

III. Framing

There are two main groups that interact in the assistive technology product searching space. The first group is the parent or caretaker of the person with a disability. The parent/caretaker is capable of accessing the Internet and has experience navigating through various websites to find the product that meets their child's needs. Each caretaker has their own methodology built up over time of how they search for products and what results to filter out in their mind as they shop for a very specific need. Some caretakers are more comfortable than others buying inaccessible products and making hacks or modifications to the product. The caretaker would like to be able to search for a product or resource for their dependent individual with ease, and be able to communicate with other caretakers to share tips and products that have been helpful.

The second group of people is occupational therapists and other professionals that work with people with disabilities with an understanding of accessible technology. Many occupational therapists may have an understanding of what accessible tools are helpful for their clients, but do not have the capability to acquire a modified toy or perform the modification themselves. Those that do have the knowledge and the therapy training can provide valuable information about solutions to making a product accessible, and the various use cases for an accessible tech product. They can provide updates to products and suggest different hacks that might be helpful to make a product usable for different ability levels.

Currently, there is no "perfect" solution that exists online to serve as an accessible technology resource library. Our occupational therapist needs expert helps to maintain an adapted toy lending library that loans various adapted toys and smaller parts, like switches to clients in their clinic but the scope is small and the website is not accessible or user friendly. Other resources that are currently online include makersmakingchange.com, a collaborative website in which users with experience modifying devices can share the designs they have created to make a product accessible. This website is more maker-centric and the language is hard for an end user with no hacking experience that is simply looking for a product to understand.

IV. Contextual Inquiry

Group 1 - Parent/Caretaker of Individual with a Disability

Our interview with Sanath Kumar Ramesh was extremely informative in understanding the process of finding suitable assistive technology from the perspective of a caretaker. Because Sanath's son's condition is very rare (only ~10 cases in the world), the challenges he shared with us are magnified even more when compared to disabilities that might have more existing research and literature.

Sanath expressed that one of the current challenges is that online information regarding assistive technology is not robust. Currently, part of his process in finding devices for his son is to purchase multiple versions of a device, bring them home, and identify which version is most suitable once his son is able to interact with them in person. He noted that while it is easy to tell when a device or toy is not suitable in person, it is difficult to determine online due to a lack of information about how each technology actually functions. For instance, Sanath's son's hypotonia (low muscle tone) might make certain buttons difficult to press--but something like button sensitivity is rarely described accurately, if at all, on a product page. Testing many versions of a product can also be taxing because it is unideal to repeatedly purchase and return items from a retailer like Amazon, and even when products are borrowed from institutions like the PNW Adapted Tech Library, many trips driving back and forth are not the best conditions either.

In Sanath's home environment, more factors he has to consider include the way that devices fit into the physical space. Sanath's son in particular uses an assistive chair and toys must be at eye-level for him to be able to interact with them. When searching for products, Sanath consequently looks for toys that not only friendly for conditions like hypotonia, but also compatible with these spatial considerations. And while the main piece of assistive technology Sanath has to think about is his son's assistive chair, other users may also need to think about further integration into home ecosystems that could include voice-activated devices or other important technology.

Besides purchasing adaptive devices, Sanath also has experience with hacking toys. However, hacking is a difficult task in itself. Hacking instructions are sparse on the internet, and even for a technically versed individual like Sanath (who is an engineer and has attended hacking workshops), instructions can often leave out information because the writer might be an expert who doesn't write about steps that to them seem obvious. As such, Sanath gathers a significant amount of help not from formal web-based resources, but from posting pictures and descriptions on community boards and Facebook groups. It's worth noting that even to that end, Sanath has still found it difficult to get connected to a network of other parents or therapists.

As such, Sanath expressed interest in a web resource that can provide relevant information about assistive technology as well as a platform for community interaction. He stressed that ultimately, the community aspect might be even more important than information or instructions. For instance, if he posted a picture of a circuit board and the connection he's trying to engineer for a hack, a community might be able to answer his questions better than any manual could, and there could even be online interaction between parties like OTs and caretakers. More specifically, a strong community platform could act as an extended library, where individuals can informally lend or donate devices to one another.

