



# WPI DDS

## Creating and Implementing an Assistive Technology Inventory System

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## Abstract

The Massachusetts Department of Developmental Services (DDS) has many Assistive Technology Centers (ATCs) that provide assistive technology, such as wheelchairs, shower chairs, and lifts, to over 47,000 people with disabilities both in and out of group homes across the state. The ATCs do not have a unified inventory system to keep track of equipment. This leads to equipment being lost and unavailable to be used by those who need it. The project's goal was to design and implement an inventory system that could be used by the DDS's central west division, with the plan to trial the system then utilize it across the entire state. With this inventory system, the DDS will save a significant amount of time, money, and effort in their efforts to locate and utilize equipment.

# Executive Summary

## Introduction

800,000 people in Massachusetts alone need expensive assistive technology to complete their daily tasks. These disabilities range from cognitive to physical, and assistive technology helps overcome some of the challenges they face in their lives. Unfortunately, some experience extreme difficulty obtaining this technology due to lack of supply, need for specialization, or extreme cost. To help with this problem, the Massachusetts Department of Developmental Services (DDS) Assistive Technology Centers (ATC) purchase, modify, and distribute these devices to those who need them across the state.

Prior to our project, the ATC relied on an out-of-date inventory management system that resulted in lost devices and hindered their mission to improve lives. To mitigate this our team researched existing solutions in other organizations, sat in on ATC team meetings, and utilized survey data to create a modern inventory management tool for the ATC to use.

## Methods

To achieve our goal of collaborating with the DDS ATC to create and implement an inventory tracking system, we assessed the ATC's needs and capabilities for implementing a system, evaluated inventory systems for other similar organizations, and finally created and tested a new inventory management system. To achieve these objectives, we utilized interviews, participant observation, and the Talk-Aloud protocol.

During the project, we conducted interviews with members of the Seven Hills Foundation and the WPI Gordon Library to learn what makes an inventory management system effective and respective challenges. We also interviewed ATC staff members both before and after creating our tool to gauge what they needed us to create and conducted interviews with ATC designers to learn about their jobs and the effect they have on people's lives.

In addition to interviews, we also learned about the ATC's needs through participant observation. We sat in on team meetings and discussed what features would be valuable in our system. The staff meetings typically included designers, the Worcester ATC director, the statewide ATC director as well as all members of our team. During these meetings one of the team members would always be taking notes to make a record of what should be included in creating our tool.

Following our tool's creation, we used the Talk-Aloud protocol to both train and get feedback on it to improve it for the next iteration. The Talk-Aloud protocol is a method of teaching someone how a process works. It involves the teacher using a process and saying out loud what they are doing at each step and why. After using the product, the learner then does the same thing talking out loud for each step as well. We studied how the staff members learned how to use the product

and looked for any possible problem areas that could be improved on to make the tool easier to use.

## Results and Deliverables

Based on our research, we had four major findings: designers at the ATC customize and revitalize equipment, inventory systems need to be intuitive and easy to access, working with state organizations with sensitive information creates constraints, and inventory systems vary greatly depending on the needs of the client.

In the DSS' case, they needed an inventory system that could track equipment as it moved across the Central West region of Massachusetts. The most prevalent need from a technical standpoint was that the system needed to be hosted via SharePoint. This would allow the system to be easily accessible to any member of the DDS that would need to use it.

One of the biggest issues the team ran into throughout the course of the project was the inability to gain the permissions needed to post code onto SharePoint. The initial system created by the team was unable to be utilized due to this limitation. The team changed directions by building a new system using a mixture of Microsoft Lists, Microsoft Power Automate, and Microsoft Forms. Using this new strategy, the team created an inventory system that can be used to track equipment as it moved through ATCs and group homes across the state.

The system utilized Microsoft List to store a variety of information about their assistive technology (AT), including, but not limited to, its current location, accessories, and availability. The team then utilized Microsoft Forms to input when AT was moved between locations. The form was then linked to the list via Power Automate. This allowed the system to successfully live on the DDS SharePoint site without encountering the same bureaucratic issues encountered with the previous attempt. Images of the system implemented can be seen in Figures A and B below.

**Figure A**

A Microsoft form used by DDS employees to move equipment from one location to another, created by the team.

**ATC Inventory Move AT Form**

\* Required

1. Item ID \*

Enter your answer

2. Enter Program \*

CRS

TCS

CSS

**Figure B**

The Microsoft List, displaying inventory items across the Central West ATCs and group homes.

Item ID	ATType	Types	Location	OriginationDate	SerialNumber	Manufacturer	Model	Bat
2000	Lift	Patient		4/12/24	Er600-209	Hoyer	Hpi-600	Sla
2001	Showerchair	Tilt		4/12/24	Rat-110191	RAZ	Rat	
2002	Showerchair	Tilt	1830	4/12/24	Rat-104019	RAZ	Rat	
2003	Wheelchair	Tilt	1700	4/12/24	Irse-089494	Quickie	Iris	
2004	Wheelchair	Standard		4/12/24	Qxi-030759	Quickie	Qxi	
2005	Wheelchair	Standard	1700	4/12/24	Q2v-062083	Quickie	Quickie 2	

Due to the overwhelming want for an inventory system at the DDS, its implementation became relatively easy. We began by running an in-person training course for those who would be in contact with the system. We then created an instructional manual describing how to both utilize the system and how to edit it, allowing it to remain sustainable as time goes by. This manual was distributed to anybody who would be using the system.

## Recommendations

In the future, we recommend a few strategies to be deployed to enforce the use of the system:

1. Review Data and Usage of Tool: conduct check-ins and continue training.
2. Training with Onboarding: train newcoming employees.
3. Universal Method of ID Generation: unified process of giving item IDs to equipment.
4. Share System with Other Regions: share the inventory system with other ATC locations.

In the end, the team was able to successfully create and implement an inventory system. This system met the needs of the DDS and is adaptable to changes in the future. With the help of members of the DDS such as our sponsor, the system is now able to be used by employees across the Central West region of Massachusetts.

## Acknowledgements

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Finding 3	Sean Thornton
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Recommendation 1	Sean Thornton
Recommendation 2 & 3	Kerstin Andrews
Recommendation 4	Amanda Haner
Conclusion	Kerstin Andrews
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## I. Introduction

A person unable to walk needs a wheelchair to complete their daily tasks. Unfortunately, the wheelchair this person needs costs 50,000 dollars, a purchase that they simply cannot afford out of pocket. This tragic story is relevant to more than one billion people living with disabilities around the world, with over 800,000 of those individuals living in the state of Massachusetts (NiDILRR, 2023). These disabilities can range from cognitive to physical and can cause disabled individuals to face uncountable challenges in their lives. Assistive technology is used to overcome these challenges and enhance the functioning of people with disabilities.

Some individuals who need assistive technology encounter difficulties while trying to obtain, due to high costs and lack of supply. To help with this challenge, the Massachusetts Department of Developmental Services (DDS) has many Assistive Technology Centers (ATC) throughout the state to supply these resources for free to those who need them. The ATC is a state-run organization that refurbishes, stores, and distributes assistive technology to over 47,000 people who live with disabilities across the state of Massachusetts (Mass.gov, 2023). Currently, the ATC relies on an out-of-date inventory management system, leading to issues with keeping track of supply and hindering its mission.

To help address this problem, our project studied the ATC's current inventory management system to prototype a revamped inventory tracking tool. A background on basic concepts of assistive technology, inventory management principles, and inventory management software is provided below in our second chapter. We achieved our goal by interviewing employees of the ATC and other similar companies to learn the requirements of an inventory system, performed environmental scans on inventory systems that exist within the industry, improved that system via feedback from ATC employees, and finally implemented the inventory system at the DDS.

## II. Background

### What is Assistive Technology?

People with disabilities frequently face several barriers in their everyday lives that lead to challenges in their daily living. Barriers are any factor in an individual's environment that limits their functions and creates disability, either through their absence or presence (Centers for Disease Control and Prevention [CDC], 2024). Many types of barriers exist, however, the most common seven include attitudinal, communication, physical, policy, programmatic, social, and transportation (CDC, 2024).

Some of these barriers, such as physical, communication, and transportation, can be overcome through assistive technology (AT). Assistive technology is any piece of equipment or device that increases the independence of individuals with disabilities, either physical or cognitive, and helps people improve or at the very least, maintain their functional capabilities and overall abilities (Department of Developmental Services [DDS], 2024). AT minimizes an individual's disability and their need for assistance when used in daily living and encourages meaningful participation in society, which can promote a higher quality of life (Ashton, 2003). Devices can range from something as simple as a pencil grip or cane to more complex high-tech items, such as battery-operated wheelchairs, hearing aids, or prosthetics.

Besides the benefits of increased body function of people with disabilities, assistive technology has also proven beneficial in many life areas, especially in the socioeconomic domain (Borg et al., 2009). Socioeconomic benefits of assistive products can include reduced health and welfare costs, such as hospital admissions or state benefits; for example, the frequent hospitalizations of an individual with pressure sores or urinary tract infections can be reduced by access to a wheelchair with proper cushioning (World Health Organization [WHO] & United Nations Children's Fund [UNICEF], 2022). Another socioeconomic benefit is the increase in employee productivity, which benefits not only the disabled individual but also the company by indirectly stimulating economic growth, and the increase of an individual's lifetime earning potential (WHO & UNICEF, 2022). Socioeconomic benefits are just one area; the implementation and use of AT also promotes benefits in education, mental health, social relationships, and many other domains. Figure 1 summarizes the main benefits of assistive technology at an individual, community, and society level.

**Figure 1**  
*Benefits of AT for individuals, community, and society.*



*Note.* From *Global report on assistive technology*, by WHO & UNICEF, 2022. (<https://iris.who.int/bitstream/handle/10665/354357/9789240049451-eng.pdf>). CC BY-NC-SA 3.0 IGO.

There is a high demand for assistive technology across the globe. Around 15% of the world's population, or roughly 1 billion people, live with disabilities (Muhammad et al., 2015). There is a wide variety of AT available worldwide; however, a lot of the more complex assistive technology in the market is expensive. Mid-cost AT sells for between \$1,500 to \$15,000 per item while high-cost AT is valued at over \$15,000 per item (National Disability Insurance Agency [NDIS], 2023). The average person will not be able to afford that out of pocket, especially if they need more than one piece of equipment to aid with their disability.

## Assistive Technology Policies

There are policies in place, both internationally and federally in the United States, which make it easier for disabled individuals to access assistive technology. In 2006, the United Nations (UN) adopted the Conventions on the Rights of Persons with Disabilities (CRPD) in response to disabled persons' basic human rights being routinely denied (Borg et al., 2010). It is a fifty-article international policy whose purpose is to "promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, and to promote respect for their inherent dignity" (UN, 2006, para. 16). Assistive technology is

mentioned in various articles of the policy; article four specifically commits governments to promote the development and availability of new technologies at an affordable cost to disabled persons (UN, 2006). In 2022, the United States reauthorized the Assistive Technology Act (AT Act), adding modernized updates to the policy. There are two main purposes behind the AT Act. The first is to support State efforts to provide AT to disabled people of any age through statewide programs and the second is to provide States with financial support that maximizes the ability of programs to supply assistive technology to disabled individuals (Association of Assistive Technology Act Programs [ATAP], 2022).

