Deliverable E

Submitted by

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Aidan Mountain, 300237958

Zhehao Xu, 300232081

Fred Xu, 300136783

Yuning Xia, 300231028

Cem Kiyik, 300073910

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University of Ottawa

Table of Contents

1 Introduction

In this deliverable E we will do a 10 minutes presentation about the current steps on our project. We are going to summarize the feedback from our client and explain our plan about how to improve our prototype. Our team will summarize all the key components in our project deliverable, like target specification, benchmarking and conceptual design, etc. Our initial plan will be discussed and how we keep on tracking with our plan will be showed. A summary of our client feedback will be provided, and the general progress of our prototype so far will be presented. Finally, plan for the next client meeting will be shown, like questions to be asked to the client.

2 Summary of the project deliverables (to date)

PDB

- **Customer Needs**
  i) Comfortable
  ii) Light Weight
  iii) Big Size
  iv) Waterproof & Drain system
- **Problem Statement**
  - Darcy conveys a need for a foldable and lightweight shower seat for travelling. This shower seat must be made for wet conditions and have durable feet, and it should be under 5 lbs. and 21 inches tall. A backrest would be a great option to add on.
- **Target specification**
  -

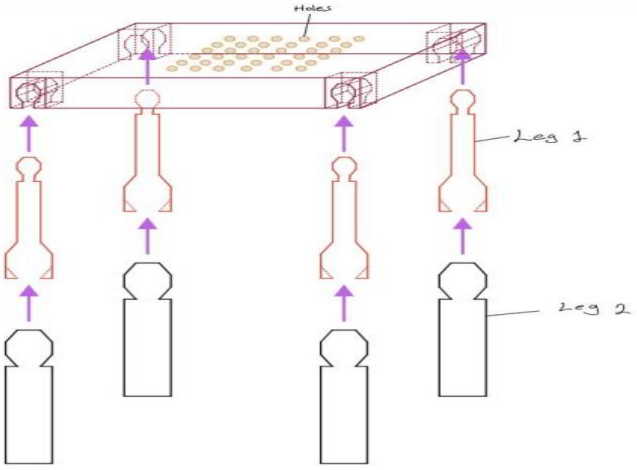
	Metric Name and Number	Importance	Unit
5, 7	Collapsibility	1	Qualitative, scale of 1-5 (5 being best)
8	Waterproof	2	Binary (yes/no)
4, 6	Durability	1	Qualitative, scale of 1-5 (5 being best)
2, 9	Comfort	1	Qualitative, scale of 1-5 (5 being best)
3	Weight	1	Kilograms
1	Height	1	Centimeters

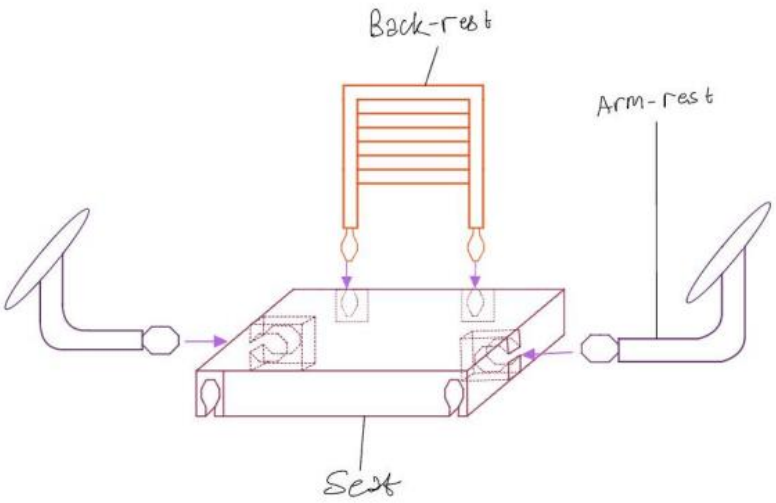
- **Benchmarking**

PDC

- **Core Product Functionality**
    i) Stability
    ii) Portability
    iii) Usability
- **Product Concepts**
    i) Paul's Concept
    ii) Aidan's Concept
    iii) Cem's Concept
- **Concept Analys**

i)





ii)

- **Group Design**

  i) 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.

