Deliverable C

Submitted by

B32

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List of Acronyms

Acronym	Definition

1. Introduction

Based on the information we gained from deliverable B, we start our next stage on our project. Deliverable C is mainly about generating and analyzing concepts and preparing for our next client meeting. In the conceptual design part, we will generate various subsystems or the entire system of our product. And these concepts will be analyzed based on the target specifications. Then our group will develop a group design based on the best solution we've got. Also, project plan will be updated including adding some dependencies and milestones to allow us to arrange our schedules properly. Finally, short preparation for our next client meeting is provided like client's feedback about our conceptual design.

2. Product Functionality

The core functions of the shower seat are stability, portability, and usability in diverse shower settings.

The stability of the product depends on the design and materials used for the legs and seat. These materials must support at least 250lb to function as the client specified.

The functions that the product needs to be portable to the specifications of the client may be, collapsible legs, legs with adjustable height, and a small overall seat size.

The usability of the product is based on its ability to be used in a diverse set of shower types. It will also need to be able to function in wet and humid environments. The seat therefore will need to be made from corrosion and mold proof materials.

3. Target Specification Analysis

Target specifications are used to express the demands of the customer in the form of characteristics. These characteristics may be assessed to ensure that the product succeeds and remains focused on the demands of the client.

	Metric Name and Number	Importance	Unit

5, 7	Collapsibility	1	Qualitative, scale of 1-5 (5 being best)
8	Waterproof	2	Binary (yes/no)
4, 6	Durability	1	Qualitative, scale of 1-5 (5 being best)
2, 9	Comfort	1	Qualitative, scale of 1-5 (5 being best)
3	Weight	1	Kilograms
1	Height	1	Centimeters

Table 2: Metrics, units, and explanation

The quantifiable specifications are used to quantify measurements that do not have a standard measurement using a relative scale. The measurements put in place will help the team achieve its goals and stay focused on its requirements and desires. The measures were rated based on the necessity of ensuring that the customers' core demands are appropriately portrayed and addressed through established measurements.

4. Product Concepts

Paul's concepts:

4.1. Folding Mechanism

The purpose of this mechanism is to minimize the folded volume and reduce the steps required to fold the whole seat. So the whole seat can be folded into the cushion. Seat legs can be

retracted into columns which are half-length of cushion. And because the seat has no backrest, whole seat can be folded into the cushion.

4.2. Extendable Legs Mechanism

Seat legs have several levels of lengths. There can be a thick and sturdy screw in the middle of a seat leg, and when driving the screw, the legs will be extended or retracted.

4.3. Seat design(materials)

The chair can be designed to be all plastic or latex, and the legs of the chair are iron or aluminum or similar steel products to support the user's weight. There is no backrest and there are holes in the middle of the chair for water to flow out. The width of the chair should be the same as the width of the bathtub. The cushion can also be extendable to fit users' preference.

Aidan's Concepts:

4.4. Extendable Legs:

Extendable legs using a hole peg system. Multiple holes allow for multiple heights.

4.5. Seat Cushion:

A seat cushion made from polyethylene foam wrapped with vinyl. This will allow the seat to be waterproof. It will also allow it to have enough give to be comfortable.

4.6. Full Plastic Seat:

A fully plastic seat. Having this will reduce comfort but it will shrink the products' size and weight. It also would allow for storage of folded legs inside the body of the seat.

4.7. Silicon Leg Tips:

Using silicon as leg tips allows the legs to be slip resistant and waterproof as well as being easy to cast or form.

Full Concept:

This concept is focused on comfort and portability. The seat will be made from polyethylene foam. This makes the seat waterproof and mold proof. This foam will be secured to a plastic frame with holes at the bottom to drain any water buildup inside the seat after prolonged use. The base of the seat will be attached to two aluminum bars that run the length of the seat. The bars are aluminum because of their light weight and resistance to corrosion. These bars will attach to hinged legs. The legs will be able to rotate 90 degrees inward. On the bottom of the base of the seat are clips that hold the legs in place while they are folded up. The tips of the legs are made of silicon rubber as it prevents slipping.

Cem's Concepts:

4.8. Foldable Legs:

Legs can be folded from the hinges at the corners of the shower chair.

4.9. Seat:

The seat is made from plastic because using plastic will reduce the price and will not allow the water to be absorbed. The seat has holes that allows the water to fall. The seat is also designed in a parabolic shape which allows the water to go into the holes.