In simple terms, both the CRPD and the 21<sup>st</sup> Century AT Act state that people with disabilities have the basic human right to access available and affordable assistive technology. These policies are the reason that organizations like the DDS Assistive Technology Centers exist and can supply these resources to the public for free. To supply these services, these facilities need to keep an accurate and efficient inventory tracking system, paying attention to what is being lent out, what is coming back in, if there's damage, their stock, and all of that is where inventory management comes into play.

## Inventory Management

Inventory management is vital to a wide range of companies and organizations. Inventory management can be described as the receiving, tracking, and storing of products. It differs from something such as supply chain management, which is the development of raw goods to a final product (Fabregas, 2023). Inventory management can be expressed with a wide variety of techniques and principles.

There are three main principles that exist within inventory management: demand, supply, and uncertainty. Firstly, demand is the “want” of a product from a consumer. Demand is essentially how many people want to buy a certain product from a company. Supply refers to a company’s ability to produce and distribute a particular product. Supply is inherently linked to inventory control, as it dictates how much of a certain product should be stored at any given point in time. Uncertainty is the final principle; it refers to the inherent unpredictability behind demand (Dooley, 2005). Uncertainty shows that it is difficult to guess how much of a demand a product will change in the now, versus days, months, or even years from the present (de Armas et al., 2021). As an example, one can look into the sale of cans of peas at a grocery store. Demand would be the amount of people wanting those peas, supply would be the number of canned peas a grocery store should keep in its storage to meet the demand of its customers, and uncertainty refers to a change in demand for peas. For example, canned peas might briefly become incredibly popular if a hurricane is approaching but might drop dramatically in demand once the event is over. On the other hand, there could just be a week where people coincidentally all want canned peas, versus another where nobody wants them at all.

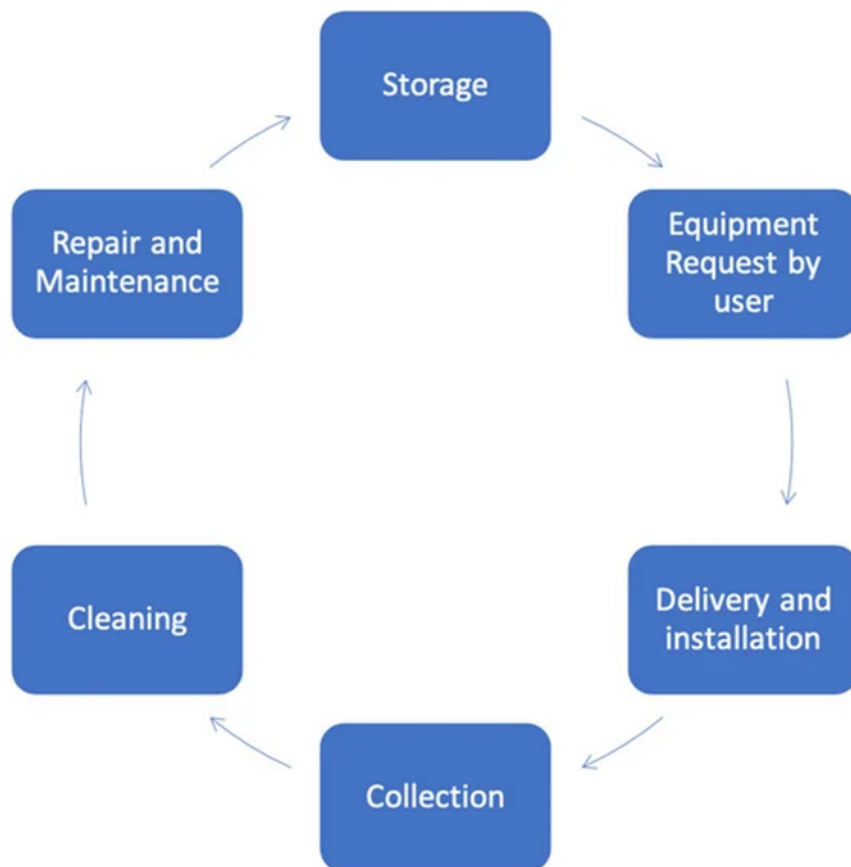
Working closely with other departments, locations, and suppliers, also known as employing a multi-echelon system, can also help manage inventory more efficiently. Large-scale companies

tend to employ multi-echelon systems to optimize their productivity. These same principles can be applied to smaller operations as well. Rather than focusing specifically on the inventory at one location in a chain, it tends to be more efficient in looking at inventory across locations. This model of inventory system would not only analyze trends of demand, supply, and uncertainty from a singular location but would also analyze these trends across the whole system. Using a multi-echelon model would also utilize the transfer of inventory from one location to another, preventing stockout and minimizing cost due to preventing the need for purchasing new items (Farasyn et al., 2011). In the case of AT distribution, a multi-echelon system could refer to loaning equipment between locations, not dissimilar to a library.

AT distribution centers focus on giving assistive technology to those who need it. The AT distributed to consumers is loaned, sometimes long-term or short-term. Because of this, a significant amount of equipment that is sent out is eventually returned, repaired, and reused by another consumer (de Armas et al., 2021). This circular distribution model can be seen in Figure 2.

**Figure 2**

*A circular inventory model at a Barcelona AT distributor.*



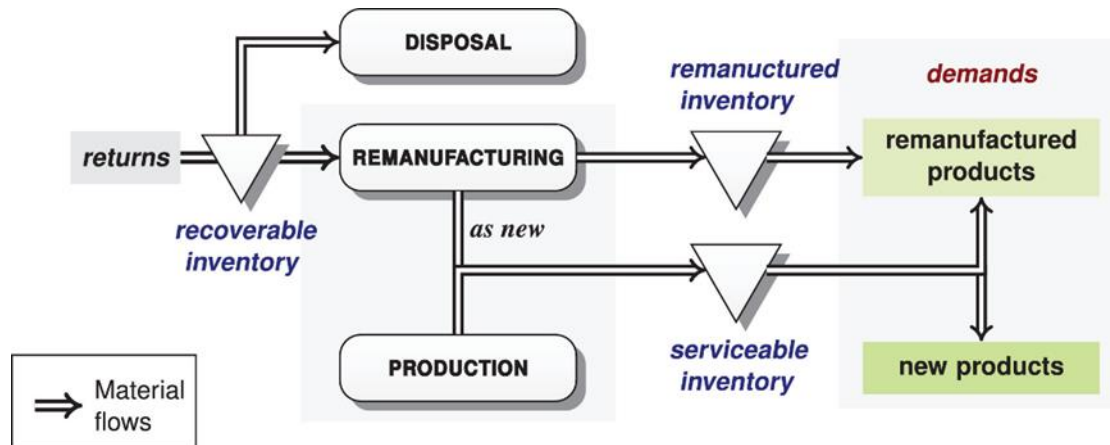
*Note.* From *Optimizing Assistive Technology Operations for Aging Populations*, by de Armas et al., 2021. (<https://doi.org/10.3390/su13126925>)



This circular model allows for costs to be minimized by reducing the number of new technologies being bought. This can be considered an example of Circular Economy (CE), which focuses on recycling and revitalizing returning products to promote sustainability. There are three pillars within CE: economic, environmental, and social. Much of the literature focuses on the environmental aspect, but the economic and social pillars are vital to AT distribution. The economic and social pillars refer to preventing/avoiding disposal costs and the impact on regional development, respectively (Suzanne et al., 2020). Figure 3 offers an alternative diagram perspective to CE. CE systems in AT management can help significantly reduce costs by avoiding purchasing AT equipment. CE allows for less production cost due to upcycling materials, allowing organizations to save a significant amount of money (“Ellen MacArthur Foundation,” n.d.).

**Figure 3**

*A diagram demonstrating CE, showcasing a flowchart of what happens to a returned product.*



*Note.* From *Towards circular economy in production planning: Challenges and opportunities*, by Suzanne et al., 2020. (<https://doi.org/10.1016/j.ejor.2020.04.043>)

As complexity grows in systems that use techniques such as CE, an efficient inventory management system becomes crucial in both saving time and money. Certain techniques can be employed to increase the efficiency of an inventory system. Consistency is key when employing inventory techniques. Internal tracking systems such as SKUs (stock-keeping units) can help keep inventory consistent. SKUs work by systematically giving unique codes to each product. There are also UPCs (universal product code) that come from the supplier that can also be used to track product (Fabregas, 2023). Utilizing inventory technology allows for greater ease while taking inventory. Making use of software or barcodes can add ease to the inventory process (Caramela, 2023). Barcodes can be created using a wide range of applications such as excel, online programs, Mac or PC applications, or inventory management programs designed specifically to make them. There are two main categories of barcodes: 1D and 2D, e.g. the black and white lines you would find on a product at the store, and QR codes. Barcodes can be

incredibly helpful in the inventorying process, as they eliminate a significant amount of human error. (Marker, 2021).

## Implementation of Inventory Systems

Properly implemented software is an effective tool for inventory management. Software can assist in solving many of the difficulties when working with inventory management, such as knowing when to order stock to reduce the costs of storing a product and to prevent instances when a product is sold out (Лозовська & Бандоріна, 2022). By preventing overstocking and understocking, the software can avoid unnecessary costs to an organization. Also, by allowing the software to complete these tasks automatically, it speeds up and simplifies the employees' jobs, allowing for the organization to be more productive (Лозовська & Бандоріна, 2022). A productive organization will be able to move their product more efficiently, which would result in more consumers having the items that they need. For organizations with multiple distribution centers, inventory management software becomes essential for smooth operation. Using software that works on a server allows organizations to keep a live updated record of their inventory and use that information to correctly adapt to their current situation in real-time (Thanjaivadivel & Singh, 2012). If an organization were to instead use a non-software option, then there would be a much longer delay in the exchange of information, resulting in the organization not being able to react and adapt to information as quickly and effectively. Overall, software is an effective, if not the best, option for an inventory management system.

Furthermore, optimization of software and a focus on ease of use is essential in building a system that works effectively and efficiently for an extended period. First, high quality code will result in a better product that lasts longer. High quality software will have fewer bugs and be easier to use resulting in a longer life span. It is important to take care to focus on usability when creating the software because if it is hard to explain or learn how to use it then it is more likely that it will be misused in the future (de Armas et al., 2021). The focus on ease of use and high-quality software will result in a better product in the end. This can be achieved with the idea that the simplest solution is often the best. Overengineered software can be subject to bugs, and it will be harder to fix these bugs because the code is harder to read (de Armas et al., 2021). This would result in the software being replaced sooner as if there is a bug that results in the software being rendered unusable then it cannot be fixed easily, resulting in the software being replaced. Another method of optimizing the user experience is programming the software to do as much for the user as it can (Dooley, 2005). This allows for the user to have a better and simpler experience, preventing misuse of the software. These optimizations to the software and user interface will allow for a system that better serves all types of users.

User Interfaces (UIs) are also critical for an effective inventory management system. UI encompasses both the visual aspects of a site and how a user interacts and gathers information from it. An effective UI anticipates how a user will use a program. It allows the interface to be

easy to access, understand, and complete tasks. Some examples of elements that can be used in an interface are input controls, such as text input and buttons; navigational components, such as search fields and pagination; and containers, such as accordions (Usability, 2024).