Group 2: Occupational Therapist / Accessible Technologist

Gabriel Laigo gave us the perspective of an occupational therapist that has experience running and maintaining the PNW Adapted Toy Library (ATL). From his experience in working with clients, the main problem is a lack of access to pre hacked toys, and people can't afford to buy a bunch of toys that potentially won't fit their child's needs. There is also a problem that switches are expensive and there is a technical barrier to hacking toys. The PNW Adaptive Toy Lending Library serves as a temporary and partial solution to the problem - it offers a mechanism for any Provail clients to borrow a modified toy for 1 month. However, the library requires much manual maintenance and the workload and paperwork required by the Provail staff is lengthy and scattered in different places.

Gabe walked us through their current process for accepting a loan request, the Google Form that the user must fill out, and the associated paperwork filled out by the clinic. The ATL has a "Checking Out Items" section on the main website which leads to a table displaying a photo of the toy and the toy name. There are 2 filters available, a filter on ability and a filter on the product type (toy, switch, misc). There is also a text input box for a word based search query but it was not functional. Gabe mentioned that the associated check out form was hard for users to notice and navigate to. Currently the sole environment that the ATL is used is when therapists in the Provail clinic recommend a toy to check out for their client, but they hope to scale to the public eventually. He mentioned that the clinic has had requests from interested individuals outside of the clinic to loan a toy, since the library is technically available to anyone in Washington state, but the clinic requires that the user must be able to visit their clinic in person in order to loan the device. The overall user interface of the ATL is really hard to use. There is no uniformity in what steps the user should take in order to enroll in the library, browse the library, and checkout a product.

The current ATL is built using Google's Awesome Tables. Our needs expert has found the table to be simple to use and easy to maintain, but there is a limit to how much that service can be done for free. The process for checking out a toy is hard and the end user usually requires assistance from a Provail clinic team member to complete the process. Those that are providing support for using the ATL are the Provail therapists or volunteers.

In the lens of the solution we are hoping to build, people like Gabe would help to provide database support by supplying the database with accurate information about each product. As a product needs expert, they play the role of user administrator on the product. So the motivations of the administrator is to securely and efficiently update the database with new product information. The database should be easy to manipulate and the user interface should be accessible. The preferred outcome of the end user is for the database to be updated without any

error. They may hope that their contribution to the database results in more users finding the right products that find their specialized needs. Other people involved would be the web developers responsible for supporting and maintaining the technical components of the website, like ensuring that the service is always running.

Gabe hopes that some features of the current ATL library related to the intake/outake forms would be improved. For his role, paperwork is a necessary part of the lending process, and he expressed interest in a more digitized format. He also hopes for more support in terms of maintaining the database, as the Awesome Tables solution is constrained by the free tier level of use.

V. Task Analysis

Goal 1: Users should be able to search for products that fit certain criteria (a taxonomy).

Description

The first interaction the user has with the library is a search bar that supports multi-word search queries and category/tag-based search. The application should process the query and find relevant products based on the backend taxonomy, which includes the physical constraints of the product, ability required: motor skills, computer software, mobility aids, educational aids, and modifications to the product (additional switches).

Example search query: "Adapted nerf gun", "Amazon Alexa with TTS enabled"

Subtasks

- Clearly identify the search bar on the landing screen. There should be:
 - A text field in which user can enter keywords
 - A dropdown menu from which user can select taxonomy-specific tags, such as "Hearing"
 - Selected tags should be displayed in an adjacent field, and should include an "X" button to deselect the tags
 - A "Search" button that can also be triggered by pressing the Enter key
- A search will bring the user to a page displaying all products matching the query that were retrieved from the database.
 - Each item returned will consist of the product name and a product image.

