Heating mat

Deliverable H

Team 10

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Contents

Introduction

The goal of this deliverable is to devise a test plan and develop the third prototype from the feedback given for the first and second prototypes. A prototyping test plan will be outlines based on the "Prototyping Test Plan" provided in lecture 11. Furthermore, the third prototype will be developed, and it will be used to achieve the objectives the team has set out in this plan. This deliverable is divided into four main sections: why, what, how, and when explanations of the prototyping test plan.

Prototyping test plan

Why?

Why is this test being done?	This test is critical as prototype III is essentially the final prototype that will be presented. Any issues or fixes found in this test will be corrected as the final patch, in other words, absolute all flaws or weaknesses associated with our design model will be fixed to perfection. This test will once again reveal if our design is still as effective and functional as before, which should not be an issue for the third iteration of our prototype. Finally, our test will also reveal safety or functionality issues related to the electric wiring, materials of the matts, assemblement of piece, and power supply.
What are the specific test objectives?	The main objective of this test is to make sure that all criterias required by our client is met. The test will also include functionality, design, materials, safety, durability, and aesthetics. The final prototype constructed by individual parts we picked out will allow for us to thoroughly test our initial design and see if it holds up in real life.
What is communicated and learned through the prototype?	This final prototype gives our team the full experience of building something from design to finish. By the end of this test our team will have the full knowledge of how all the critical components of our system works and how they can be assembled. This prototype gives us insight for future projects in terms of the full experience. Furthermore, this prototype will communicate to us all the remaining errors that exist within our entire project, which is critical to the overall success of this course to our group.
How are results assessed?	The results will be accessed by each member of the team using a 1-5 scale with 5 being the most practical and 1 being the least practical. This method of "practical/ non-practical" categorization allows for the team to identify the most important issues within our system and seek out those first. By prioritizing the most critical and important

	issues, this prototype will be able to meet the clients' needs more efficiently and overall complete our project.
What are the criteria for success and failure?	The success criteria for this prototype is if all of the clients criteria are met for this final prototype. If part of what the client wants is not yet met, the team will prioritize to fix that without failure. If the team is unable to achieve all of the clients' needs before the deadline, this project will be deemed as unsuccessful.

What

What is the prototype?	This prototype is the final prototype our team will construct. It will be built using specific materials picked out by our team for specific reasons. These materials then will be used to build critical components which will be used to assemble our final prototype. The heating cables and silicone rubbers will be reused as some of the critical components as we found them to be extremely effective. The design and dimension will be the same as to the conclusion stated in deliverable G.
What materials are required and what is the approximated cost?	• 2 Anti-slip waterproof silicone rubber mat (CDN$14.50) • Snow melting heating cables (CDN $29.60) • Temperature and humidity sensor for Arduino (CDN$ 19.99) • Arduino Kit (pre-owned) • Glue (pre-owned) • Tape (CDN$6.99) Estimated Cost = CDN$95.00

What information will be measured? Is this important data?	• The dimensions of the design can be measured through this prototype.
	• Also, the snow melting mechanism will be measured both qualitatively and quantitatively.
	  ○ Qualitatively to verify
	  ▪ If snow will melt.
	  ▪ Will it overheat?
	  ▪ Will it be connected well to tiles beside it?
	  ▪ Did the sensor work?
	  ○ Quantitatively to check aspects as:
	  ▪ How much time would it take to melt snow?
	  ▪ How much time would it take to overheat?
	  ▪ Rate of snow melting.
	  ▪ Also, the heat energy used can be measured knowing the voltage and measuring the time it works.

How

How will the results be recorded?	• Test of dimensions of parts and total size of the tile can be identified and recorded on excel. If the dimensions are not compatible, then it could be changed (we concluded the dimensions are coherent and perfect).
	• **Qualitatively**
	  ○ Test if the snow does melt.
	  ○ If it does not overheat within the test time (20 minutes).
	  ○ If it can be observed if the sensor will turn heater off.
	• **Quantitatively**
	  ○ Team would observe how much time it could take to melt a narrow layer of snow.
	  ○ Within 20 minutes no overheat
	  ○ Can measure how much snow is melting per time.
	  ○ Voltage and power are known, we can conclude from them the energy used over time measures with phone stopwatch.