#### Figure 4

*An example of an accordion container used in UI for information organization.*



*Note.* From *UI cheat sheet: Accordions*, by Gadd 2021 (<https://uxdesign.cc/ui-cheat-sheet-accordions-3e88f0d4dfce>).

There are many aspects of UI that can make it effective. In summary, an effective UI is simple, consistent, purposeful in its spacing and layout, strategic in color, strategic in typography, clear in communicating its functions, and anticipating the goals of the typical user. For example, a designer can utilize a change in color to draw the user's eyes to an important element on the page. Large font sizes can indicate the title of a section and keep information organized. Page organization can lead the user on a journey, taking their eyes from one important section to the next (Usability, 2024). These same principles also make the program accessible to those using the website who may have disabilities. For example, color choice might affect someone who is colorblind, and both color and font choice might affect someone who's visually impaired. Effective UI holds these aspects in mind during the design process (Zeuner, 2020). UI also should keep in mind cognitive load, or the amount of information the human brain can handle during a specific period of time. It should keep information brief and organized. Interface tools such as the tabs can also help reduce visual clutter (Berkeley Extension, 2021).

Better inventory management software is important when improving the quality of life for those who need assistive technology. First, the quality of the delivery process has a major effect on the satisfaction of the assistive technology. The entire process of the service delivery process influences the user's satisfaction with the product (Ranada & Lidström, 2019). This is important to keep in mind because inventory management is essential in delivering the technology to the user as efficiently as possible and if it takes too long then the user will be unsatisfied with the

technology. The focus on ease of use and high-quality code will allow for a higher level of satisfaction with assistive technology.

## The Project

To those who need it, assistive technology is a vital part of improving the quality of life. In Massachusetts, those with a need for AT are helped by legislation and government agencies that distribute these different types of devices. According to the National Institute on Disability, Independent Living, and Rehabilitation Research (NiDILRR), over 800,000 people live with disabilities in Massachusetts, which is approximately 11.6% of the state's population, with Worcester and Middlesex counties having the highest number of disabled persons. The Massachusetts Department of Developmental Services Assistive Technology Centers help distribute these devices across the state to these individuals. To better supply these technologies, the ATC reached out to the Worcester Polytechnic Institute (WPI)'s Worcester Community Project Center to ask for a student team to help develop a new inventory management system.

As a result, the goal of our project was to create and implement a sustainable inventory tracking system for assistive technology for the Department of Developmental Services Assistive Technology Centers. To achieve this, an understanding of the principles of inventory management and knowledge of how to implement them into software was required. In addition, we needed an understanding of how the system previously in place at the ATC worked and what our new system needed to improve on, which will be discussed in the next chapter.

### III. Methodology

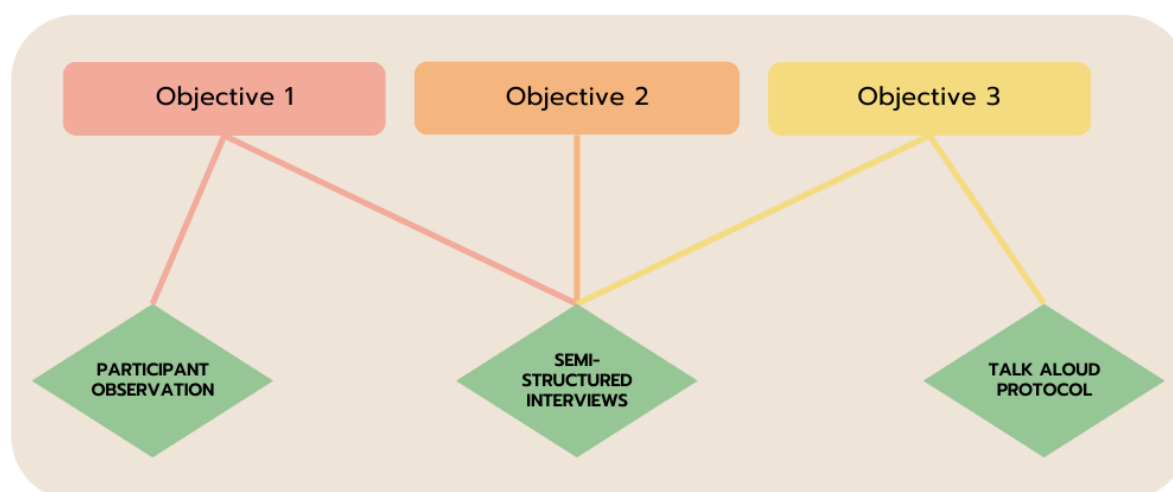
The goal of this project was to collaborate with the Department of Developmental Services Assistive Technology Centers (DDS ATC) to create and implement a sustainable inventory tracking system for assistive technology. To achieve this goal, our objectives were to:

1. Assess the ATC's needs and capacities to implement an inventory system.
2. Evaluate and compare inventory systems from similar organizations.
3. Create and test an inventory system compatible with Microsoft Office.

To achieve our objectives, we used a variety of methods, including semi-structured interviews, participant observation, an environmental scan, and talk-aloud protocol. Figure 5 below maps out the project's objectives and the methods used to complete them. An outline of the project timeline can be found in Appendix D.

**Figure 5**

*Methods Diagram*



#### Method 1: Semi-Structured Interviews

Over the course of the project, we conducted a total of 6 interviews on three key areas to increase our knowledge on what makes an efficient and sustainable inventory tracking system.

Throughout weeks one and two, we interviewed employees of the ATC, including Northampton designers, physical therapists, and directors, to understand what the respondents wanted to see in the system our team created. Throughout weeks two and three, we interviewed staff of similar organizations that utilize loaning inventory systems, such as the Seven Hills Foundation and the WPI Gordon Library, to learn what makes an efficient inventory system. In week six, we again interviewed staff members of the ATC, where they provided us with feedback on the first iteration of the inventory management tool.

We used a semi-structured interview technique that kept the interviews controlled enough to stay relevant to the topics at hand while also allowing freedom to digress and bring up new topics and questions to be discussed (Berg & Lune, 2012). Interviews lasted around 30-60 minutes. All three team members were present during each interview; two members facilitated the interviews while the remaining member took notes and recorded the interviews. The presence of all team members made it possible to collect more information per unit time than if only one of us were there (Beebe, 2014). The member in charge of recording the interviews asked for verbal consent. The first couple of questions were general and non-threatening to establish rapport between us and the respondents (Berg & Lune, 2012).

The ATC employee interviews took place over Teams meetings. Some questions included “Are there any specific goals or features you would like to see in a future inventory management system to enhance overall operations?” and “Are there any specific concerns or challenges you foresee in transitioning to a new inventory management system?” A full list of interview questions can be found in Appendix A. The outside organization interviews took place in person at Seven Hills Foundation and The WPI Gordan Library. Some questions included “Can you provide an overview of your inventory management system? What are its key features?” and “How does your system track products? How does it track damaged or unusable products?” A full list of questions can be found in Appendix B. The feedback interviews took place at the ATC. Questions included “Did the software functions that you used work to your standard? If not, what could be improved? What was not working?” and “Did the user interface make sense? Were there components that were difficult to follow or understand?” A complete list of questions can be found in Appendix C.

Throughout our data collection, team members took interview transcripts/notes and developed a log, a more condensed format ready for analysis. Logs were prepared and added upon within 24 hours of the interviews. Before analysis, team members read each log, then convened and discussed their findings while comparing the logs.

We then coded and categorized our logs. To code and categorize our data, we looked for recurring words and phrases that were associated with the topics at hand (Beebe, 2014). For the ATC employee interviews, we looked for recurring words and phrases that were associated with what they were looking for in a future system. For the outside organization interviews, we searched for common themes and features across different inventory systems used by these facilities. Lastly, for the feedback interviews, we examined recurring words and phrases to understand what could have been improved and what worked in the inventory management prototype created. Our coding was an ongoing process and continuously evolved throughout the project (Beebe, 2014). Our team organized certain data into a better display, specifically graphics, to compress our data that made drawing conclusions easier. The next elements in our

analysis were to draw conclusions and generate meaning from our data (Beebe, 2014). The responses from all three types of interviews aided us when creating an inventory management system that they implemented.

## Method 2: Participant Observation

During weeks one through six, we utilized participant observation by taking a tour of the facility, working independently on site, and sitting in on and participating in ATC staff meetings. Over the course of six weeks, we spent on average 4 hours a week at the ATC. The staff meetings typically included designers, the Worcester ATC director, the statewide ATC director, etc. Participant observation requires more than just being there passively (Beebe, 2014). It allowed us access to backstage culture and to report on unscheduled behaviors and discussions (Munck, 1998). These meetings included lots of discussion and debates between employees that gave us insight into what should and should not be included within their inventory management system. We were also able to participate in these meetings, providing our own suggestions and asking questions and clarifications to help guide the conversation. A team member took notes that included information we observed, along with our comments, questions, and thoughts. We analyzed the data from these meetings through coding analysis as outlined in Method 1, looking for trends and common themes on what should be included in the inventory management system.

## Method 3: Talk Aloud Protocol

After we created the inventory management tool, we used the Talk-Aloud protocol to teach staff how to use it and to evaluate their understanding of it. The Talk-Aloud protocol is used when evaluating a user interface. It works by a subject using software while explaining what they are doing to an observer who is taking notes (Hoyler, 1993). We recorded the screen using screen recording software to review later. To train the staff members, one team member would use the software and explain aloud what we were doing and why. Either in a group or individually, staff members acted as observers and took notes, learning how to use the software we created. After we instructed them, we debriefed and then reversed the roles. Staff then demonstrated what they learned to the team by repeating what we did. This demonstration helped us learn how intuitive the user interface was and where possible weak points could be for us to improve on a further iteration. We looked at the notes taken during the Talk Aloud protocol to see if there is a common place where staff members struggled to learn how to use the software. After the Talk Aloud protocol was complete, we conducted a feedback interview, as seen in Method 1.



## IV. Findings

When one walks into the Worcester ATC's workshop, the floor is crowded with wheelchairs and walkers in varying stages of customization. Designers and technicians are bustling around the workshop modifying and adapting AT equipment. The four AT centers across Massachusetts carry out almost 2,000 work orders per year, most of them for their residential group homes (Laughlin, 2023). Their work, however, often gets lost or hard to track. The AT Centers do not have an inventory tracking system for their assistive technology, which makes it hard to know where their equipment is at any given time. Their AT is kept in parking lots, workshops, residential group homes, basements, etc., and without an inventory system, it is hard for the centers to manage every piece of equipment. Locating their AT is critical, especially when an emergency arises, and they need certain equipment immediately.

The DDS ATC needs an inventory management system that is intuitive and easy for staff members to use in the field to keep track of their equipment. This chapter presents our findings from our collaboration with the DSS to create an inventory system that fits their needs.

### Finding #1: Customization is an important part of the designers' job

A big part of the ATC's designers' job is customization. Assistive technology customization is a necessary requirement for disabled individuals whose bodies or needs do not automatically work with off-the-shelf products. One of these projects changed the lives of a young boy and his mother. The child's ability was fading fast, and he was no longer able to stand, losing the function of his torso. This loss of function prevented the boy from doing what he loved: pulling up a stool and helping his mother cook at the kitchen counters. Worcester designers were able to modify a gait trainer; this adapted piece of equipment was able to be put onto the boy's stool, so he could continue helping his mom.

