Deliverable -G-

Prototype II & Customer Feedback

Presented by: Group 8

Owen Gregory (300318477)

Jacob Kolman (300303023)

Mohammed Skalli (8847082)

November 13, 2022

1 Client feedback

1.1 Positive Feedback

- Simplicity.
- On off switch.
- Good process of showing concept.
- Plug and go.
- Accessibility is an asset.

1.1 Next Steps & Uncertainties

- Can we get all sides covered?
- Can the doors planned safety be achieved?
- Make sure that the machine is usable by everyone.
- How will the water be used?
- How will the board be held?
- What will let the brushes reach the most area?

2 Prototype

2.1 Updated BOM

THENORTHDESIGN

BILL OF MATERIALS 13/11/2022

(1/2)

ID	Component	Feature	Unit price	Qty.	Price	Prototype
1	Brushed DC Motor	electrical	$ 15.81	1	$ 15.81	
2	Scrubber Brush	electrical	$ 5.62	1	$ 5.62	
3	Push button	electrical	$ -	1	$ -	
4	24V Battery	electrical	$ -	1	$ -	
5	Drilling Machine	assembly	$ -	1	$ -	
6	Drill Bits	assembly	$ -	1	$ -	
7	Other Drill Accessories	assembly	$ -	1	$ -	1
8	Plastic tupperware	assembly	$ 4.00	1	$ 4.00	
9	Epoxy Plastic Weld	assembly	$ -	1	$ -	
10	Wiring	electrical	$ -	1	$ -	
11	Dish Detergent	testing	$ -	1	$ -	
12	Cutter	assembly	$ -	1	$ -	
13	Plastic Plate	testing	$ -	1	$ -	
14	Cardboards	assembly	$ -	1	$ -	
15	Chopstick	assembly	$ -	1	$ -	
16	Brush	cleaning	$ -	1	$ -	
17	Straw	tubing	$ -	1	$ -	
18	Tape	assembly	$ -	1	$ -	
19	Epoxy Plastic Weld	assembly	$ -	1	$ -	2
20	Knife	assembly	$ -	1	$ -	
21	Sharpie	assembly	$ -	1	$ -	
22	Pencil	assembly	$ -	1	$ -	
23	Screen Mesh	cleaning	$ -	1	$ -	

Total = $ 25.43

THENORTHDESIGN **Appendix - Additional Sources** 13/11/2022

(2/2)

Item ID	Link
1	https://www.hoteemotor.com/worm-gear-motor/ht-wog34b.html
2	https://www.walmart.ca/en/ip/scotch-brite-little-handy-scrubber-505p-8-ca-non-scratch-white/600007583890
3	/
4	/
5	/
6	/
7	/
8	https://www.dollarama.com/en-CA/p-cliplock-food-container/3033713
9	/
10	/
11	/
12	/
13	/
14	/
15	/
16	/
17	/
18	/
19	/
20	/
21	/
22	/
23	/

2.2 Prototype Development

- Cardboard boxes will represent the exterior and the shape of the box to demonstrate the volume and compactness of our prototype. Plastic or metal will be used for waterproofing however the cardboard is used to test the dimensions.
- Rubber is still included to ensure sealing.
- Installed an inflow and outflow system with straws to represent the tubing and our pump system.
- Epoxy glue, hot glue, and rubber is used to limit the water from seeping through the cracks.
- Five brushes are strategically placed on the top and bottom connected by glue, that represents the motors, to ensure that all surfaces are being cleaned.
- There is a red button on the side of our prototype to represent the automation of our system and it's easy of control.

- We have set out to prove the cleanability of our prototype with more brushes.
- We have learned that the motors will be used with 18V to get the most power, velocity, longer battery life, and longer life.
- This system is more efficient and easier to maintain.

2.3 Prototype set up

2.4 Critical Component Analysis

Our testing is conducted by measuring the efficiency percentage which is found by a ratio of the total cleaned area to the original area that was covered in algae. It is assumed that the brushes will be spinning by motors. To test the efficiency, the space between all the brushes is measured to get the maximum number of algae scrubbed as possible.

As shown in the setup of the project, the brushes are glued to the top and bottom. The glue is a representation of the motors. All wiring and circuitry of the system will be sealed outside of the box to keep all electrical current safe from any liquid or water residue.

