Project Deliverable G

Introduction

Using the feedback given by the client and possible clients, we have designed a second prototype that specifically focuses on meeting the client's expectations and addresses their feedback. Our design process is guided by a detailed prototyping test plan, measurable objectives and valuable feedback, which are enclosed within this document. This methodology will ensure the client's needs are met.

Feedback Received from Client

The first prototype was presented to our client twice. The first time was during our second client meet which was our first personal meeting with the client. During that meeting the client provided a lot of insight and feedback that was immediately implemented into the prototype. The feedback was discussed in detail in Deliverable F. A quick summary of the feedback is:

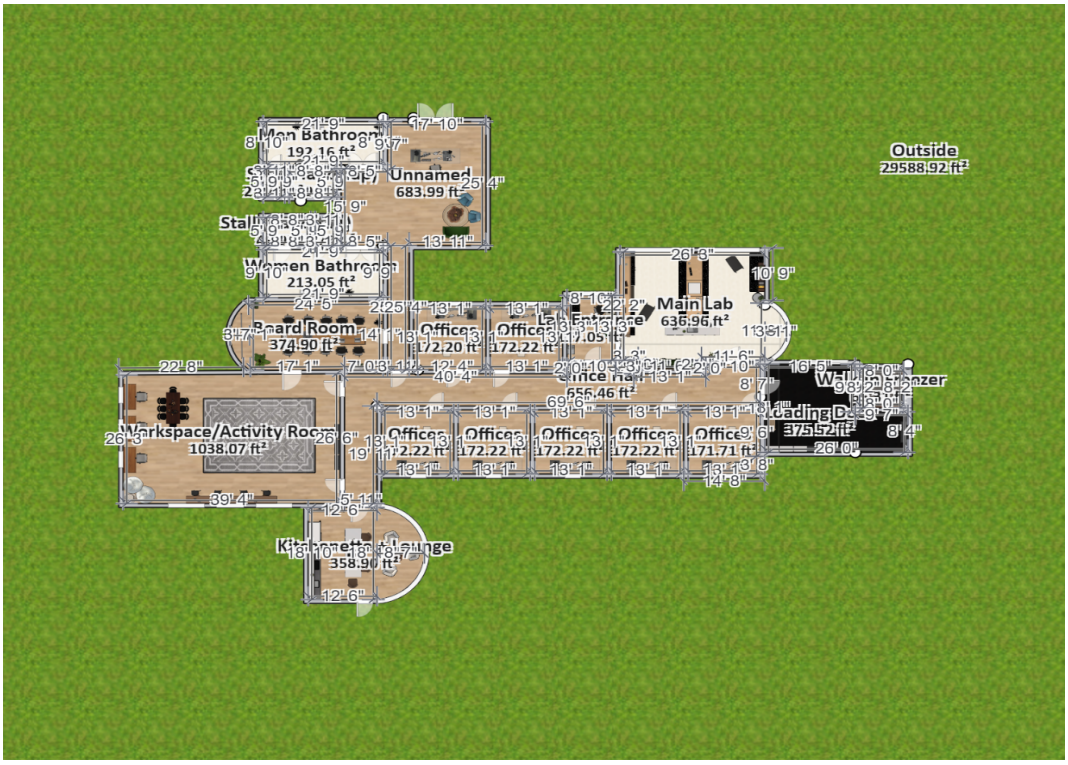
- Increase the Freezer space
- Fewer parking spaces with a covered loading/storage area
- Fewer projectors in the boardroom
- Omitting the oven from the kitchen

The most recent client meet was brief and its purpose was to show the client the progress of our design. After presenting our final iteration of prototype I the client has stated that they are satisfied with the changes we have made.

Prototype #2

For our second prototype, we recreated a 2D and 3D floor plan of our building with a new design. The floor plan contains the same critical subsystems as the first-floor plan but with additional subsystems, such as the parking lot, parking spaces, outdoor loading dock area, outdoor firepit area and two main entrances, along with an updated building design and ceiling decor. The 20m x 30m parking lot contains 10 parking spaces along with two handicapped spaces and a place for delivery trucks to deposit resources in the loading dock. It also contains slanted wooden roofs at the entrance held by support pillars. There are also two main entrances where you can enter into the main hall, or to the lab hall, both of which have roofs and paved entrances. The building is now shaped to enclose an outdoor area, with the lab moved to the right corner and the offices aligning the sides of the building along with a small workspace area in the bottom right corner. The enclosed outdoor area will contain sunken ground in the form of a circle (I couldn't edit this feature in the program, so refer to Figure 1 for a reference image) with a gazebo roof, firepit and benches, along with some outdoor storage for traditional activities like Pow Wow (A traditional dance), Makwa bingo, animal tanning and more. Finally, there will be a special roof pattern that will be displayed in the building, which represents a tiled river flowing through the building. Our clients call themselves *Omàmiwinini*, meaning downriver people, so we believe this tiled ceiling pattern holds a great amount of symbolism to their culture, which is why we chose this pattern. This prototype was finished on November 12th, and we are currently preparing for our 3rd prototype by constructing 3D models of our rooms in order to 3D print physical models to display to the judges. Our 3rd prototype will be finished around late November.

