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GNG2101[D] - Introduction to Product Development and Management

Detailed Design & Prototype 1

Project Deliverable D

Group 2.4
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1. Introduction

In Deliverable C, we came up with a conceptual design that had the features that we wanted our prototype to showcase. After the client meeting, this design was modified to fit the client needs better. The following deliverable will discuss an updated and detailed version of the new conceptual design with all of the necessary components along with a detailed bill of materials which will be broken down into individual electrical and mechanical components and their respective prices. In addition to this, preparation for the next client meeting will also be discussed.

2. Client Meet Feedback

The feedback given to us during the client meeting was very clear and easy to process. Both clients, Paul and Sandy, preferred the 1st design because of its simplicity, creativity, ease of use and resemblance to the idea they both had in mind. They both specified that having one button to carry out all commands and movements for the tablet holder would be a very big improvement to our design, as it would allow those with limited range of motion to be able to operate the device. Paul and Sandy also stated that the whole tray and tablet holder will need to be moved and put inside the user's backpack, so it must be able to fit properly and be moved quite easily. They also specified that external wires are okay as long as they are not underneath the tray, as the surface there needs to be a soft and comfortable material for the user's legs.

3. Bill of Materials (Preliminary)

Item name	Description	Units of measure	Quantity	Unit cost	Extended cost	Link
Wheelchair tray	This Item will be paid for by the client	N/A	1	$91.89	$91.89	Tray link
Mini Linear Rail	The rail is made from steel. The size of the rod is 11.8 x 0.5 x 1 inch	Inch	1	$26.99	$26.99	Rail link
Tablet holder	Made from ABS plastic, the tablet holder will be 3D printed. The dimensions will be 12.2 x 11 x 1 inches.	Inch	1	$0	$0	N/A
Side holder	Made from ABS plastic, the side holders will be 11.7 x 4.35 x 1.24 inches	Inch	2	$0	$0	N/A
Arduino	Already in possession of Arduino Uno	N/A	1	$0	$0	N/A
Motors	Already in possession of Arduino Uno	N/A	2	$0	$0	N/A
Hinge	Stainless steel hinges, 4 x 1 inches	Inch	2	26.07	52.14	Hinge Link

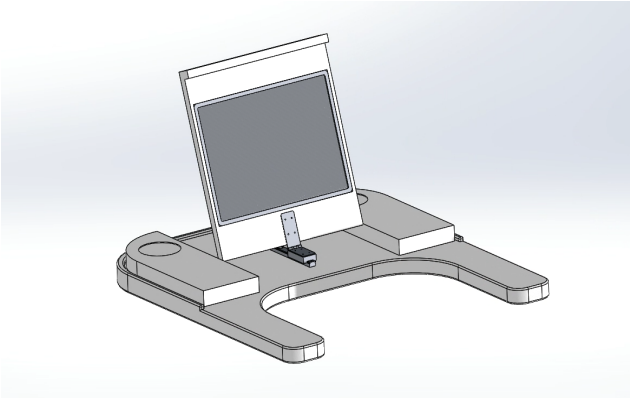
Total cost (without taxes or shipping)	79.13	
Total cost (with taxes and shipping)		