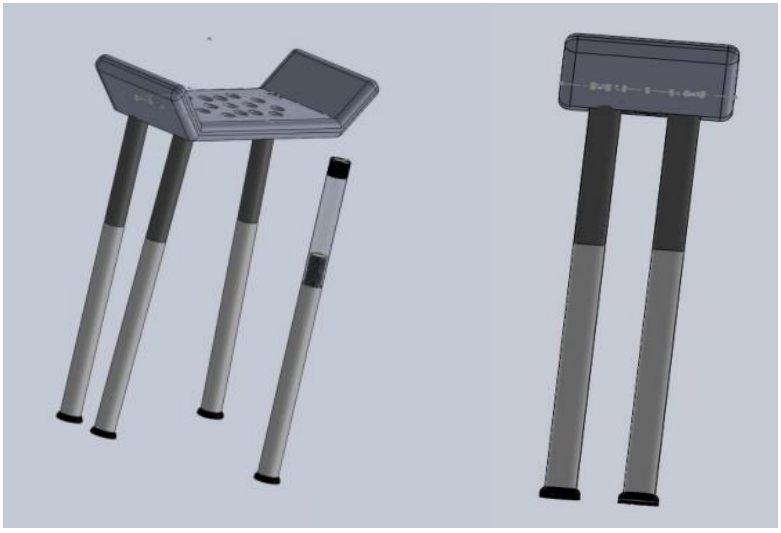
  ii) This product will be able to support the required 250lb and be the exact height needed. The weight of this product would not exceed 6lb. The strength of this design is its simplicity, light weight, and small size. This makes it ideal for travel and use. The drawbacks to that focus are the reduction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

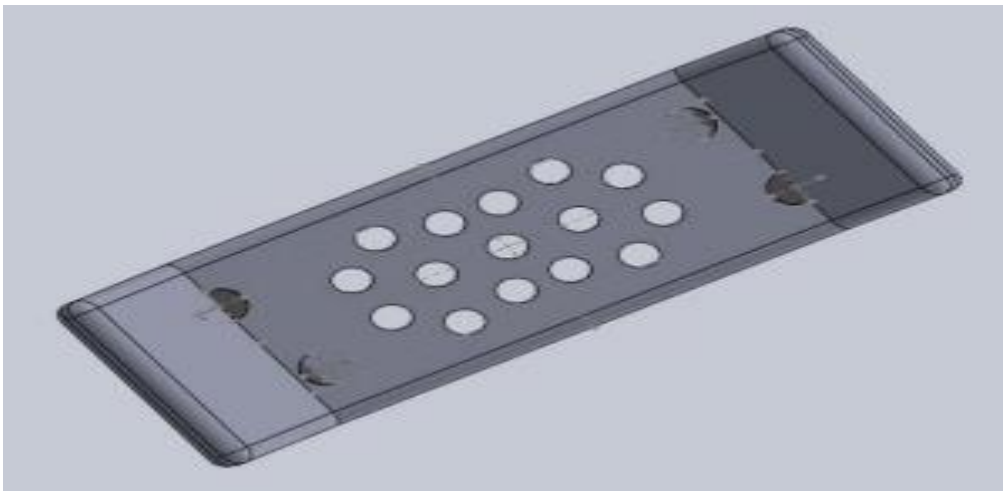
PDD

- **Bill of Materials**

Part and Link	Description	Cost (CAD)
Silicone Rubber	Two-part moldable plastic mixture to in case the bottom of the leg to prevent damaging the floor and prevent the chair from slipping.	$13.39
Aluminum Square Tubing	7-8' of aluminum tubing to act as the legs of the chair	$30.73
ABS Plastic	Plastic for the creation of the seat portion of the seat.	$10.50
Shower seat	We bought one complete shower seat, and we will modify and build our product based on it.	$ 40
Total Cost		$94.62

- **Critical Product Assumptions**
  - To make our product waterproof, we assume that the material of the seat is ABS plastic. We assume the shape is parabolic to confirm the water buildup inside is drained effectively. The separable parts, padding, legs, armrests, and backrest make the seat portable, which can be achieved by the separable parts, padding, and legs. It is assumed that the connectors between the legs and the seat are smooth and easy to connect. We also assume the legs are aluminum because of their anti-corrosion and lightweight. The leg tips are assumed to be silicon rubber made. The lifespan of the shower seat is assumed to be 6 years.
- **Prototype 1 (3D Model)**





3 Initial Project Plan

The first project 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 shower seat will have a textured top to avoid slipping. The seat portion will have holes in the center area to provide drainage from water so that it does not build up. The seat will also have a removable backrest 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, lightweight, and small size. This size makes it ideal for travel and use. The drawback to that focus is the reduced comfort while using the seat.