Another customization project took place in the heart of Massachusetts, where a man lived with ALS, a neurodegenerative disease that slowly causes a person to lose muscle control in their body. His wife spent day in and day out worrying about him as he gradually lost the ability to change the channel on the television, to move, to speak. She constantly worried about her ability to help him as his health declined, becoming more dependent upon her. Both were stuck in a cycle of losing their independence, growing worse as the days went by.

The case was eventually brought to the designers at the Worcester ATC. The pair was faced with a difficult challenge, but they worked with each other's strengths to find a solution to help the man. Together, they refitted a tennis ball to act as a remote. This tennis ball was fitted to his bedside, connected to a network of controls. This remote utilized the same technology as a cell phone vibration. He could squeeze the remote to activate it and it would then vibrate a certain number of times. Squeezing it after a determined number of vibrations allowed him control over

a variety of functions, e.g. controlling his bed, operating the TV, and calling his wife if needed. Due to the programs run by the DDS, the pair gained their independence back.

These stories, along with countless others, demonstrate the value of the ATC's work, making a huge difference in a lot of people's lives. Implementing an inventory tracking system will make it easier for the ATC to manage and note these customization projects, ensuring that their hard work and dedication does not go to waste. The location feature will help designers keep track of their customizations, decreasing the chance of losing that progress and having to remake it, while the notes and accessories features will record specific details of their modifications, in case they want to replicate a past project or allow for future employees to see.

## Finding #2: Inventory systems need to be intuitive and easy to access

During our time with the DDS, there was one major theme: they needed an inventory system that everybody at their organization could and would unanimously use. Issues arose when a system was attempted in the past, one employee even mentioned he started trying to keep track of inventory using an excel spreadsheet, but there was no unified inventory system used within the organization when it came to tracking equipment in their homes.

Having an inventory system that is intuitive is crucial for widespread use across employees. A more convoluted system becomes incredibly difficult for an employee to utilize it. For example, one of the issues mentioned most within an interview with the Seven Hills Foundation, a similar AT distribution organization, was that inputting and changing equipment in their system was incredibly difficult and frustrating to do. When interviewing librarians from the Gordon Library, they mentioned it took years to become fluent with the system that they utilize, and even then, they became knowledgeable in specialized areas of the system. The DDS requires a system that can be easily used by many therapists and designers. An inventory system that is easy to learn and operate would lead to less frustration and more widespread use across employees.

## Finding #3: Working with sensitive information and state organizations creates constraints

In addition, while working with the DDS we learned that systems that they create have specific needs in the features of the software itself and how the software is created. These were important to keep in mind when creating our inventory management tool for the ATC.

Furthermore, we learned the limitations of working in a governmental organization. We began development of our inventory management tool using React.js with plans of hosting it on the DDS SharePoint site and accessing a JSON file on the same site acting as our database.

Additional permissions were needed to host the site and edit the JSON file stored on SharePoint using JavaScript. We requested these permissions from the Massachusetts IT department through our sponsor. Unfortunately, we did not hear back from the IT department for two weeks, where we learned the first drawback of working in a government organization, information moves slowly. Next, we learned another drawback of working in a government organization with the information we received from the IT department. We were informed that we could not be given permission to run scripts on the DDS SharePoint nor have access to edit a file stored on it using JavaScript for security reasons. The combination of this and not learning about it 3 weeks into the project resulted in our near complete inventory management tool being shelved. The code for this tool can be found in Appendix E.

#### Finding #4: Inventory systems vary greatly depending on the needs of the client

First, we learned about the specific needs of what the inventory management tool could do and what information is stored. During our participant observation where we sat in and participated in meetings with staff members at the DDS ATC, we learned that the system we would be creating would have a lot of different fields for each assistive technology entered into it. We compared this to some of the inventory systems of other organizations that we talked to and learned that the system for the DDS would have to be much more in depth.

The DDS requires a system that is simple and intuitive for the user, with the overall goal of utilizing little to no training to understand the system. However, other systems differ from these concepts. As mentioned in Finding #2, the librarians from the Gordon Library had commented that it took a significant amount of time to become fluent in the system utilized by their organization. However, the library's system is in control of nearly every aspect of daily activities. It keeps track of loaned items, generates analytics based on those items, generates emails, works in tandem with other programs (such as workday) utilized by WPI, and more. The deep complexity of the system is inevitable for the tasks it performs; thus, a large learning curve is necessary in this scenario.

After many meetings with DDS members, our group began creating another inventory system. We learned what the DDS wanted a system to keep track of equipment moving in and out of group homes across the Central West region of Massachusetts. The goal was to create a system that tracked features of equipment, availability of equipment, current location of equipment, and with the overall ability for members of the DDS to be able to move the equipment from one location to another. A brief overview of equipment features can be seen in Table 1. A further breakdown of needs can be found in Appendix G.

**Figure 6**

*An overview of features the members of the ATC requested to be tracked within the inventory system.*

	Lifts	Wheelchairs	Showerchairs
Features	<ul style="list-style-type: none"> <li>• Lift type</li> <li>• Battery type               <ul style="list-style-type: none"> <li>○ Battery date</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Wheelchair type</li> <li>• Power</li> <li>• Size               <ul style="list-style-type: none"> <li>○ Seat width</li> <li>○ Seat depth</li> <li>○ Seat to floor height</li> <li>○ Wheel size</li> </ul> </li> <li>• Cushion type</li> <li>• Headrest</li> <li>• Leg-rest type</li> <li>• Back type</li> </ul>	<ul style="list-style-type: none"> <li>• Shower chair type</li> <li>• Size               <ul style="list-style-type: none"> <li>○ Seat width</li> <li>○ Seat depth</li> </ul> </li> </ul>

Employees at the DDS also had requirements of the system beyond tracking aspects of equipment. Overall, there would be two types of employees utilizing the system: designers and therapists. The designers needed access to editing the system, as they would be logging equipment, repairing equipment, and modifying the equipment. The therapists, however, only use the equipment. Because of this, the team was requested to create multiple interfaces for the system, one for the designers that allowed editing access to the system, and one for the therapists that did not. Besides the multiple system interfaces, the biggest need for the DDS's inventory system was that they required that the system be hosted on Microsoft's SharePoint. This way, equipment wouldn't be hoarded or lost amongst the many group homes found in the region.

## V. Discussion

The largest obstacle throughout our project was the bureaucratic aspect of it. As the DDS is a government-run program, everything must be run through it. This had a large impact on the project. Due to government policy, we were not allowed to put JavaScript or any sort of outside code onto SharePoint. Our initial attempt at a system consisted of our own code. This gave us the creative freedom to achieve many of the wants and needs provided by the DDS employees. However, due to the government policies, we were unable to use our code created for an inventory system. This meant all work on the inventory system we had completed had to be set aside and circumvented with a new solution.

The system being programed was then replaced with a Microsoft compatible program that did not rely on integrating outside coding in its implementation, allowing it to coexist with the government policies as discussed in Finding #3. After some conversations with members of the DDS, we produced a new system using several already existing Microsoft SharePoint features: Microsoft Lists, Microsoft Power Automate, and Microsoft Forms. Using this combined with the features discussed in Finding #4, we were able to create a comprehensive inventory system to be implemented into the DDS. An insight into what the Forms and the Lists look like can be found in Figures 7 & 8.

**Figure 7**

*A Microsoft form used by DDS employees to move equipment from one location to another, created by the team.*

**ATC Inventory Move AT Form**

\* Required

1. Item ID \*

Enter your answer

2. Enter Program \*

CRS

TCS

CSS

**Figure 8**

*The Microsoft List, displaying inventory items across the Central West ATCs and group homes.*

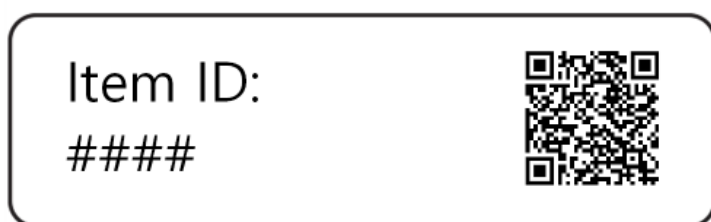
Item ID	ATType	Types	Location	OrginationDate	SerialNumber	Manufacturer	Model	Bat
2000	Lift	Patient		4/12/24	Er600-209	Hoyer	Hpl-600	Sla
2001	Showerchair	Tilt		4/12/24	Rat-110191	RAZ	Rat	
2002	Showerchair	Tilt	1830	4/12/24	Rat-104019	RAZ	Rat	
2003	Wheelchair	Tilt	1700	4/12/24	Irse-089494	Quickie	Iris	
2004	Wheelchair	Standard		4/12/24	Qxi-030759	Quickie	Qxi	
2005	Wheelchair	Standard	1700	4/12/24	Q2v-062083	Quickie	Quickie 2	

With this new design, we were able to keep a hub of all items being utilized by the state group homes on Microsoft Lists. Due to the therapists' need to move equipment and the requirement that the system be easy to access and use, Microsoft Forms was utilized as the mechanism for moving equipment. To use Forms to edit Lists, Power Automate was used to link form inputs to change the location of items in the inventory. More information on how this was done can be found in Appendix F.

One “want” the designers initially had for the system was for the user to be able to scan a QR code found on a piece of equipment and for the QR code to take the user directly to the page needed to change that specific piece of equipment’s location. Unfortunately, due to the move away from the initial system, this process becomes troublesome due to costs of QR codes within the Microsoft suite and issues with coding the QR code to automatically fill fields with equipment IDs. Instead, the team implemented a QR code found on the piece of equipment that takes the user to the Move AT form. The QR code will then be printed onto a label via a label maker. On the label next to the QR code, the short and comprehensive ID of that specific item will be written clearly so the user can fill it into the necessary field. An example of what this label would look like can be found in Figure 9.

### Figure 9

*An example of the label that would be placed on the AT equipment.*



In each of our interviews with the DDS employees, we asked “Are there any specific concerns or challenges you foresee in transitioning to a new inventory management system?” The overwhelming response was that if the system is easy to use and hosted on SharePoint, there should not be many issues in encouraging the employees at the DDS to utilize the system.

We also asked, “How would you like to see training and support for a new system implemented?” We had two consistent answers to that question: they wanted an in-person walkthrough/training on the system and a document showing how to utilize the system. We complied with both requests. On the last week of the project, our sponsor arranged a presentation and training at the Worcester ATC to a large group of designers, therapists, and other employees of the central-west division of the DDS. We also created a PDF manual on how to utilize,

change, and update the system. A full version of this instructional manual can be found in Appendix H.



## VI. Recommendations

This chapter presents our recommendations for the DDS ATC for the upkeep of the inventory system in the long-term.

### **Recommendation #1: Review Data and Usage of Tool**

Even the best tool is useless if used incorrectly. This saying applies to the inventory management tool that we helped create. To ensure it is used correctly, we recommend a check of the data in the system for accuracy be performed three months into using the tool. Following this initial check, we would then recommend that additional checks are performed at least twice a year. This will ensure that the tool is being used properly and effectively. If the tool is not being used effectively or correctly, we recommend more training to educate staff members on how to better use it.