Our second prototype floor plan



First prototype floor plan to compare

Figure 1: Sunken ground in a circular pattern (This is the design we would like in our enclosed outdoor space)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Using iPhone or iPad
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Floor Thickness
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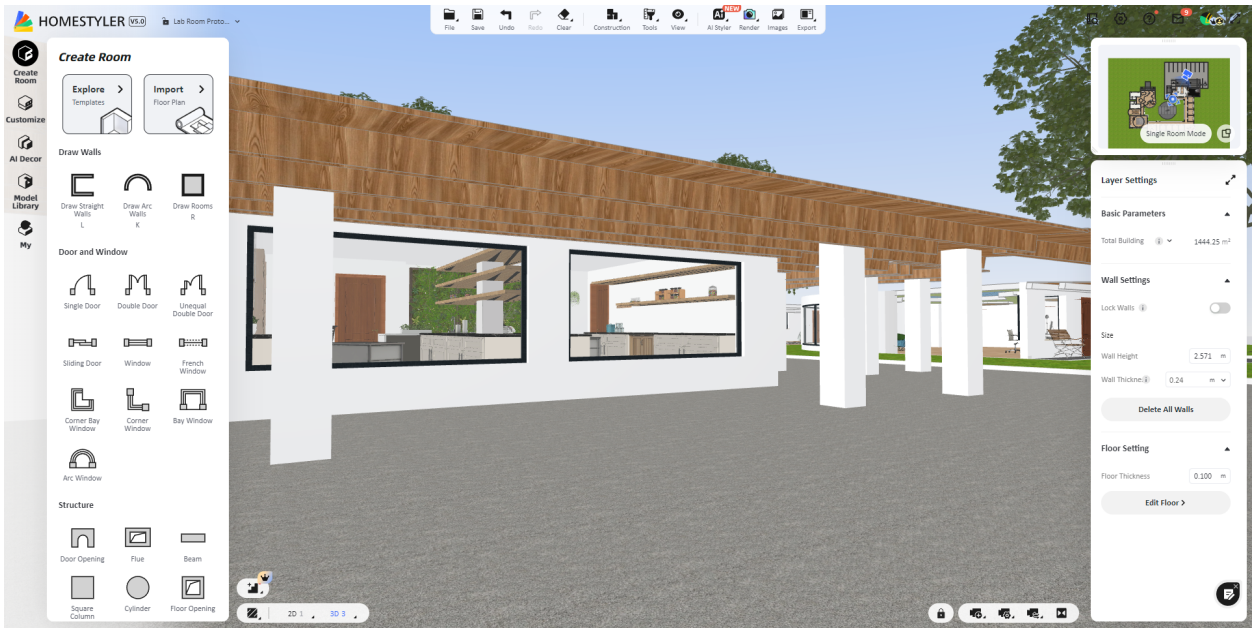
Edit Floor
Single Room Mode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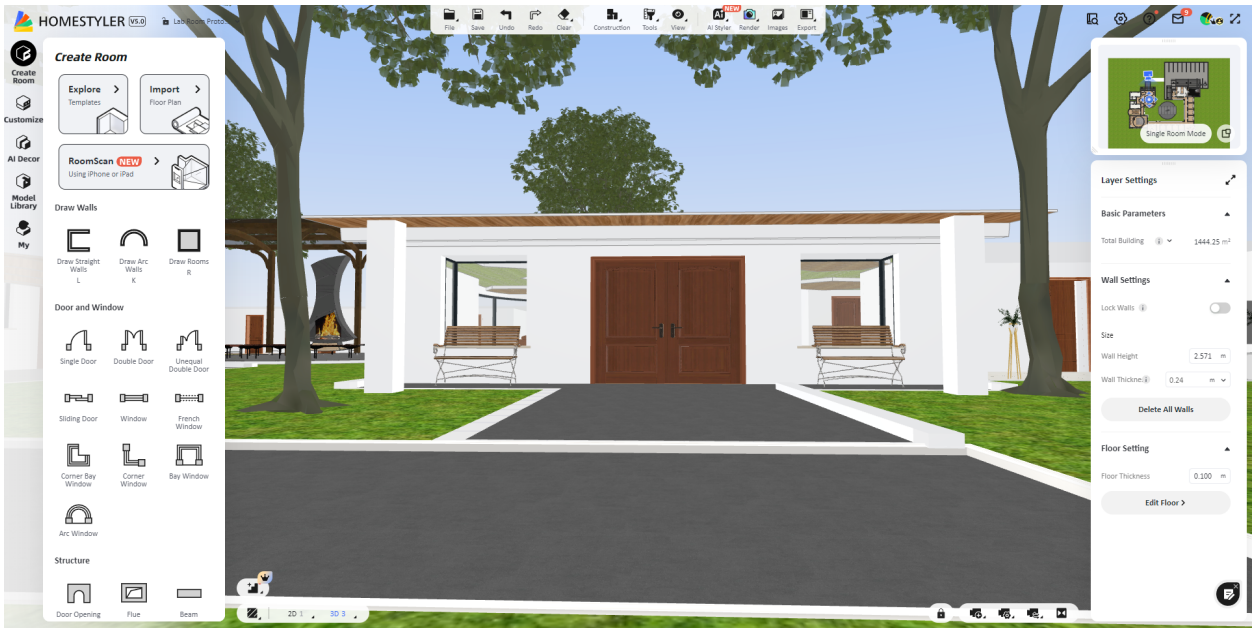
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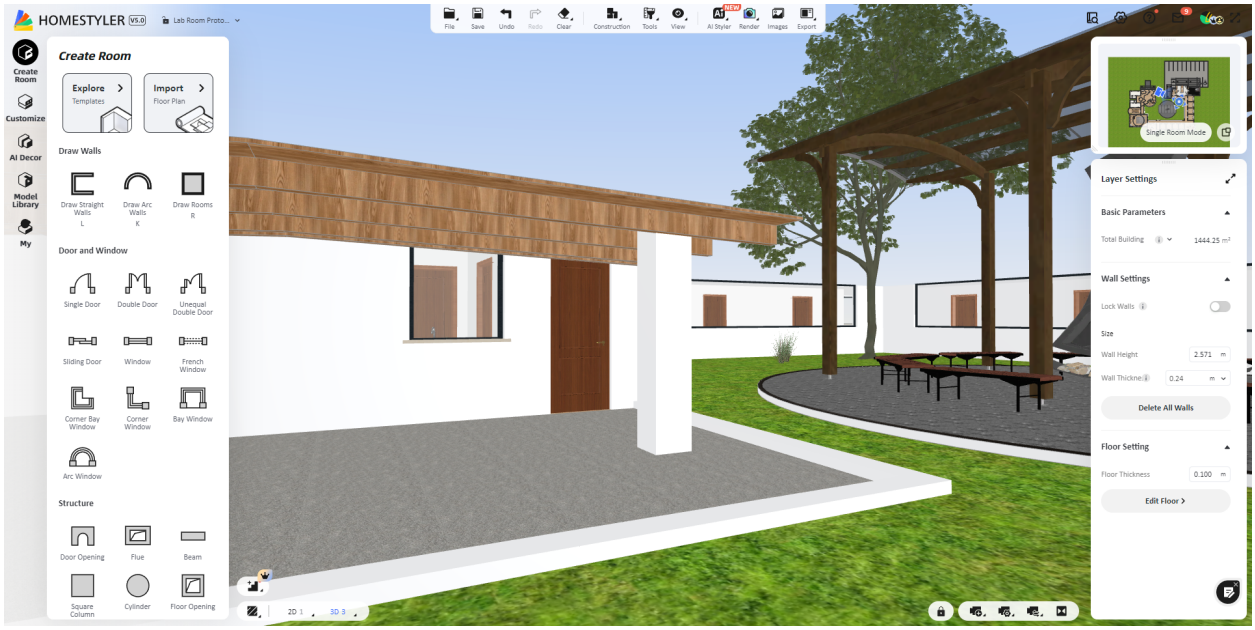