Goal 2: Users should be able to learn additional, relevant details about a selected product.

Description

Those looking through the library need to know additional details about a product in order to assess whether or not it will adequately assist an end-user's needs. There is a wide variety of associated information that is relevant, including product specs, purchasing/borrowing information, and so forth. This information should be easily found on a product page.

Subtasks

- Once a user clicks on a product image or title, they should be led to a page with additional details
- The following details should be displayed:
 - Photo(s) of the product, if available
 - Embed video demo of product, if available
 - Text-based product description and features
- Products tags should be displayed to indicate what search fields are associated with this product
- Usage information should be displayed
 - If there are certain ability levels needed for the product (sight, hearing, touch)
 - Technical specification of the products
- Users should have hyperlinks to external retailers, product lending programs, and product modification instructions, if available

Goal 3: Users should be able to share reviews and commentary for each product.

Description

As we discussed with our needs expert, assistive technology products are not one-size-fit-all. A product may have certain features that are difficult to accurately assess online (say, weight or to what degree a component can be adjusted), which may cause difficulties depending on a user's needs. Consequently, it is imperative that individuals searching for products are able to share reviews with one another, whether they're caretakers, professionals like OTs, or the end-users themselves. Furthermore, because the assistive tech community can vary in size depending on the commonality of an individual's condition, it may be useful for users to be able to connect with one another the attachment of user profiles to reviews.

Subtasks

- System will allow users to highlight the product they wish to comment on
- System will provide a text field in which user can type their review
 - There will be button for user to confirm their review posting
- Review will be displayed in a "comments section" on product page

- Username (link to profile info) will be attached to each review
- Authorized user can delete or edit their review

Goal 4: User Administrator should be able to easily add, modify, or delete product information

Description

From our conversation with our needs expert, we learned that not many people have the expertise of understanding accessible products and knowing how to modify products to fit specific needs. Our volunteer data providers should have a simple and efficient experience on the website to contribute or edit the database. The language used to convey the taxonomy and information required of the user administrator should be clear and cause no confusion on how the product data should be classified.

Subtasks

- The user will click on a button to upload a CSV file containing products and their descriptions in the agreed format. The System will process the CSV and add the new entries into the database.
- When logged in as an authenticated user, the user administrator can view products and access an Edit button to edit the product description. The System will process the changes to the product description and update the database for the specific product modified.

General Requirements and Dependencies

- Users may be unfamiliar with usage of technology. Search inputs and search button should be clearly identified and easily accessed.
- The website should be accessed via the Internet on any internet browser and on any device (desktop or mobile)
- Users may have visual disability. System should be compatible with screen readers.
- System commands (search, display product, upload reviews, etc) should be reasonably responsive, or otherwise indicate that they are unable to be processed.
- The system should provide a mechanism for the user to revert or modify their search at any time
- System should be available even if multiple users are using it concurrently.
- The database that the system depends on should have sufficient storage and reliably produce results without failure

Time and Resource Constraints

- Users must have internet access and a web enabled device
- The system is not as constrained by time as other systems that promise immediate results, but the system should produce results from a search query that is in line with the user's

expectations. The user should not feel like they have wasted time when they enter a query, if the returned results do not meet their needs.

- The database must be able to flexibly store a large catalog of products. We may want to store in the cloud with a flexible database schema (NoSQL)

Exceptions, Errors, Emergencies

- There may not be a product that fits the product-filter-inputs a user enters. In this case, a “No Product Matching Your Description” page should be displayed. The user should be directed to try another search on the home screen.
- The database may be unavailable, in which case users should see some kind of notice next to the search button or product display page. For instance, “Database currently unavailable. Please try again later.”
- If the feedback section of the website has crashed, there should be a message that notifies the user, like “Posting and viewing comments is currently unavailable, please try again later”
- If the library application crashes, users should be sent back to the home screen upon restore
- If the site administrator is unable to add new product listings, they should have a way to contact the website developers