### **Recommendation #2: Training with Onboarding**

Even though a training presentation has been given to a variety of employees via the students working on the project, the training should not stop there. We recommend having the therapists and any other member of the DDS who need to utilize the system go through training with another member versed in it. Also, new employees to the organization should be introduced and trained in the system to enforce its continued use. Beyond the in-person training, we recommend that the ATC Inventory System Manual (seen in Appendix H) should be promoted and easily accessible to anybody who utilizes the system.

### **Recommendation #3: Universal Method of ID Generation**

When using the system, we recommend a universal process be used when generating new item IDs. We recommend that each category of equipment should begin with a unique marker. For example, lifts could be categorized with ID numbers like 1#### and wheelchairs as 2####. The symbol # in this situation is a stand-in for a number. If the DDS plans on categorizing more than nine categories of equipment, we recommend changing the first digit in the ID to a letter, such as lifts having an ID that starts with L (L####) or wheelchairs with a W (W####). The numbers generated after the first digit identifier are more arbitrary, but we recommend that they should increase numerically as equipment is logged. For example, the first lift to be logged should be 1001 or L001, the second should be 1002 or L002, so on and so forth. If there are over 999 pieces of that equipment type, the ID number can be extended by a digit. However, we also recommend keeping item IDs short for ease of use.

**Recommendation #4: Share System with Other ATC Regions**

The ATC has different regions across the state, with the inventory system currently living on the CRS SharePoint site. Once the CRS region is comfortable with the system, we recommend it be shared with the other regions, along with any training materials such as the ATC Inventory System Manual, which can be seen in Appendix H. Having one unified AT inventory management system across Massachusetts will ensure that all equipment is inputted into one place, making it easy to track.

**Conclusion**

AT is incredibly important to thousands of Massachusetts citizens. Their ability to access it is critical to not only function, but independence. With a functioning inventory system, the DDS can not only continue offering their services, but also increase their efficacy. With their new system in place, the DDS will be able to keep track of equipment, improving wait times across the group homes. We hope by helping improve their inventory system, the DDS will be able to continue and grow their help to the citizens of Massachusetts.

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## IX. Appendices

### Appendix A: ATC Employee Interview Questions

#### Consent Form

Hi, we are Amanda Haner, Kerstin Andrews, and Sean Thornton, and we are students at Worcester Polytechnic Institute. Our team is seeking to learn about the systems currently in place at the ATC to manage their inventory and what employees wish to see in future systems. We are hoping to design and implement a new inventory management system.

We are asking you to participate in an interview that will last 30-45 minutes. During this interview, we will ask you questions about the use of inventory management at the ATC. These questions will ask about the current systems in place and what employees want from a system in the future. If any questions make you uncomfortable, you can choose to skip that question. With your permission, we will record the interviews to review for analysis. The data you give may be used in presentations and reports accessible to the public. Participation in this study may result in an improved inventory management system with input from your answers in this interview.

Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You have the right to withdraw from the interview at any point in time. If you have any questions during the interview, we encourage you to ask.

For more information about this project or about the rights of research participants, or in the case of research-related injury, contact:

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Project Advisor: Courtney Kurlanska

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**Your responses will not include your name and your identity will remain confidential throughout our research.**

### Interview Questions

1. What is your role at the ATC?
2. What does the ATC currently use to track inventory?
  - a. Do you utilize Excel for your inventory management? Do you utilize SharePoint for your inventory management?
  - b. How often do you interact with this system?
3. How long has your current system been in place?
  - a. When was the last time it was updated?
4. What are the main challenges or pain points your organization faces with the current inventory management system?
5. Are there any specific goals or features you would like to see in a future inventory management system to enhance overall operations?
  - a. Are there any top priorities for a future system?
6. Are there any specific concerns or challenges you foresee in transitioning to a new inventory management system?
7. How would you like to see training and support for a new system implemented?

## Appendix B: Semi-Structured Interview for Employees from Outside Organizations

### Consent Form

Hi, we are Amanda Haner, Kerstin Andrews, and Sean Thornton, and we are students at Worcester Polytechnic Institute. We are asking you to participate in our study on inventory systems.

We are asking you to participate in an interview that will last 30-60 minutes. During this interview, we will ask you questions about the use of inventory management at your company. These questions will be utilized to help implement a new inventory tracking system at the ATC. The data you give may be used in presentations and reports accessible to the public. If any questions make you uncomfortable, you can choose to skip that question. With your permission, we will record the interviews to review for analysis. The data you give may be used in presentations and reports accessible to the public. Participation in this study may result in an improved inventory management system with input from your answers in this interview.

Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You have the right to withdraw from the interview at any point in time. If you have any questions during the interview, we encourage you to ask.

For more information about this project or about the rights of research participants, or in the case of research-related injury, contact:

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**Your responses will not include your name and your identity will remain confidential throughout our research.**

### Interview Questions

1. Can you briefly describe your position at this organization?
2. Can you provide an overview of your inventory management system? What are its key features?
3. How often do you interact with the inventory system? For example, how often do you log items coming in and out of the system?
4. What software do you utilize? E.g., Excel, internal system, etc.
  - 4.1. Are there any concerns that you have about this software?
5. How does your system track products? How does it track damaged or unusable products?
6. How does your system handle reordering products?
7. How are new products put into the system?
8. What are some aspects of the system that you particularly like?
9. What are some aspects of the system that you don't like? Anything that makes it frustrating to use?
10. How would you describe the learning curve to the system? Is it easy or difficult for new employees to pick up?
11. Does your system utilize any tools such as barcode scanners?
12. What are your thoughts on the overall usability of the system?
13. Would you recommend your current system to others, why or why not?
14. How much did it cost to implement the system? How much does it cost to maintain?
15. Are there any closing thoughts you would like to share?

## Appendix C: Questions for Interviewing Employees to get Feedback about our Software.

### Consent Form

Hi, we are Amanda Haner, Kerstin Andrews, and Sean Thornton, and we are students at Worcester Polytechnic Institute. We are asking you to participate in our study on inventory systems.

We are asking you to participate in an interview that will last 30-60 minutes. During this interview, we will ask you questions about the inventory management software that we created. These questions will be utilized to help implement a new inventory tracking system at the ATC. The data you give may be used in presentations and reports accessible to the public. If any questions make you uncomfortable, you can choose to skip that question. With your permission, we will record the interviews to review for analysis. The data you give may be used in presentations and reports accessible to the public. Participation in this study may result in an improved inventory management system with input from your answers in this interview.

Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You have the right to withdraw from the interview at any point in time. If you have any questions during the interview, we encourage you to ask.

For more information about this project or about the rights of research participants, or in the case of research-related injury, contact:

Researchers: Amand Haner, Kerstin Andrews, and Sean Thornton

[DDSATC-D24@wpi.edu](mailto:DDSATC-D24@wpi.edu)

Project Advisor: Courtney Kurlanska

[cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu)

**Your responses will not include your name and your identity will remain confidential throughout our research.**

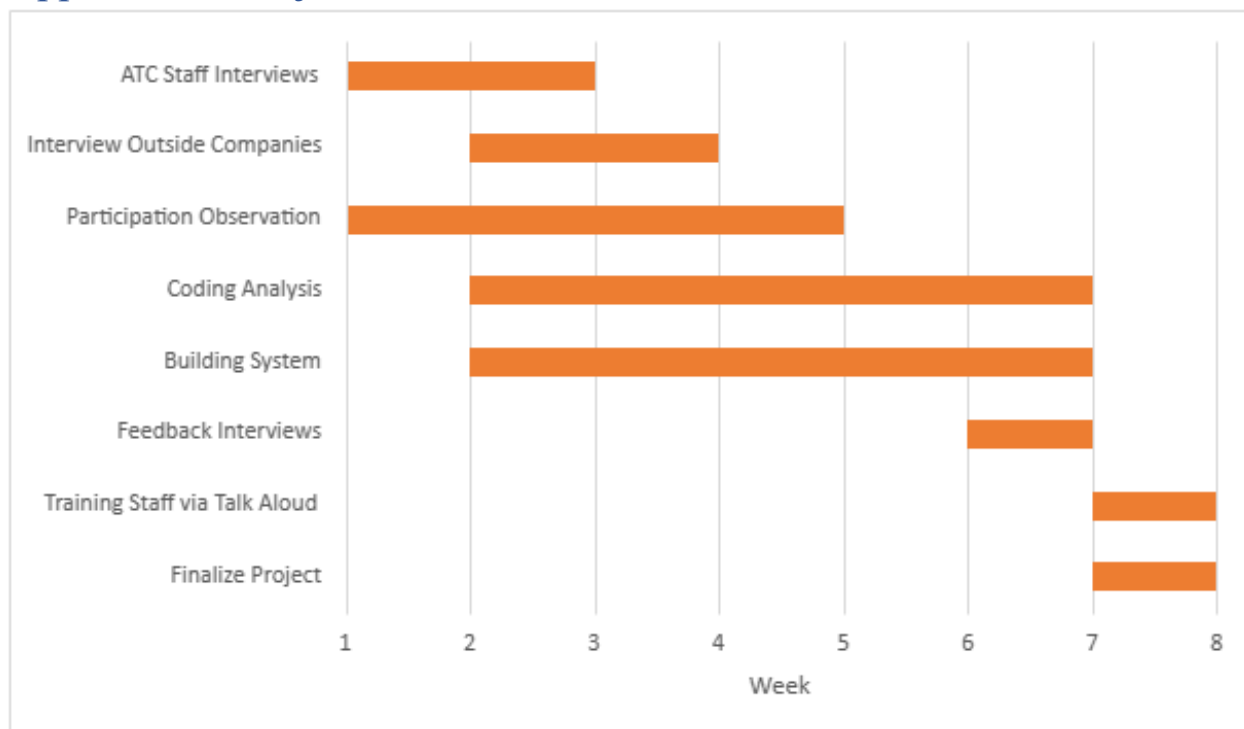
### Interview Questions

1. Did the software functions that you used work to your standard? If not, what happened, what could be improved? What was not working?
2. Did the user interface make sense? Were there components that were difficult to follow or understand?
3. How long did it take to fully understand the software? Is there anything that could change to accelerate this?
4. Are there aspects of the software that you liked? If so, what were they?
5. Are there any improvements that we can make to the inventory system? If so, what were they?
6. Is there anything else you would like us to know or change about the software?

We would also like to include some stories in our report. Can we ask about your experiences working with the DDS?

1. What inspired you to take this job?
2. What does a typical day in your life look like?
3. What is the most memorable experience throughout your time working with the DDS?
4. What is the job you are proudest of?
5. What is the most challenging part of your job?
6. What is your favorite part of your job?