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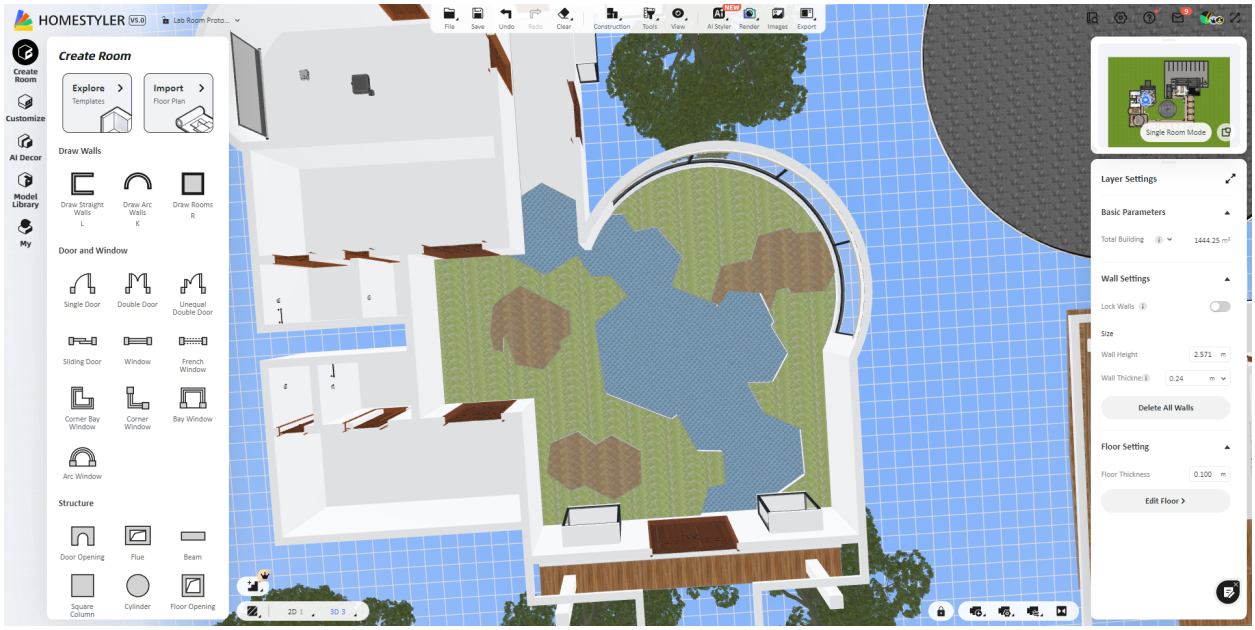
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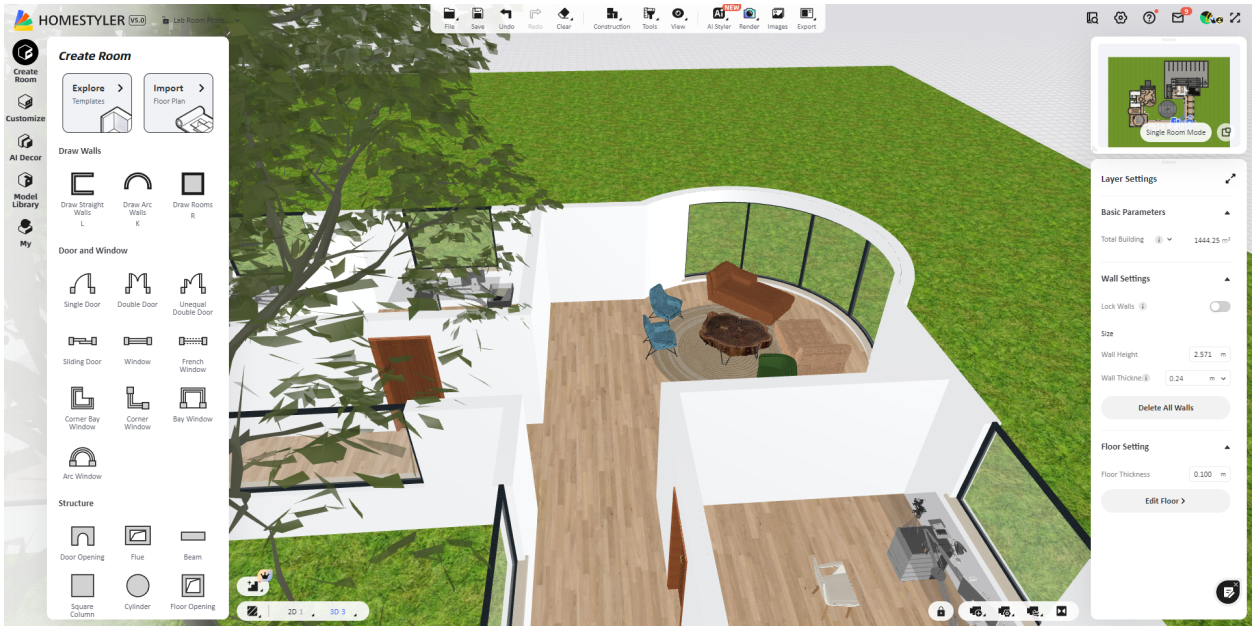
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Experimental model

