either state so next to the price at the top of the page or under the price in the Information section of the page. We don't specify what the in-app purchases are simply due to how many there can be for one app and how different they can be in functionality, ranging from purchasing the full version of an app, purchasing a subscription to a service, getting in-app credit, unlocking extra features, removing ads, etc.

Store: Which store you are viewing the app in. Both isn't an option simply because the differences in functionality, price, and version differences for a single app can desync the app's properties in the search engine.
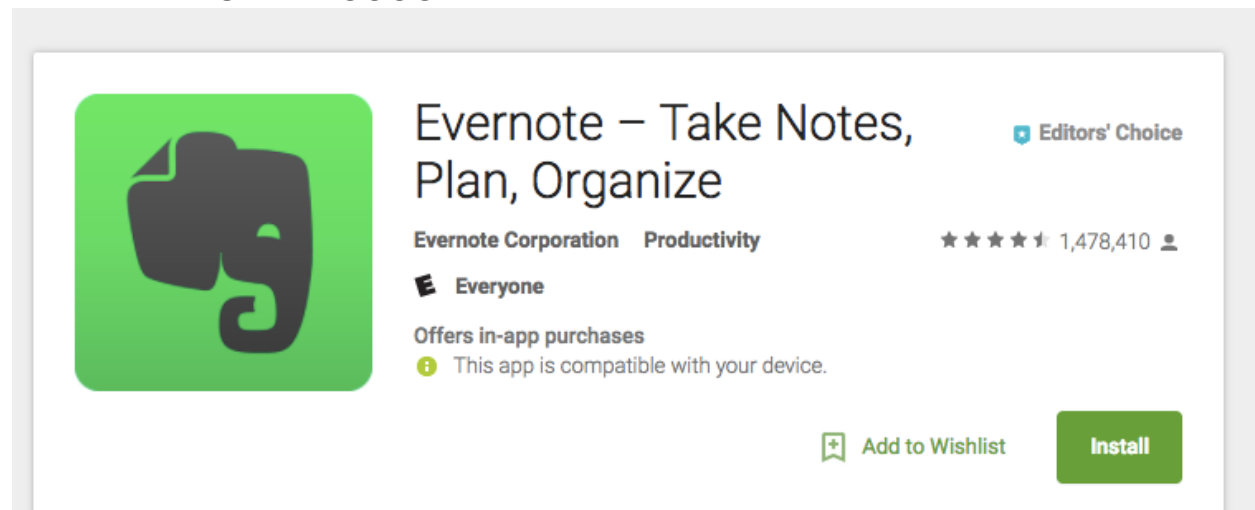
Device type: Which device the app is for. The information is clearly stated in the Information section under Compatibility. Alternatively, if there are screenshots of an app on a specific device (found immediately before the description, under the app name and other header information), then it is available for that device.

Store Link: Copy the entire URL from the top of the browser when on the app store (assuming you are in a browser and not the app store itself). This makes it easy for a user to find an app in the search results and immediately go to the app store from the search results. If you are in the iTunes app, press the ellipsis button and press copy link.

In a bundle: When searching for apps, you can sometimes find a collection that includes the app that you want. If a bundle exists that has this app in it, click on the checkbox to state that it is in a bundle.

Language: The languages that the app is available in. We only record the following languages: [INSERT LANGUAGES HERE]. This is because some apps have extensive lists of languages offered, some of which we don't expect to be very common. The languages offered are found in the Information section beneath the compatibility. If the app supports a language not currently in the given list, type the language into the 'Other Language' field; if there are multiple languages that you wish to add in this field, please separate them with commas.

DIFFERENCES WITH GOOGLE PLAY:

ADDITIONAL INFORMATION

Updated
February 7, 2018

Size
Varies with device

Installs
100,000,000 -
500,000,000

Current Version
Varies with device

Requires Android
Varies with device

Content Rating
Everyone
Learn more

Interactive Elements
Users Interact, Digital
Purchases

In-app Products
$1.00 - $99.99 per item

Permissions
View details

Report
Flag as inappropriate

Offered By
Evernote Corporation

Developer
Visit website
Email appstore-evernote-android@evernote.com
Privacy Policy
305 Walnut Street
Redwood City, CA 94063

Category: Google Play uses different categories than the iTunes app store. For the sake of the search engine, we have decided to primarily use the iTunes app store categories. Please use your best judgment when translating the Google Play store's category to the iTunes store category.

Languages: Unfortunately, the Google Play store does not record the languages the app is offered in.

Cost: If an app is free, then the green button will say "Install"; otherwise, the button will show the price of the app.

If using the Google Play Store App, extra information can be found by pressing Read More in the description.

Keep in mind that not all request forms will have all of the information for a given app. Before approving an app to be displayed in the public search results, please make sure that all of the fields are filled in so that the search function can actually find the apps a user may want.

3. Maintaining the AT App Search Engine

There may be cases when the disability or language the user wants to input is not listed in the dropdown menu. In situations like this, the user selects the "Other" choice, and manually types in the missing disability/language in a separate text field. The request email will include these new disabilities/languages.