## Appendix D: Project Timeline



## Appendix E: Code for the Initial System

### Layout.js

```
import { Outlet, Link } from "react-router-dom";
import "./CSS/Layout.css";

const Layout = () => {
  return (
    <>
      <nav class="topNav">
        <ul>
          <h1>DDS ATC Inventory System
            { /* <Link to="/" class="Logo"></img></Link> */}
            <Link to="/Admin"
class="navButtons"><a>Admin</a></Link>
            <Link to="/PublicTable"
class="navButtons"><a>Table</a></Link>
            <Link to="/" class="navButtons"><a>Move
AT</a></Link>
          </h1>
        </ul>
      </nav>
      <Outlet />
    </>
  )
};

export default Layout;
```

### Public.js

```
import React, { useState, useEffect } from 'react';
import { updateLocation } from
'../../Database/DatabaseInteractions';
import Select from 'react-select';
import './CSS/Public.css'

const Public = () => {
```

```

const [ATID, setATID] = useState('');
const [Loco, setLoco] = useState('');
const [pgrm, setPgrm] = useState('');

const handleATChange = (event) => {
  setATID(event.target.value);
};

const handlePrgmChange = (event) => {
  setPgrm(event.target.value);
};

const handleLocoChange = (event) => {
  setLoco(event.target.value);
}

const update = () => {
  console.log("Moving " + ATID + " to " + Loco);
  updateLocation(ATID, Loco);
}

useEffect(() => {
  const urlParams = new
URLSearchParams(window.location.search);
  const ATIDParam = urlParams.get('ATIDParam');
//http://localhost:3000/?ATIDParam=(PUT ID HERE)
  console.log(ATIDParam);
  if (ATIDParam) {
    setATID(ATIDParam);
  }
}, []);

// const locations = {
//   "CRS": [
//     { value: 'chocolate', label: 'Chocolate' },
//     { value: 'strawberry', label: 'Strawberry' },
//     { value: 'vanilla', label: 'Vanilla' }
//   ],
//   "TCS": [
//     { value: 'Steak', label: 'Steak' },

```

```

//      { value: 'Pork', label: 'Pork' },
//      { value: 'Chicken', label: 'Chicken' }
//    ]
//  }

return (
  <div>
    <body>
      <h1>Move AT</h1>
      <label>Enter AT ID: </label>
      <input
        type="text"
        value={ATID}
        onChange={handleATChange}
      />
      <select onChange={handlePrgmChange}
value={pgrm}>
        <option value="">Select Program</option>
        <option value="CRS">CRS</option>
        <option value="TCS">TCS</option>
      </select>

      <select onChange={handleLocoChange} value={Loco}
disabled={pgrm === ""}>
        <option value="">Select House</option>
        {pgrm === "CRS" && (
          <>
            <option value="1800">1800</option>
            <option value="1802">1802</option>
            <option value="1820">1820</option>
            <option value="1824">1824</option>
            <option value="1830">1830</option>
            <option value="1848">1848</option>
            <option value="1849">1849</option>
            <option value="1858">1858</option>
            <option value="1859">1859</option>
            <option value="1826">1826</option>
            <option value="1827">1827</option>
            <option value="1828">1828</option>
            <option value="1803">1803</option>
            <option value="1821">1821</option>
          </>
        )}
      </select>
    </body>
  </div>
)

```

```

<option value="1854">1854</option>
<option value="1857">1857</option>
<option value="1861">1861</option>
<option value="1888">1888</option>
<option value="1890">1890</option>
<option value="1895">1895</option>
<option value="1896">1896</option>
<option value="1862">1862</option>
<option value="1860">1860</option>
<option value="1870">1870</option>
<option value="1804">1804</option>
<option value="1814">1814</option>
<option value="1815">1815</option>
<option value="1816">1816</option>
<option value="1817">1817</option>
<option value="1818">1818</option>
<option value="1819">1819</option>
<option value="1864">1864</option>
<option value="1868">1868</option>
<option value="1885">1885</option>
<option value="1899">1899</option>

        </>
    })
    {pgrm === "TCS" && (
        <>
            <option
value="California">California</option>
            <option value="Texas">Texas</option>
            <option value="New York">New
York</option>
        </>
    })
</select>

    <button onClick={update()} id='updateButton'>
        Update
    </button>
</body>
</div>
);

```



```
};

export default Public;
```

### PublicTable.js

```
import { getDatabase } from
'../../Database/DatabaseInteractions';
import React, { useState, useEffect } from 'react';
import './CSS/PublicTable.css'

const PublicTable = () => {
  const [data, setData] = useState([]);

  useEffect(() => {
    getDatabase().then(fetchedData => setData(fetchedData));
  }, []);

  return (
    <html>
      <h1>Table</h1>
      <table id = "public">
        <thead>
          <tr>
            <th>ID</th>
            <th>Type</th>
            <th>Battery Type</th>
            <th>Battery Date</th>
            <th>Location</th>
            <th>Origination Date</th>
            <th>Serial Number</th>
            <th>Make</th>
            <th>Model</th>
          </tr>
        </thead>
        <tbody>
          {data.map(item => (
            <tr key={item.ID}>
              <td>{item.ID}</td>
              <td>{item.Type}</td>
              <td>{item.BatteryType}</td>
```

```

        <td>{item.BatteryDate}</td>
        <td>{item.Location}</td>
        <td>{item.OriginationDate}</td>
        <td>{item.SeralNumber}</td>
        <td>{item.Make}</td>
        <td>{item.Model}</td>
      </tr>
    ))}
  </tbody>
</table>
</html>
);
};

export default PublicTable;

```

### EditAT.js

```

import './CSS/EditAT.css'
import React, { useEffect, useState, useRef } from 'react';
import { getAT } from '../../Database/DatabaseInteractions';
import QRCode from 'react-qr-code';
import * as htmlToImage from 'html-to-image';

const EditAT = () => {
  const qrCodeRef = useRef(null);

  const [ATID, setATID] = useState('');
  const [ATtype, setATType] = useState('');
  const [powerType, setPowerType] = useState('');
  const [batteryType, setBatteryType] = useState('');
  const [batteryDate, setBatteryDate] = useState('');
  const [location, setLocation] = useState('');
  const [originationDate, setOriginationDate] = useState('');
  const [serialNumber, setSerialNumber] = useState('');
  const [make, setMake] = useState('');
  const [model, setModel] = useState('');
  const [notes, setNotes] = useState('');

  const handleATIDChange = (event) => {
    setATID(event.target.value);
  }

```

```

};

const handleATTypeChange = (event) => {
  setATType(event.target.value);
}

useEffect(() => {
  const urlParams = new
URLSearchParams(window.location.search);
  const param = urlParams.get('param');
  console.log(param);
  if (param) {
    let item = getAT(param);
    setATID(param);
    setATType(item.ATtype);
    setPowerType(item.Type);
    setBatteryType(item.BatteryType);
    setBatteryDate(item.BatteryDate);
    setLocation(item.Location);
    setOriginationDate(item.OriginationDate);
    setSerialNumber(item.SeralNumber);
    setMake(item.Make);
    setModel(item.Model);
    setNotes(item.Notes);
  }
}, []);

const downloadQRCode = () => {
  htmlToImage.toPng(qrCodeRef.current)
    .then((dataUrl) => {
      const link = document.createElement('a');
      link.href = dataUrl;
      link.download = 'qr-code.png';
      link.click();
    })
    .catch((error) => {
      console.error('Error generating QR code:',
error);
    });
});
};

```

```

return (
  <div>
    <h1>EditAT</h1>
    <label>Enter AT ID: </label>
    <input
      type="text"
      value={ATID}
      onChange={handleATIDChange}
    />
    <div ref={qrCodeRef} id="QRCode">
      <QRCode value={`https://youthful-
butterfly.static.domains/?ATIDParam=${ATID}`} />
    </div>
    <button onClick={downloadQRCode}>Download QR
Code</button>
  </div>
);
};

export default EditAT;

```

### DatabaseInteractions.js

```

import csvData from './database.JSON';
import React, { useState } from 'react';

export const updateLocation = (id, newLocation) => {
  //csvData.find(item => item.ID === id).Location =
newLocation;
}

export function updateATInfo(JSON) {

}

export function addNewAT(JSON) {

}

export function deleteAT(ID) {

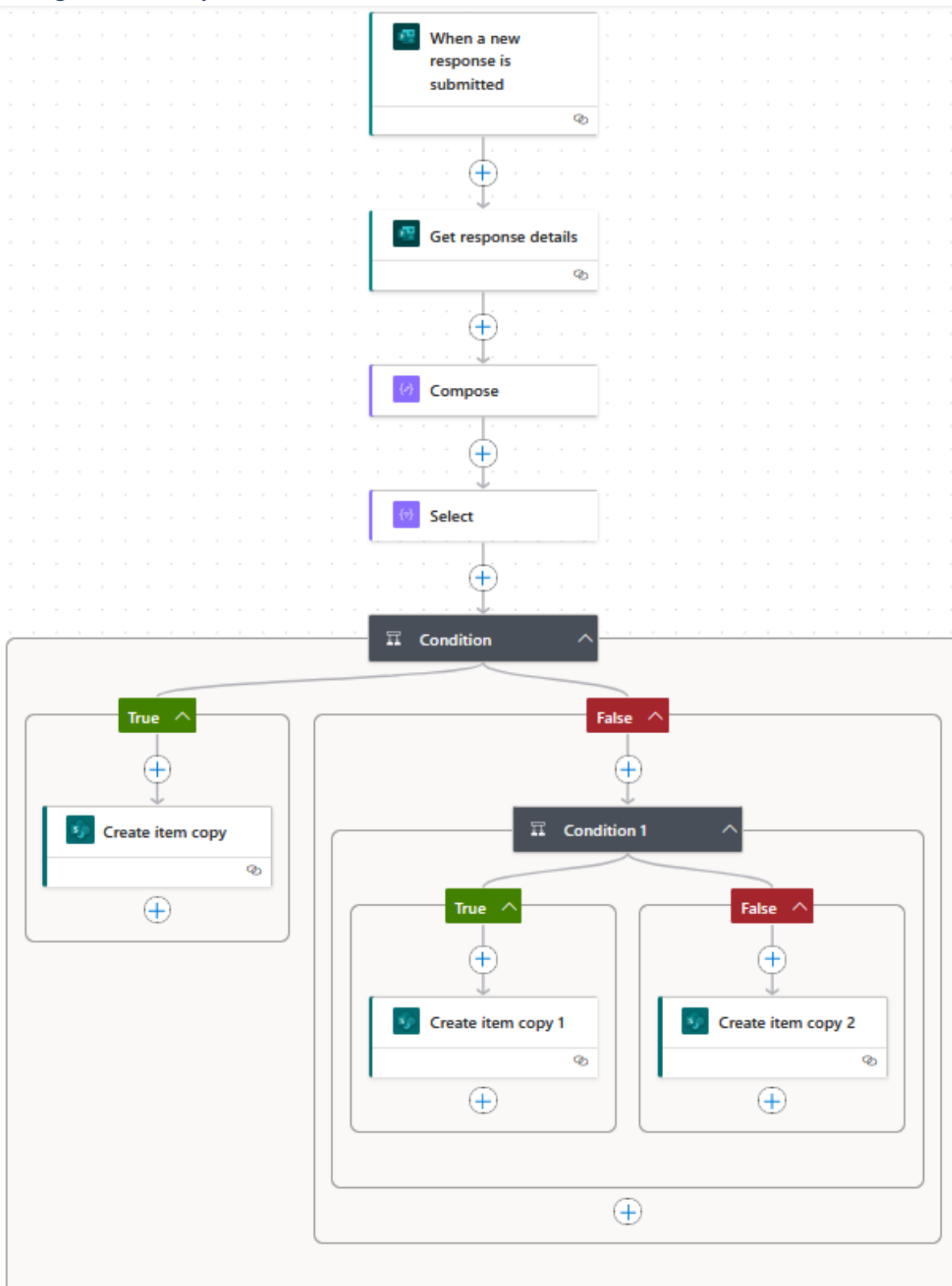
```

```
}  
  
export function getAT(ID) {  
  
}  
  
export function getDatabase() {  
  return fetch(csvData)  
    .then(response => response.json())  
    .catch(error => console.error('Error fetching data:',  
error));  
}
```