After more research and consideration of feedback, we have decided to implement significant changes to Prototype I, resulting in the development of a new iteration—Prototype II. The changes are significant enough to constitute a new design. Since the prototype is in the same format as the previous, we will use the same experiments.

Test Results of Prototype II

Test ID	Test Objective	*Description of Prototype used and of Basic Test Method*	Description of Results to be Recorded and how these results will be used	*Estimated Test duration and planned start date*	*Results*	*Stopper*
1	Measure the WWR to make sure a good amount of sunlight enters the building.	Measure the window/wall ratio. A 3D rendering of the floor plan (prototype 1).	The window/wall ratio (WWR) should be at least 0.03. What we are going to do is measure the area of each window divided by the area of each wall, using Excel. WWR=window area/area of each wall	The test should take around 30 mins. We are planning to start this on Nov 8.	Offices: 0.04 Lab: 21 Kitchen: 0.17 Workspace: 0.22	As long as WWR is above 0.03, we are satisfied
2	Is the building accessible to handicapped people.	Analysis of features of the building and conducting a survey that asks random people for their opinion on the accessibility of the building to mitigate any bias that can come from designers. We are looking for at least 80% approval. A 3D rendering of the floor plan (prototype 1)	The building should pass the Accessibility in Ontario's Building Code and get 80% approval from survey.	The test should take around a day for everyone to submit their response to the survey. We will start on Nov 7	We have obtained a 90% approval rate from 20 different people	Satisfaction when communicated with 20 at least individuals, to ensure confident results from large sample size
3	Safety Features. The building must pass certain Ontario building codes.	Analysis of features of the building and seeing if it meets the criteria A 3D rendering of the floor plan (prototupe 1)	The building should pass the Ontario's Building Code	The analysis should take two days and will start on Nov 6	The building did indeed pass the Ontario's Building Code	Satisfied when we know the building is up to code
4	The building must have cultural elements that relate to the algonquin culture	Conduct a survey that asks an unbiased group of people whether the building incorporates the culture adequately. We can also interview algonquin people A 3D rendering of the floor plan (prototype 1)	The building must get an 80% approval rating.	The test should take around a day for everyone to submit their response to the survey. Nov 7	We have obtained an 85% approval from 20 different people	Satisfaction when communicated with 20 at least individuals, to ensure confident results from large sample size
5	The loading dock and parking lot should be capable accommodate 1-2 black trucks	The prototype is to scale so we will scale down the measurement of trucks and see if the parking lot and loading dock can accommodate	The parking lot and loading dock must accommodate the trucks with an error of 0.5m	This analysis will take 30 mins and it will take place on Nox 9	Our garage entrance is larger than the area of a truck (36 square inches), and therefore does accommodate trucks	Satisfied when we know a large truck can fit in the parking lot and loading zone

Comparison of results from prototypes I and II

Some of the results from prototype II have greatly surpassed those of prototype I. To begin, the window to wall ratio is much better in prototype II. The offices now have much bigger windows to allow for more sunlight. The lab ratio is however slightly smaller, since the windows had to be reduced to be able to properly modify the rest of the building. The kitchen WWR has slightly increased, and the workspace has remained the same. Some of the bigger changes are to the foyer and work hallway. Previously, neither had windows, now they have a WWR of 0.17 and 0.22 respectively. Prototype II is up to code, same as prototype 1 and it passed the Ontario accessibility code with the same rating. Another big change to the results was the survey done by 20 random people based on the cultural representation of the building. Prototype II received an approval rating of 95%, whereas the rating for prototype I was 85%. The accessibility for trucks has remained the same.

Feedback

Few comments taken from a survey on the design's overall look:

“I love the idea of the fire pit in the middle of the building; it catches the eye. I like the ceiling of the main entrance; it seems like a flow of water, which relates to the culture of the Indigenous people. Overall, I would give a 9/10 to the building; it is a nice modern concept, but it might be too modern for your clients, and it takes up a lot of space.” -Andrea K.