To Add a New Disability or Language

Log in to Caspio, and open the AT Apps app. From here:

1. On the left sidebar, select *Tables*.
2. Hover over *ATApps*, and click *Open*.
3. At the top, you will see *Tables > ATApps*, and under that, three tabs named *Datasheet*, *Table Design*, and *Triggered Actions*. Click *Table Design.*
4. If you are adding a new disability, click on the text field named *disability*. If you are adding a new language, click on the text field named *language*.
5. On the right, there will be a list of disabilities/languages under *Options*. Scroll to the bottom of this list, and type the new disability/language you wish to add, and hit enter.
6. Just below, there are a few buttons. Sort the list alphabetically by clicking the following button (circled in red), and selecting *Sort A to Z*..
7. The "Other" option got mixed in the middle, so just click on the "Other" text field, and click the down arrow button (circled in blue) until it's at the bottom again.
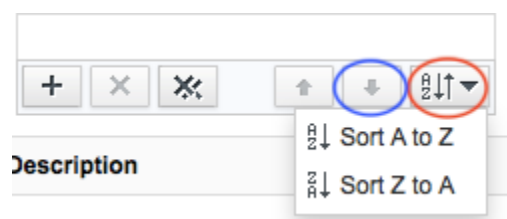
8. Where you clicked the *Table Design* button, right under is a *Save* button. Click it!

Your new disability/language has been added successfully.

To Delete Comments

1. Navigate to the comment page you wish to moderate.
2. Select the IntenseDebate button next to "Comment as a Guest, or login:…"

3. Log in with the provided credentials.
4. If you are redirected away from the page, head back to it.
5. Next to the comment you wish to delete, select *Delete*.

To Add User Accounts

1. On the left sidebar, select *Tables*.
2. Hover over *Accounts*, and click *Open*.
3. Click the *New* button, and type in a unique username.
4. Click the pencil icon in the password column and follow the instructions.

To Delete User Accounts

1. On the left sidebar, select *Tables*.
2. Hover over *Accounts*, and click *Open*.
3. Click the username of the account you wish to delete.
4. Click the *Delete* button.

To Edit Credentials of User Accounts

1. On the left sidebar, select *Tables*.
2. Hover over *Accounts*, and click *Open*.
3. To change the username, click the username of the account, and type in a new, unique username. To change the password, click the pencil icon in the password column of the account, and follow the instructions to change the password.

Caspio provides a cloud based platform for the database to be hosted on. The current site uses their free service. This provides 250MB monthly. This amount should be enough, however if this becomes a problem, there are some measures to be taken.

If the data transfer becomes an issue, there is the possibility to upgrade to the basic package for $59, which will double the limit to 500 MB. Remember to use the non-profit discount for 10% off the package.

Appendix C: AT App Use Survey

Assistive Technology App Use Survey

Greetings from the WPI Project Team responsible for creating a database for assistive technology (AT) apps. To get a better understanding of AT app usage and search habits, we invite you to participate in a ten-minute survey. Through this survey we hope to find categories of apps that are the most useful to focus our research on, and your response helps us tailor this database specifically for you. The information provided through this survey will not be shared with anyone and will be used only to provide direction for our research. Answer only questions you feel comfortable answering, and feel free to provide any additional information or questions in the text box at the bottom. We ask that you please complete this survey by the end of this week (Sunday, February 4, 2018, 11:59 PM).

How frequently do you use apps in the following categories?

	Not Used	Rarely Used	Sometimes Used	Often Used	Always Used
Reading	○	○	○	○	○
Reading (English as a Second Language)	○	○	○	○	○
Entertainment	○	○	○	○	○
Lifestyle	○	○	○	○	○
Games	○	○	○	○	○
Medical	○	○	○	○	○
Music & Audio	○	○	○	○	○
Scheduling (calendars, reminders, etc)	○	○	○	○	○
Communication/AAC	○	○	○	○	○
Sign Language	○	○	○	○	○
Task Analysis	○	○	○	○	○
Memory Aids	○	○	○	○	○
Functional Math	○	○	○	○	○
Recreation	○	○	○	○	○
Written Expression	○	○	○	○	○
Mechanics of Writing	○	○	○	○	○
Early Education Topics	○	○	○	○	○

Which categories of apps would you like to see more of in this database? Select all that apply.

- [ ] Reading
- [ ] Reading (English as a Second Language)
- [ ] Entertainment
- [ ] Lifestyle
- [ ] Games
- [ ] Medical
- [ ] Music & Audio
- [ ] Scheduling
- [ ] Communication/AAC
- [ ] Sign Language
- [ ] Task Analysis
- [ ] Memory Aids
- [ ] Functional Math
- [ ] Recreation
- [ ] Written Expression
- [ ] Mechanics of Writing
- [ ] Early Education Topics

Are there languages other than English that you are interested in apps supporting? If so, list them below.

Short answer text

Rate the following parameters on how important you consider them when searching for apps

	Not important	Marginally important	Somewhat important	Important	Very Important
Developer	○	○	○	○	○
App Category	○	○	○	○	○
Cost	○	○	○	○	○
Rating	○	○	○	○	○
Last Update	○	○	○	○	○
Data Collection	○	○	○	○	○
Voice Output	○	○	○	○	○
Print from App	○	○	○	○	○
Languages Available	○	○	○	○	○
Presence of ads/in-app purchases	○	○	○	○	○

Are there any other criteria you use when searching for an app? Please specify below.

This could be standard attributes like developer or broad category or more specific attributes such as speech output, age-appropriate interface, good for low-vision, no ads, in-app purchases, etc.

Short answer text

Would you rather search certain categories (i.e. reading/ESL, recreation, etc) by open response text or from a list of distinct choices?

○ Open response

○ List of distinct choices

○ Whichever gives me what I'm looking for

Would you rather view search results as distinct blocks of information or in a traditional spreadsheet format?

○ Blocks of data

○ Spreadsheet

○ Doesn't matter

○ Other...

Would you be willing to meet with our project team for a brief interview so that we can better understand your app usage at work? If so, please enter your email below.