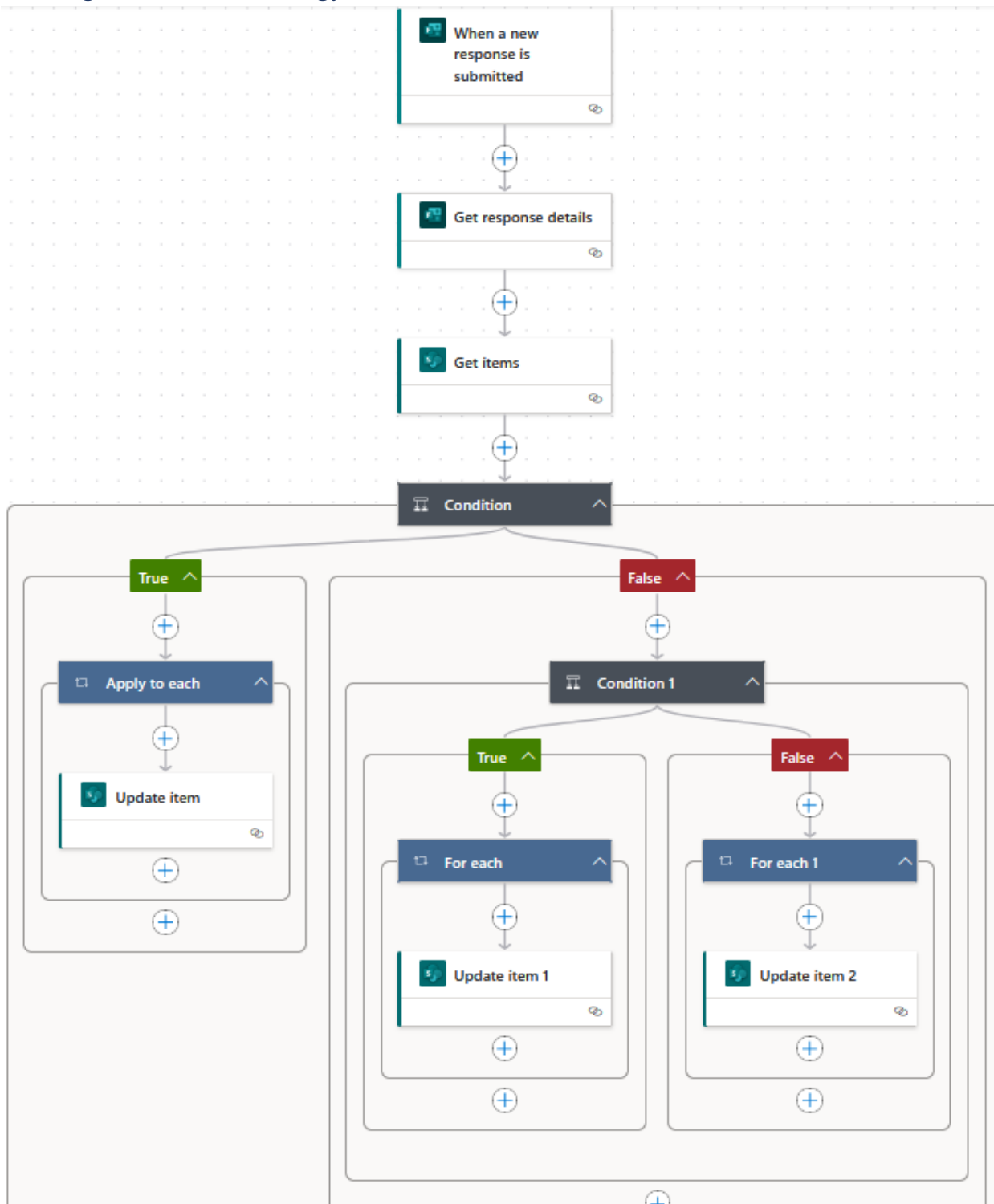
The Full codebase can be found at: [https://github.com/Seano3/ATC\\_Inventory\\_System\\_Prototype](https://github.com/Seano3/ATC_Inventory_System_Prototype)

## Appendix F: Microsoft Power Automate

### Creating a new entry into the database



# Moving assistive technology



## Appendix G: Needs for Inventory System

### Needs for All Categories of Equipment

Type of Equipment	Needs
All	<ul style="list-style-type: none"> <li>• Item ID</li> <li>• Location               <ul style="list-style-type: none"> <li>○ Origination date</li> </ul> </li> <li>• Serial number</li> <li>• Manufacturer</li> <li>• Model</li> <li>• Accessories</li> <li>• Condition</li> <li>• Availability</li> <li>• Notes</li> </ul>
Lifts	<ul style="list-style-type: none"> <li>• Lift type</li> <li>• Battery type               <ul style="list-style-type: none"> <li>○ Battery date</li> </ul> </li> </ul>
Wheelchairs	<ul style="list-style-type: none"> <li>• Wheelchair type</li> <li>• Power</li> <li>• Size               <ul style="list-style-type: none"> <li>○ Seat width</li> <li>○ Seat depth</li> <li>○ Seat to floor height</li> <li>○ Wheel size</li> </ul> </li> <li>• Cushion type</li> <li>• Headrest</li> <li>• Leg-rest type</li> <li>• Back type</li> </ul>
Showerchairs	<ul style="list-style-type: none"> <li>• Shower chair type</li> <li>• Size               <ul style="list-style-type: none"> <li>○ Seat width</li> <li>○ Seat depth</li> </ul> </li> </ul>



## Miscellaneous Needs

Type of Need	Needs
Inventory System	<ul style="list-style-type: none"> <li>• Generates item ID</li> <li>• QR code accessible</li> <li>• Multiple views dependent on user               <ul style="list-style-type: none"> <li>○ Designer view (edit access)</li> <li>○ Therapist view (viewing access)</li> </ul> </li> <li>• Dropdown menus               <ul style="list-style-type: none"> <li>○ Specifically for location input</li> </ul> </li> <li>• SharePoint accessible</li> <li>• Intuitive and simple               <ul style="list-style-type: none"> <li>○ Usable on both a computer and phone/tablet</li> </ul> </li> </ul>
Training/Implementation	<ul style="list-style-type: none"> <li>• Not a significant amount of worry about resistance; the fact they have an inventory system will likely be enough to convince people to use it</li> <li>• In-person training               <ul style="list-style-type: none"> <li>○ A walkthrough on how to use the system</li> <li>○ Leaders attend training → teach others who don't attend</li> </ul> </li> <li>• How-to booklet/document</li> </ul>

Appendix H: ATC Inventory Instructional Manual



ATC INVENTORY SYSTEM  
**MANUEL**

Prepared By :

Amanda Haner  
Kerstin Andrews  
Sean Thornton



# TABLE OF CONTENTS

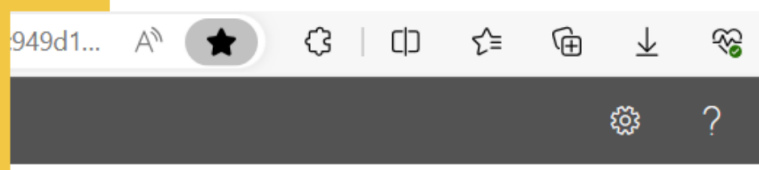
DASHBOARD.....	3
ITEM MANAGEMENT.....	4
FILTERING.....	8
COLUMNS.....	9
VIEWS.....	10
MOVE AT.....	11
THERAPIST VIEW.....	13

# Dashboard



There is a dashboard located in SharePoint that has all the resources related to the inventory system. It has the designers' table, therapists' table, the entry forms, and the QR code for the Move AT form.

To access this dashboard, use the link provide for you. After you first access the dashboard, you can either favorite the page by clicking the star in the search bar, or you can follow the dashboard on SharePoint by clicking the star on the top right of the page. Either option will make it easier to find the page in the future.

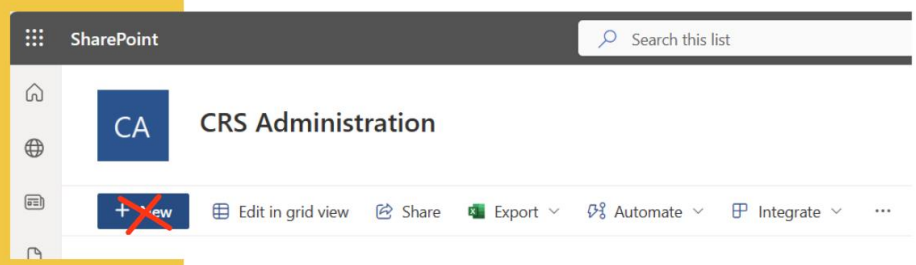


★ Following

# Item Management

## How to add an item

It may be tempting to press the '+ New' on the List to add a new item to the inventory, but avoid using this feature. There are entry forms (explained below) that this feature may interfere with.



The preferred way to add a new item is to use the Microsoft entry forms. There will be three separate forms for each type of equipment: lifts, wheelchairs, and shower chairs. Choose the form on the SharePoint dashboard corresponding to the equipment you wish to enter.

### Data Entry Section



1. Type  
Enter your answer

2. Location  
Enter your answer

Once you open a form, answer the series of questions on the page. Once everything is filled out, click 'Submit.' A page should pop up verifying that it submitted.

Once you add a new item, **be sure to print out the QR code**, found on the bottom of the dashboard page. This QR code will be put on a piece of equipment in an easy-to-see spot, and it will take users to the Move AT form (discussed in a later section). **Make sure to write the Item ID #** that was automatically generated for the new equipment entry onto the QR code, so you and others are aware of what ID # belongs to that equipment.

## Editing the Equipment Forms

To edit a question in Microsoft equipment entry forms, click the question you wish to edit. Fulfill the options you wish to make, i.e. 'Add option' to the dropdown.

1. Type

Select your answer

Tilt in Space

Standard

Power

Transport

Other

+ Add option

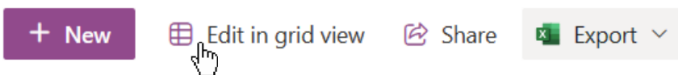
Multiple answers Required

To add a question to the entry forms, click on the plus sign toward the bottom of the page and the type of question you'd like to add, i.e. 'Choice' for a drop-down style question. Format the question to your desire.

+ Choice Text Rating Date

# How to Edit an Item

There is a few ways to edit an item in Lists. The first way is to click 'Edit in grid view, located near the top of the page.



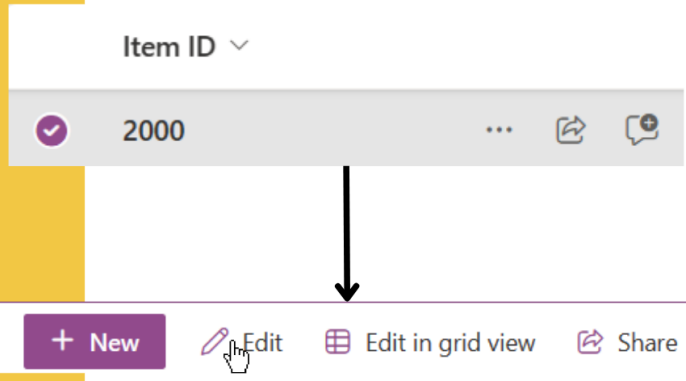
This will make the List into an editable spreadsheet. Double-click on the cell you wish to edit and make your necessary changes

Item ID	ATType	Types	Location
1111	Lift	Power	1613
1112	Lift	Roof	1615
1113	Lift	Power	1804



Once you are finsihed editing, click on the 'Exit grid view.