4 Client Feedback Summary

Since the start of the shower seat design, we have met twice with client Darcy during two lab sessions via zoom. In our second client meeting, Darcy stated that there is still a lot to improve. There are suggestions obtained from him. The life of the shower seat is no shorter than 5 to 6 years. A cushion is needed on the shower seat, following his preference. We should keep using silicon leg tips. White is supposed to be the color of the whole shower seat because the client preferred not to make it too flashy. As he looked closer at the legs, he was concerned about the connectors between them most. According to his demand, we need to confirm that the removable legs can be separated without difficulty and are stable when sat on.

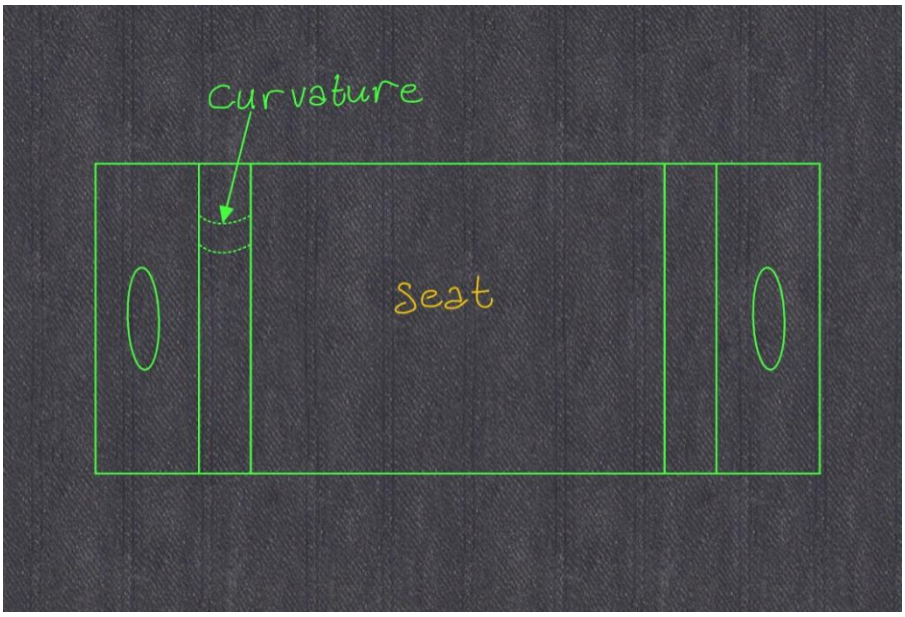
5 Plan for the Development of Prototype

The plan for future prototypes is to create and test critical systems using physical and analytical prototypes. The physical prototypes will be of the critical structure of the assembly mechanisms, i.e., how the legs attach to the body of the seat. Using analytical tools like in solid works, we will analyze stresses on the chosen design to make sure it can withstand the target weight. The final prototype will be a full comprehensive physical prototype of the seat with all systems functional. Once tested, any flaws in the design are to be solved and a new iteration is to be created.