In this prototype, we have taken a more comprehensive approach to view our project in a new light and gather more feedback in our next client meeting. This approach allowed us to invent and build this prototype with new materials to analyse our components.

Having mentioned measurements, all the brushes are measured and tested to ensure that all surface of the boards are being reached and cleaned. It is important, according to our client, that everything is cleaned.

2.5 Changes

- Handle and different configuration of the lid for easier access.
- Controlled anti-slam hinge to prevent slamming and harsh use on the prototype.
- Button on the side of the box.
- Mesh to hold the platform and still be able to clean the top, bottom, and sides.

2.6 Potential Users & Feedback

Alexis Truax: Former Retail Worker

The simplicity of the design is nice as it mitigates the chances of injury or damage. In a retail workplace it is quite common for people to be distracted and "going through the motions." With these distractions it becomes easier to ignore safety precautions which in this case seem like there are very few.

Brad Warnaar: Metal working apprentice

It does not get much easier than a single hinged box, in this prototype it looks extremely easy to replicate with most metals. With a box being easy to make and easy to seal, this prototype should be easily followed and recreated in varied materials.

3 Next Prototype

3.1 Test Plan

So far, we have tested both automation and cleaning efficiency for our first and second prototype, respectively. For the coming prototype, the team is thinking about testing the hydraulic subsystem by implementing a flowing system and testing the water pressure and its reliability.

A syringe and proper tubing could be used for the testing. The first two tests shall also be combined, and a final converged system is to be built.

As of new ideas, the team has settled for many great ideas and is still being creative on how to make an innovative yet simple design to meet the objective. A moving mesh for instance is to be considered, which goal is to allow the raft to exit the box safely and automatically with the use of gravity, without the need for the worker to put their hands inside the device and extract it. That would greatly improve the simplicity of use, widening the user population and reducing the labour skills or time.

Lastly, for design day, the team is still deciding whether the three prototypes are to be used to represent the different subsystems, or if one final representative prototype is to be presented. Regardless, both efforts and time will be invested to reach the best possible results.

3.2 General Objectives

- Analyze feedback on the prototype
- Analyze and interpret the meaning and goal of the feedback.
- Produce potential conceptual changes to meet the feedback.
- Restart the concept selection process (Redesign, Reiterate, Brainstorm).
- Begin implementing this concept into the overall design.
- Produce external feedback from peers.
- Generate the new concepts based on peer review.
- Predict usage rates, and effectiveness.
- Predict the results of tests.
- Analyze potential fixes to the results.
- Prepare potential risks/uncertainties of this new concept.
- Minimize the risks/uncertainties that the new concept presents.

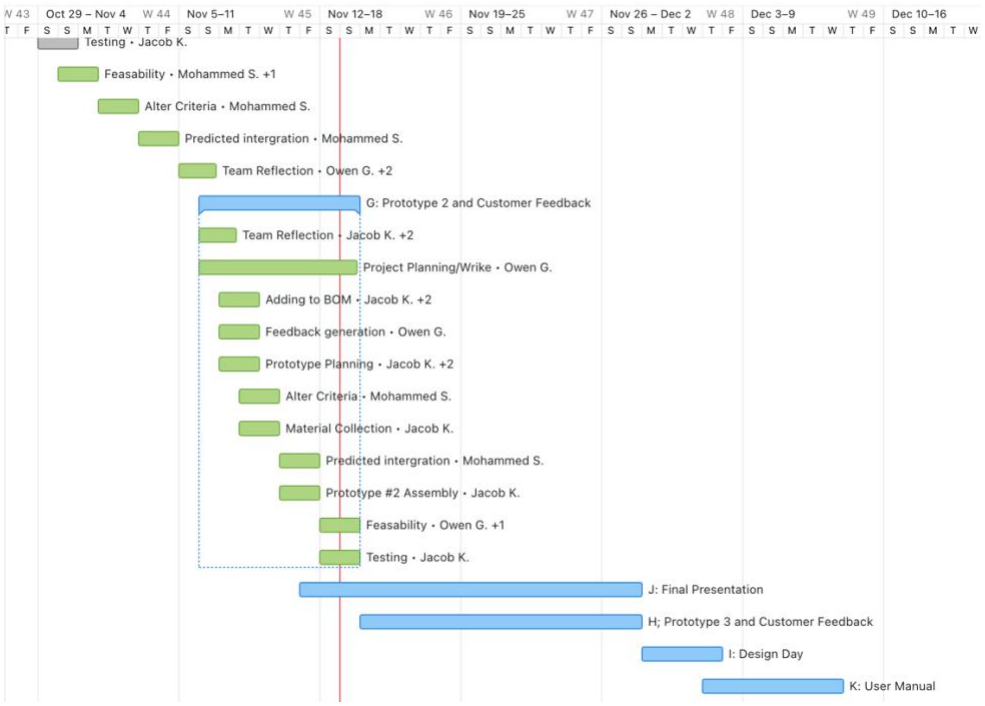
- Finish implementing the concept into the product.
- Prepare test plan for implementation of product.