Another way to edit AT is to select the row or item you wish to edit and click the 'Edit' button near the top of the page.

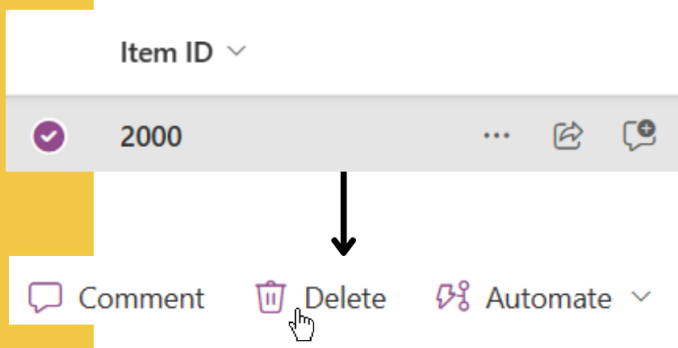


The last way to edit an item is to select or hover over a row and hit the three dots to the right of the Item ID. A menu will pop up. Choose either 'Edit' or 'Edit in grid view.' These options are the same as the two explained the previous page.

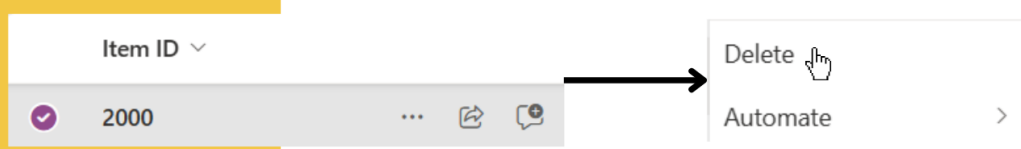


## How to Delete an Item

There are a couple of ways to delete an item or row from the List. The first is to select an item and hit the 'Delete' option near the top of the page. .



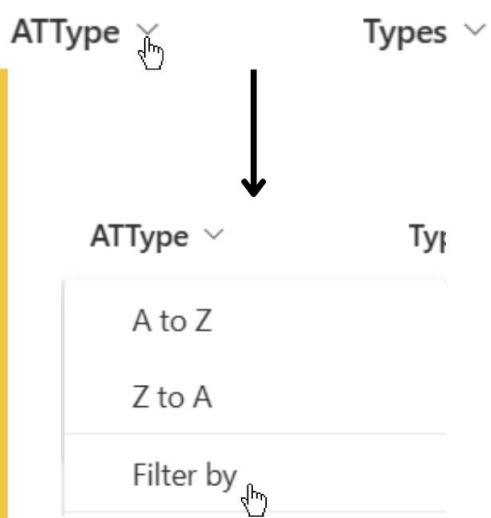
The next option is to click or hover over an item and hit the three dots to the right of the Item ID. A menu will pop up. Choose the 'Delete' option.



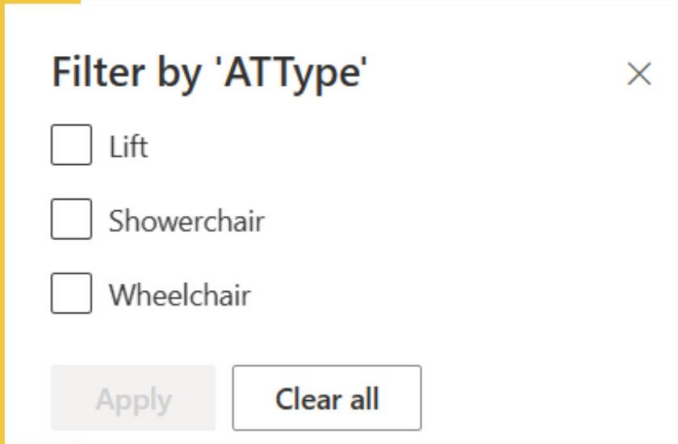


# Filtering

To filter a column, click the gray tick to the right of the column name. This should bring you to a menu. Click 'Filter by.'

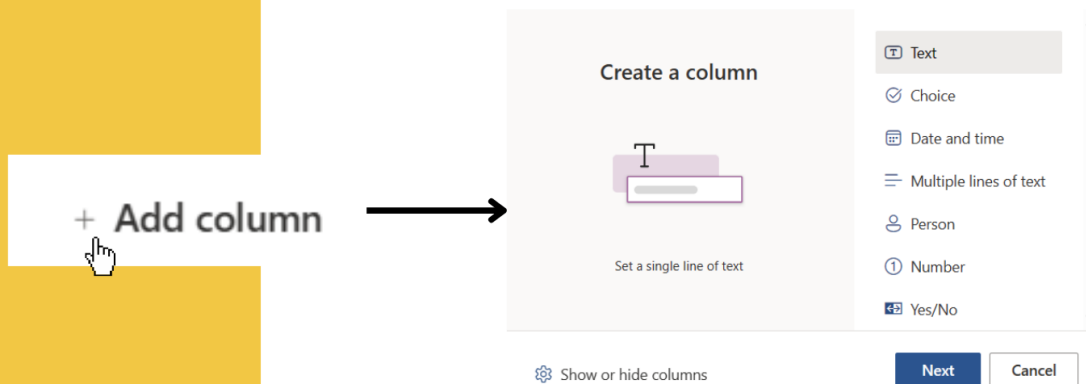


A menu will open. Choose the options you wish to filter by and click 'Apply.' Press 'Clear filters' to remove the filters and return to the original table.



# Columns

To add another column or feature in the system, click 'Add column.' A menu will pop up. Choose the type of column you want to have and click 'Next.'



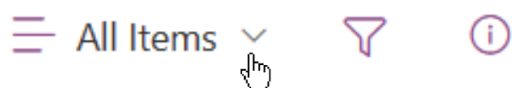
A page will pop up. Fill in the necessary information and click 'Save' at the end of the page.

The image shows a 'Create a column' form with a close button (X) in the top right corner. Below the title is a link: [Learn more about column creation.](#) The form contains the following fields and options:




- Name \***: A text input field.
- Description**: A larger text input field.
- Type**: A dropdown menu with 'Single line of text' selected.
- Default value**: A text input field with the placeholder 'Enter a default value'.
- Use calculated value ⓘ

# Views

If you want to view the columns related to one type of equipment on the list, click 'All Items' on the top right of the screen



A menu will pop up. There will be a list of equipment. Click on the equipment and columns you wish to see. Each equipment view will only have the features related to that type and help declutter the page.

- 
- ✓  List
  -  Compact List
  -  Gallery

- 
- ✓ All Items
    - Lifts
    - Showerchairs
    - Therapists
    - Wheelchairs

# Moving AT

## Using the Move AT form

Scan the QR code, either here or on the dashboard, or use SharePoint to open the Move AT form



Fill in Item ID with the ID number written next to the QR code. This is identical to the ID number of that piece of equipment found on Lists

1. Item ID \*

Click program of new location and select the location code from the dropdown menu.

2. Enter Program \*

CRS

TCS

CSS

3. Enter New Location - CRS \*

Select your answer

- 1800
- 1802
- 1803
- 1804

Submit

Click submit and verify in the List that the item has been moved!

# Editing the Move AT form

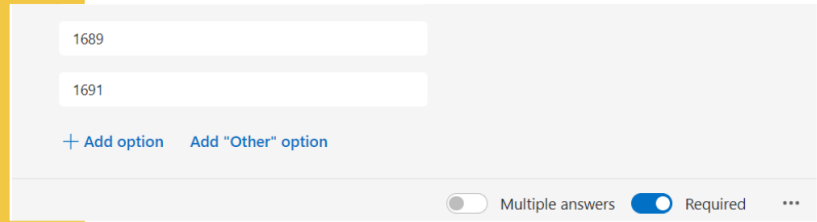
Select program you want to edit the locations of



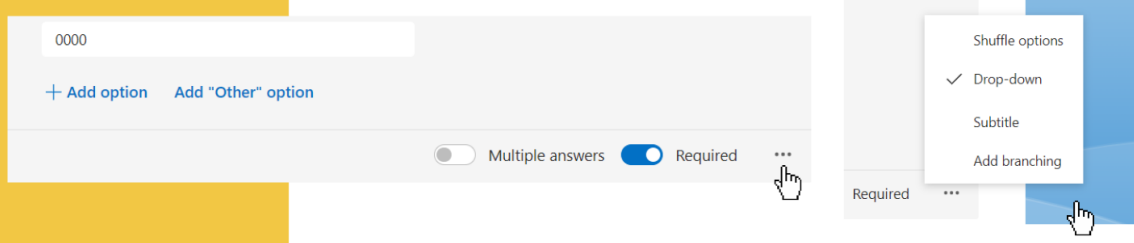
Click on a the option to edit it



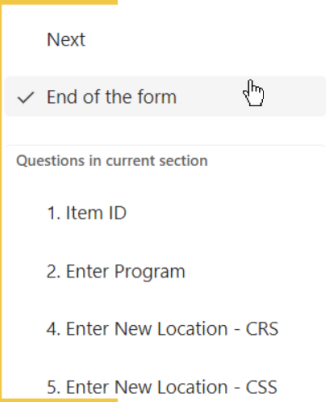
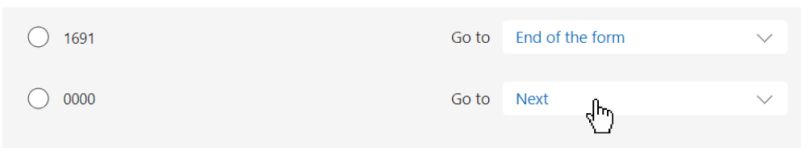
Scroll to the bottom of the question if you want to add a new option



Click the three dots for more question options, then select the "Add branching" option from the list



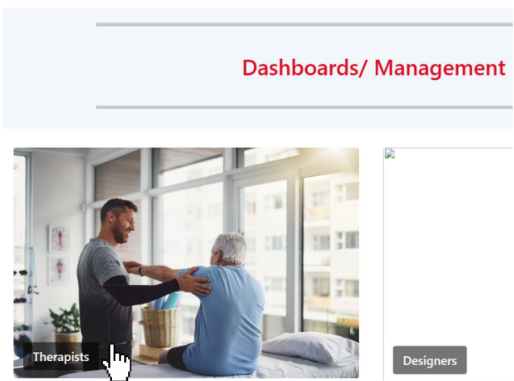
Find your newly created option and select the drop down menu



Select the "End of the form" option from the dropdown menu. This will prevent the form from moving to a separate option instead of moving the item

# Therapist View

The therapist view for the inventory system is located on the SharePoint dashboard.



Click on the Therapist link and it will bring you to a page that looks very similar to the designers' inventory table, except there will be no editing access or Notes columns. Many of the actions remain the same on the Therapists' page, i.e. filtering.