4.10. Arm-rest:

The chair has arm-rests on both sides. Arm-rests are made from aluminum and they are covered with silicone. They are attached to the seat with press-fitting.

4.11. Back-rest:

The chair has a back-rest made from plastic. It is attached to the seat press-fitting.

5. Concept Analysis

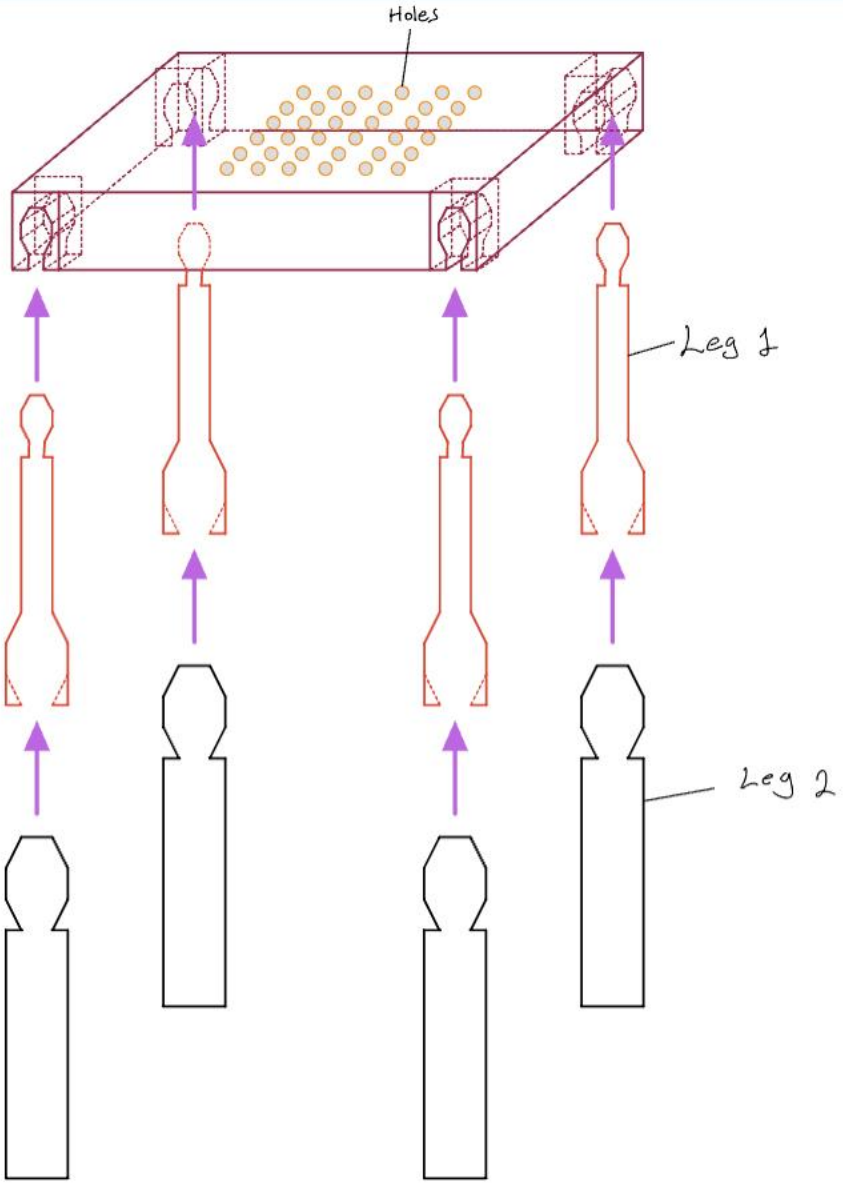

Figure 1

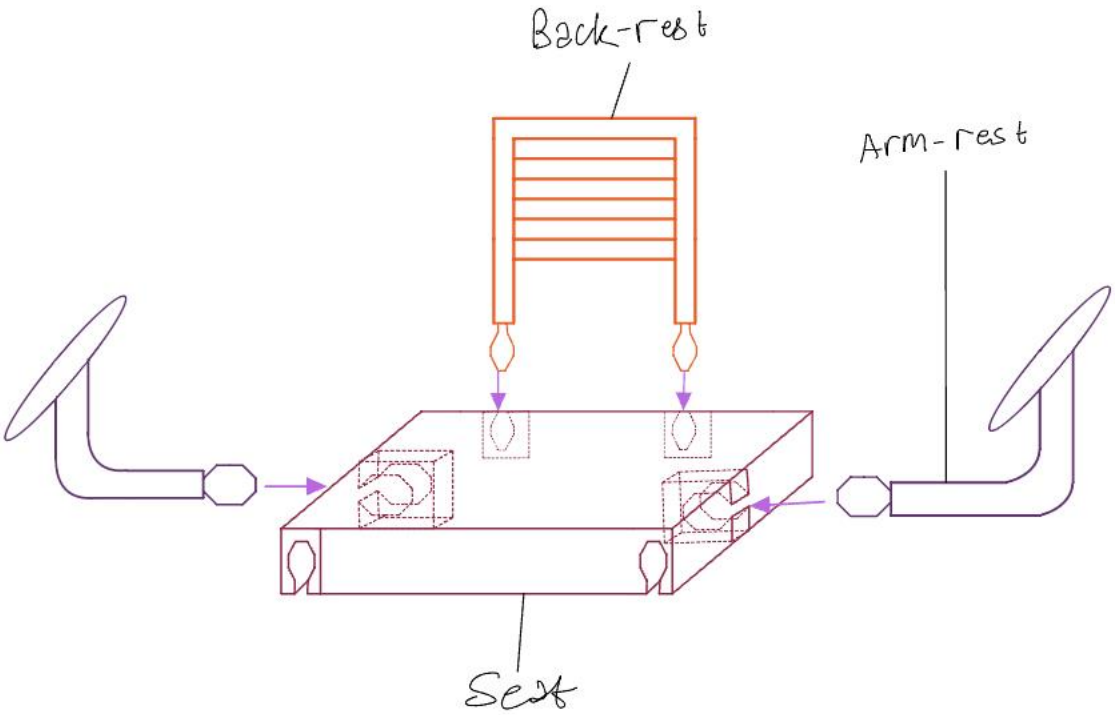

Figure 2

6. Group Design

The final group design is based on a modified version of the final concept. It will use a full plastic seat along with removable aluminum tube legs. These legs will have silicon stoppers to prevent slipping. The seat itself will have a textured top to prevent the slipping of the user. The seat portion will have holes in the center area to provide drainage of water so that it does not build up. The seat will also have a removable back rest for comfort.

This product will be able to support the required 250lb and be the exact height needed. The weight of this product would not exceed 6lb. The strength of this design is its simplicity, light weight, and small size. This makes it ideal for travel and use. The drawbacks to that focus are the reduction in comfort while using the seat.

7. Project Plan (Wrike)

Wrike Snapshot link:

https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=VW0mGlwNIzdLcD9oLQqLyXGoOWEZM6SS%7CIE2DSNZVHA2DELSTGIYA

8. Client meeting preparation

At first, we put our eyes on the waterproof performance of the shower seat. For the cushion, we have the following options made from all plastic, Vinyl-wrapped polyethylene foam, or Latex made. As for the shape of the seat, we think that a parabolic shape that allows the water buildup inside to be drained is satisfying. After that, we think about the portability properties of the seat and a folding mechanism. Some clips can hold the legs when