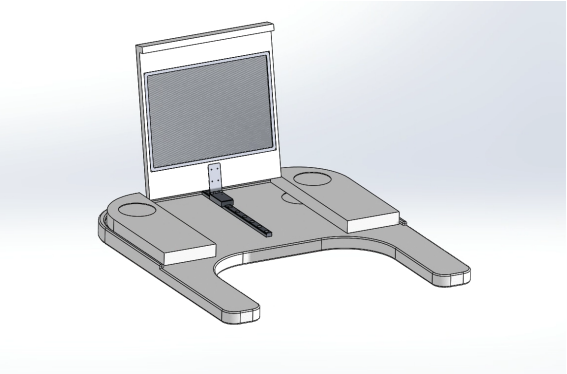
4. Critical Assumptions

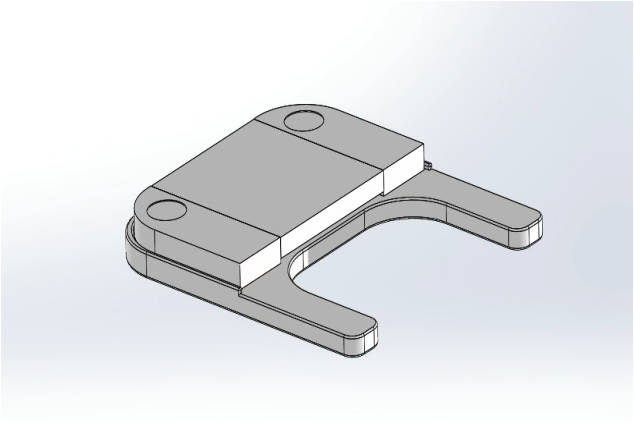
Critical Assumption	Description
Material	All of the materials listed in the BOM are readily available and easily accessible
Weight	All materials that are used to make the tablet holder have a total weight less than 7 lbs
Size	The tablet holder itself cannot be bigger than 21.83 x 11.7 x 1.24 inches
Usability	Must be usable by anyone in a wheelchair with basic motor skills
Range of motion hinge	Assume that hinges are able to open a minimum of 180 degrees
Range of motion rail	Assume that the slide rail has a functioning range of at least 25 cm of its 30 cm length
Deterioration	Assume any minor damage that occurs to the prototype over time will have only a minor effect on its functionality

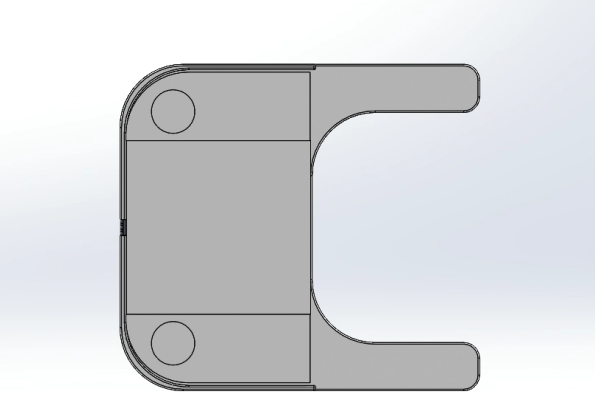
The objective of your prototype is to validate the assumptions you have made about the product and your prototype must be used to test these assumptions.