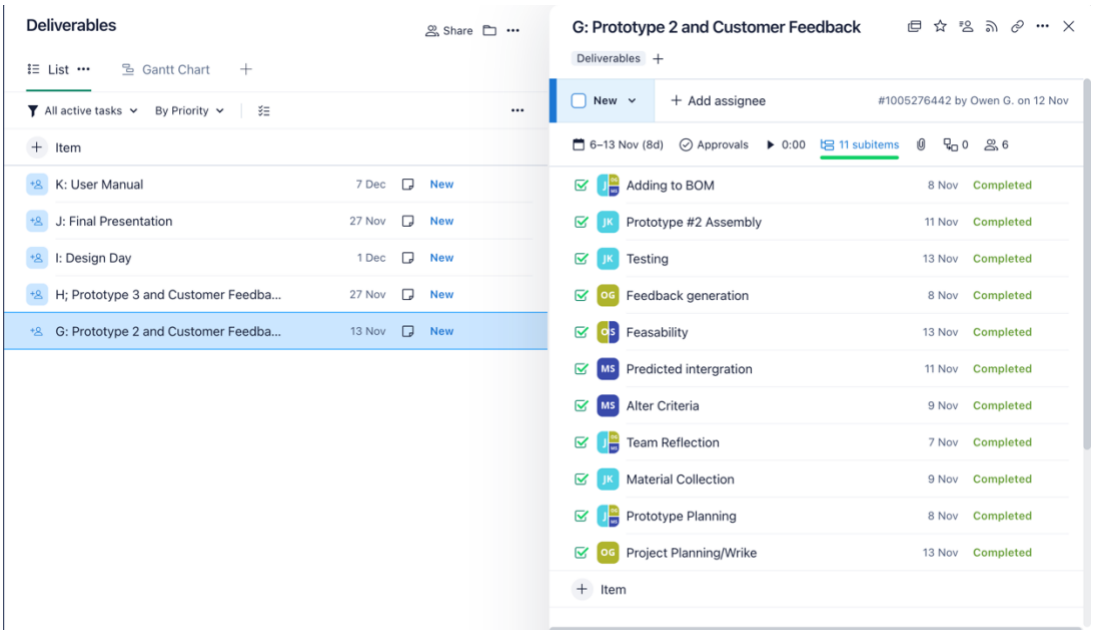
4 Project Management

After the third client meeting, we received multiple pieces of feedback and using interpretation we can discover uncertainty and new priorities. Like last week's project we must work in a divided and conquer style. With some of the group taking the feedback and making readable information, while others work on the physical prototypes/analytics of the projects.

This week's work is highly focused on clearing up any uncertainty that the clients may have, while also preparing ourselves for the final prototype and design day. With the next client meeting approaching we must also begin some preparation for that, with potential animations/drawings or added prototypes. As we move into our development's next phases, we will continue to follow a similar process to produce a clear and effective prototype and concept for our clients.

(Please refer to Wrike for more detail)





5 References

Jason Foster. 2019. “GNG 1103 – Engineering Design Lecture Notes” uOttawa.

Makerepo staff. 2021. “Professional development/Design thinking/Design for manufacturing - CEED Wiki.” Accessed November 6, 2022. https://en.wiki.makerepo.com/wiki/Professional_development/Design_thinking/Design_for_manufacturing.