they are folded up on the seat base. Aluminum bars attached to hinged legs that can rotate 90 degrees inward are lightweight and anti-corrosive. The whole design should be light and durable enough. For the legs part, we add an extendable mechanism to the legs. There are two choices for the design aspect. One has a thick and sturdy screw in the middle of a seat leg, which can adjust by driving the screw. Another idea is a hole peg system. It contains several holes that allow different heights. We have silicon rubber leg tips because it is waterproof and durable.

Here is the question list for the next client meeting:

1. Which waterproof cushion design is the client's preference?
2. What kind of extended legs mechanism does the client want?
3. What is the budget for the final product?
4. What should be the projected lifespan of the seat?
5. What is the preferred color of the seat?
6. What else do we need to improve our design?

9. Conclusions and Recommendations for Future Work

In this deliverable we have a thorough consideration about how our product should look like, how many sub systems it should have, and how it could satisfy the customer. By generating several sub systems, we find various ways to functionalize our product, although they may not be efficient or realistic. When analyzing these concepts, the most important thing is if the concept fits the target specification. Analysis allows us to choose the best possible solution among these concepts and assemble the subsystems into an entire system. And by sketching the model of our final product, we can have a precise vision about how our product works and how can we build it in reality in prototype 1. Then what we should do in the future is to ask for our client's opinion about our concepts and where we should slightly change our product. Then we can start our prototype 1.