

Project Deliverable F: **Prototype I and Customer Feedback**

GNG 1103 – Engineering Design

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Abstract

Prototyping is the most important part of any designing project. It is what allows you to incorporate ideas that you think would work, figure out what does not work and what is required by the client to make the project successful. This deliverable would present a better understanding of our prototype by explaining the reason behind the prototype and what we adjusted in our design to fit the client's needs using faster and inexpensive resources to build a preliminary model.

Introduction

This deliverable focuses on the prototyping test plan based on the outline provided in "Lecture 11 – Prototyping Test Plan", and it shows a basic prototype that is made using inexpensive materials and components like small wooden popsicle sticks or cardboard. The report will present feedback from the client on the prototype in order to improve the result of the final project. There are some standard objectives which will make sure whether or not the test plan is achieved. Furthermore, the objectives will include establishing feasibility, analyzing critical subsystems or reducing risk and uncertainty, and defining a stopping criterion.

Prototype 1

Prototype 1 was designed from small popsicle sticks to construct the current design of the greenhouse. The design was to represent on a smaller scale so that the actual design can be visualised as much as possible. The structure was held together by glue. Building a scaled prototype of our design gave us a much clearer understanding of the greenhouse. This prototype has a few shortcomings of this project which includes an absence of materials used to represent: all the items used in the actual design, the mechanisms used to connect the walls to the base and the walls to the roof, the hydroponic system



Figure 1: Front view of Prototype 1

Prototype Test Plan

What:

Prototype 1 was built using popsicle sticks bought from the dollarama store and put together using adhesive, which both cost 15 dollars. The purpose of this was to test our concept and provide further evidence on the overall structure. The design represents what the actual design would eventually look like as much as possible. In this case, our focus is on the roof, and prototype 1 is a miniature scale design compared to the final greenhouse that would determine the slope angle of the roof, which will be presented on design day because it helps us visualize better and gives us a clearer picture of what the structure would look like after the project is completed.

Why:

One of the most critical features we want to test was the gambrel roof design to ensure whether or not the snow and water will slide off the roof instead of staying and covering the ceiling. During the construction, we made sure that the angle was properly calculated concerning the frame of the structure. To ensure that the angle of the roof is sloped far enough, we will simulate it with water once we fully finish building the roof. Using our Engineering knowledge, since the gambrel roofs provide excellent drainage because of its steeper slope design, it can easily manage the rainfall the best, as the water simply runs off of the side of the building without getting captured.



Figure 2: Top view of Prototype 1

When:

The first prototype was constructed just before we physically started building the roof of the greenhouse and it took seven days to come up with the prototype and test for what needed to be corrected. We had a different design prior to the design we have now because after we came up with the previous design, we discovered that it required more use of wood, which needed more money. Our client emphasized that we keep a strict budget, so we changed the roof shape to the one we have now because it involved the use of wood scraps to build the roof, thus ensuring we save cost. In other words, the prototype helped us adjust what we needed to finally create a better model of what is required to please our customer.

Stopping Criteria:

The stopping criteria helped us to acknowledge when was the right time to stop, when our target was successful. To be completely satisfied with the testing objective we should examine if the gambrel roof design fully functions to the best of its abilities, we simultaneously started by testing the water at a various angle on the structure, which it may take around one day to do. Once we have visually seen that the liquid flows smoothly down the roof, we can conclude that the testing objectives were achieved, then record down the angles and glue the roof permanent with the rest of the greenhouse.

Client Feedback

On the 28th of February 2020, we met again with the client, Monique Manatch, to discuss the construction of a greenhouse. We were able to show the client some pictures of our design on a laptop and ask for her opinion and feedback. One of the emphasized feedback was a concern that rodents would be able to get into the greenhouse. To solve this issue, we will elevate the greenhouse off of the ground and add plywood on the bottom with copper mesh, which is a wire mesh barring material that is used as a physical barrier to prevent rodents from entering through tight spaces, around it. Another concern was snow and rain removal, precisely from the roof. The roof truss is a gambrel style roof, as shown in figure 3 below, and it will be covered with polypropylene sheets because it allows the snow to slide down. Moreover, there will also be gutters on both sides of the roof to collect the water from the roof to the rain barrel.



Figure 3: Side view of Prototype 1

Conclusion

A prototype serves as a throwaway model made to understand the essentials of a project before the design proceeds further. In other words, prototyping is a project test run. It is an important component that would guarantee our client the best success at the end of the project. Prototyping enhances the quality of the specifications and requirements given to clients. The main objective of this project is to make our customer happy and keep her satisfied; we will ensure this by involving her with all the intricate details of the project. With the prototype, our client was able to see and interact with a working model of the project, give her immediate feedback, request project changes, and alter model specifications. It most importantly helped us eliminate misunderstandings and miscommunications. In conclusion, the prototype helped us to determine early what exactly the client needs and what we need to modify in our design with faster and inexpensive resources.