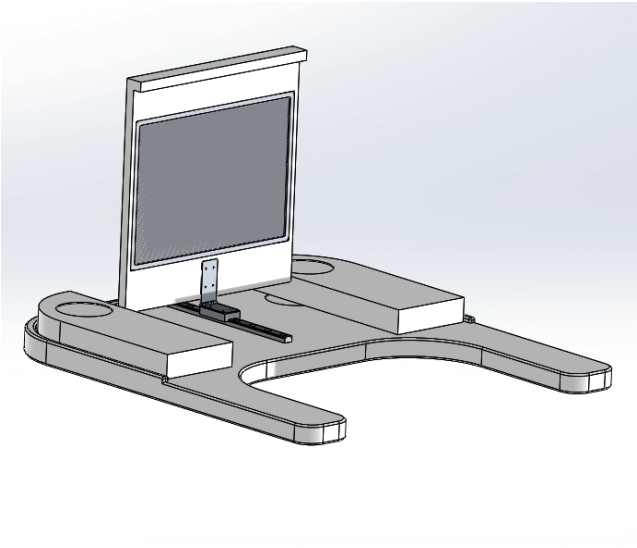
5. Detailed Prototype Design

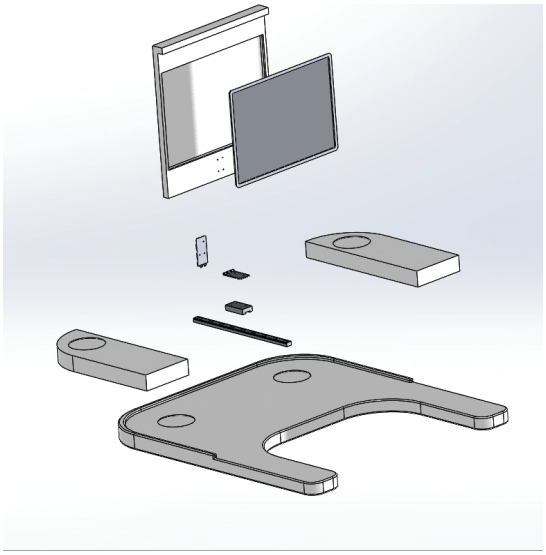


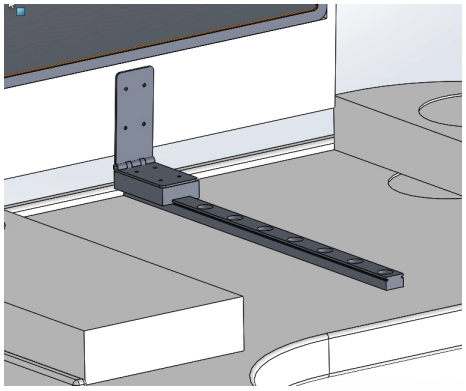












Mechanical Subsystem: the rail and slider is used in order to move the ipad forwards and backwards. The slider has a hinge connected to it which allows the user to open the tablet holder, exposing the ipad.

6. Prototype Testing & Evaluation

At this stage in the prototyping process the testing involved was very basic and is simply being used to test features such as proof of concept, mechanical functionality and if components will fit together. The tests were performed through manual manipulation and observations within the CAD file.

Feature	Specific Test	Result
Storage	Placed all components in the stored position and ensured no overlap or gaps in design	Functional
Activation	Manually adjusted the tablet holder from the closed to open position	Functional
Sliding Rail	Manually slid the moving upper portion of the prototype along all positions of the rail	Functional
Hinge	The hinge was opened to ensure the tablet could take any position between 0-180 degrees	Functional
Deactivation	The tablet was returned from the	Functional

	open to closed position to ensure use would not hinder the closing mechanism	

7. Next Client Meet Preparation

Our next client meeting will not happen until after the reading week so this will give our group plenty of time to prepare a prototype to present to the client. Due to the nature of our product and the materials involved it would not be possible to build multiple physical prototypes on the budget provided. For this reason we as a group have decided to create a CAD model to present to during the meeting. The CAD model will be dynamic to demonstrate the mechanical features in our design, it will include a virtual equivalent of all the components that will be on the final prototype. Also we will demonstrate the functionality of the tablet activation feature and its ability to adjust to preset positions by showing the client the system's code and how it works on the system. At this point all the major features of the design and product specifications have already been confirmed with the client. So during the next client meet we will begin by asking them for general input on the prototype presented to them. From there it will be important to learn of any specifics they would like us to apply for the physical prototype, this will include a preference for materials used and anything else related to aesthetics. We can then move on to focus on the pre-programmed settings defined by the system's code. Possible modifications that could be made such as changing the preset locations or the speed at which the system operates will be given to the client so the system can best suit their needs. At this point we will have acquired all the information we need from the client and will ask them to provide any additional feedback before ending the meeting.

8. Conclusion

Taking the feedback we received, our group decided on what materials we need to use alongside deciding on a CAD model design for us to demonstrate during our next client meeting. The feedback given gave the proper guidance of what to go along with our first design, and to expand it to include a remote and adjustable angles for the tablet. We then modified our first design, and then analyzed what materials would be needed along with what materials are feasible and available.

Using what feedback we got, we listed out critical assumptions for our product to then modify and shape the prototype. In conclusion, we were able to carry out testing in CAD and come up with a prototype along with properties and specifications for the client.