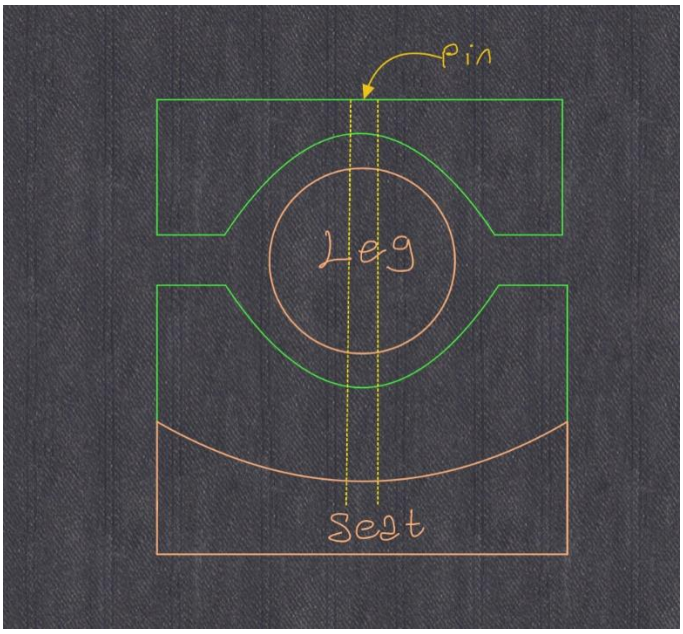
6 Prototypes we have developed so far

Until the due time of deliverable E, we finished prototype 1, and we already started the work on prototype 2. We have discussed and ensured the product concept and target specifications. Then we used a 3D model to simulate and create a visual prototype, and it was successfully tested. After that, we had a meeting with the client and professor, we summarized the details of development of the product. Now, we are working on the physical prototype, we purchased a finished similar product, and we had a conflict of how to develop or reshape this product to make it satisfy the client's need, like to make it fordable and have a backrest. We listed out several possible ways to do this, and finally we reached an agreement. So, currently we are planning to cut the upper corner of the chair (the red circle in the picture1), and then add an attachment to make the chair fordable and portable. And now we are building a 3D model based on our plan, and currently we've done ¼ of the whole product.

Seat Geometry

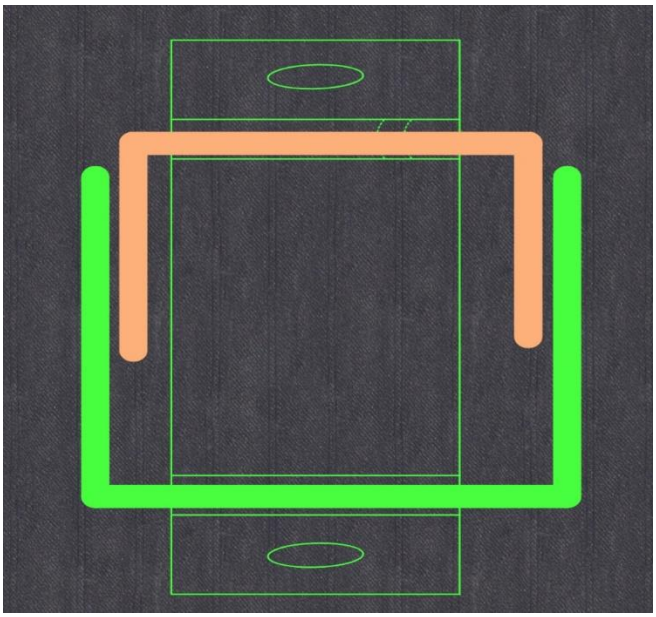


Leg Attachment of the Seat



Transational movement of the legs are constrained by the green box we have designed and rotational movement is constrained by the pin when the client wants to use it. And the user can remove the pin to fold legs when desired.

Folded Legs



7 Client Meeting 3 Plan

This time in client meeting 3, we would like to focus on the usability of the shower seat, as its theoretical tests are all done. We are heading to a physical test on our prototype. For the cushion, we make it all plastic. A parabolic shape that allows the water buildup inside to be drained is applied to the seat. We also consider the seat's portability and folding mechanism. A hole-peg system on the legs makes the seat separated into several small parts, which can fulfill the client's portable need. The connectors at the end of the legs can make sure it is easy to dismantle and reconnect between them.

Here is the question list for the client meeting 3:

1. What do you think of our leg adjustments?
2. What do you think about our connectors?
3. Do you think there are other improvements that could be made?
4. What do you want to add to the folding mechanism?

8 Wrike Snapshot

https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=z1WSHm3fJVFIESzJ9jODbMwP2P5Gaeu5%7CIE2DSNZVHA2DELSTGIYA

9 Conclusions and Recommendations for Future Work

Content above is the works we've done so far. In the presentation, our team will separate the whole presentation into 5 parts, and everyone can have a chance to present one part of the project. We stay enthusiastic to our future and we are working well. There are still some places for future promotion, so after the third client meeting, we would finally complete the product and provide a satisfied result.