When

How long will the testing take and are there any dependencies for the testing to happen?	Since the design is ready, real testing will take place. The test should take less than 1 hour. This would depend on the amount of snow on the exterior part (surface of the design). However, multiple trials will be performed to get the best results possible.
When are the results required and what depends on the results?	The results are required before design day. The team needs to proof that the design is working. The Gantt chart provided explains the estimated test periods with the given time constraints taken into consideration.

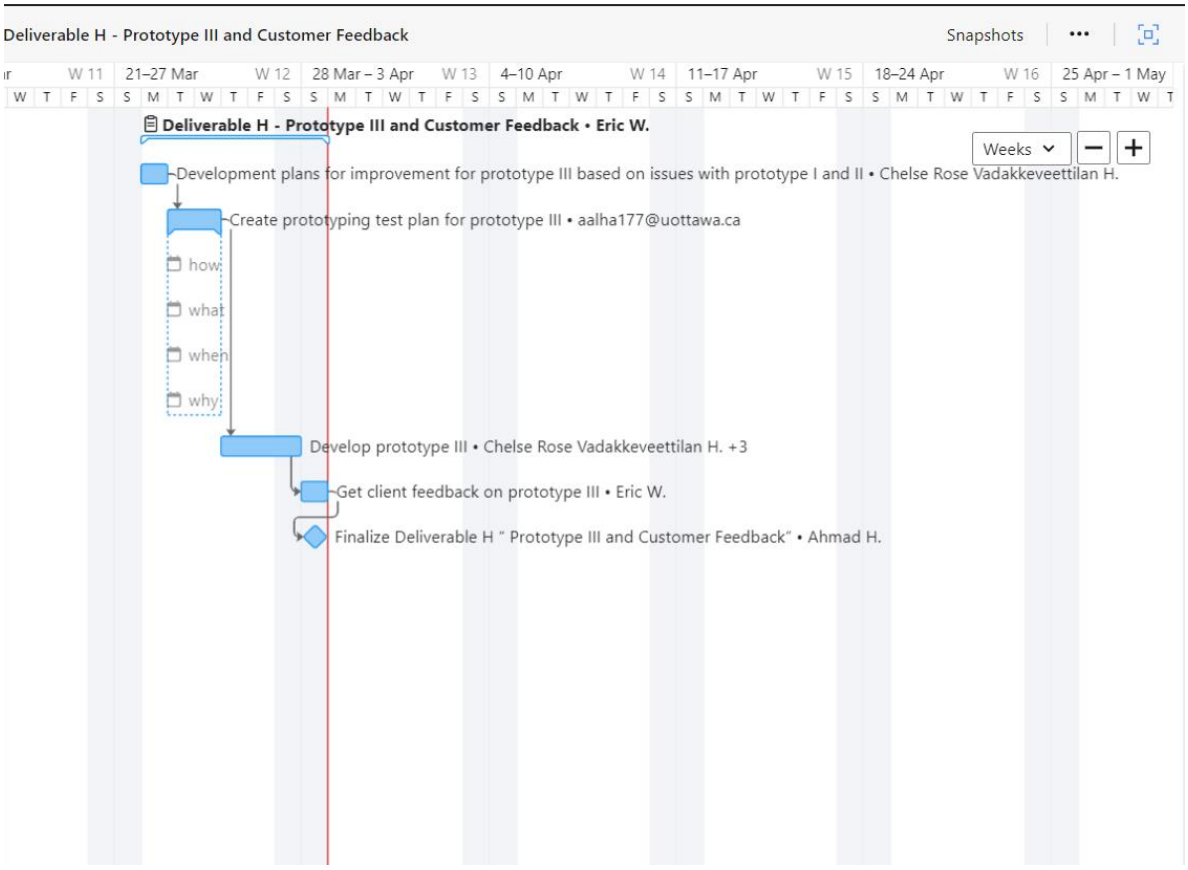

Figure 1. GNG1103 Team 10 Deliverable H Gantt Chart

Conclusion

In conclusion, the group's third prototype physically tests the functionality of the concept. It was influenced by the first and second prototype and the comments of the client and other feedback received from other potential users.