“I’m impressed by the quality of your design. It is simple, and it seems appropriate for your client. The previous design lacked harmonization; I like the new one. You should be careful about the type of plants that you decide to put in the laboratory because the structure doesn’t provide much light sources for the plants. Another solution is to install a light source pointing only at the plants. Because the people in the laboratory will have a view of the parking while other rooms have a prettier view, and because of the lack of a light source for the plants, I would give a 9/10 to your design.” -Viana N.

“I like the overall look of the building; it is very attractive. I am still having a hard time picturing the Algonquin culture in your design. The fire pit and the ceiling with water are nice, but I would not have noticed that you are trying to depict the Algonquin culture if you did not mention it. If you can add more elements, such as a cairn (a pile of rocks), a canoe, or make the ceiling represent the map of their territory instead of just random water flow, it would be astonishing. I would give a 9/10 to the building for the lack of proper representation of the Algonquin culture.” -Chris D.

Community/Cultural Space BOM

Name	Description	Quantity	Cost	Tax	Total Cost	Links
Cobble Circle Kit	9ft + 9" diameter	1	$489.99	$63.70	$553.69	Cobble Circle Kit
Fire Pit	Multi-functional design: The Patio Fire Pit Round Table serves as both a fire pit and a table, offering a dual-purpose solution	1	$831.85	$108.08	$939.93	Fire Pit
Outdoor Bench	3.6ft long seat can comfortably seat at least 2 adults under 550lbs	3	$139.99	$18.20	$474.57	Outdoor Bench
Total					$1,968.18	

Building Target Specifications

	Design Specifications	Relation	Value	Units	Verification Method
	Functional Requirements				
1	Lab	=	67.1	m^2	Analysis
2	Offices	=	128 (8 Offices)	m^2	Analysis
3	Freezer	=	6.07	m^2	Analysis
4	Loading Dock	=	34.96	m^2	Analysis
5	Boardroom	=	34.12	m^2	Analysis
6	Bathroom	=	56.26	m^2	Analysis
7	Kitchen	=	36.4	m^2	Analysis
8	Community/Cultural	=	3846.09	m^2	Analysis
9	Parking Lot	=	527.93	m^2	Analysis
10	Utilities	=	Yes	N/A	Analysis
11	Security	=	Yes	N/A	Analysis
12	Wheelchair Accessbility	=	Yes	N/A	Analysis
13	Workspace	=	99.32	m^2	Analysis
14	Main Hallway	=	132.28	m^2	Analysis
15	Entrance	=	25.13	m^2	Analysis
	Constraints				
1	Cost	>=	200000	$	Estimation
2	Zoning Permit	=	Yes	N/A	Obtained
3	Overall Space	>=	5000	m^2	Analysis
4	Environmentally Leed	=	Yes	N/A	Test
	Non Functional Requirements				
1	Appearance	=	Yes	N/A	Analysis
2	Sustainble for future	=	Yes	N/A	Analysis
3	Windows	=	Yes	N/A	Test
4	Life span	=	100	Years	Estimate
5	Thermostat	<	Yes	N/A	Test

Prototype Test Plan

Test ID	Test Objective (Why)	Description of Prototype used and of Basic Test Method (What)	Description of Results to be Recorded and how these results will be used (How)	Estimated Test duration and planned start date (When)
1	Analyzing floor plan of Prototype 2 for de-risking. This will allow us to allocate sections to all team members so they can print their part for Prototype 3, which is a physical 3D model.	We will use Prototype 2 and analyze the different aspects of the subsystems contained within. It will be an analytical prototype because the results from the test will yield from analysis. Using the second prototype, we will ensure compatibility of the dimensions and assign sections to be modelled and printed to all team members. The test software will be Onshape in our case but any 3D modelling software is appropriate. The prototype can be built using the modelling skills we learned in the previous labs.	Prototype 2 will be thoroughly analyzed by the team to determine the most optimal way of dividing the sections for ease of modelling and printing. This is necessary to avoid mistakes such as, for instance, duplicate walls when two members print adjacent rooms. This is especially important in this stage of the project because we expect to have limited time on the 3D printers in the MakerLab due to the high demand in this time of the semester. If we can minimise the printing mistakes, we will save a considerable amount of time that can be allocated to other tests or improvements on the project.	The test duration depends on 3D printing experience of the team. We can go with 1-2 hours for this test, but depending on the level of experience we have, the time may change. The dependency for this test is the completed floor plan (Prototype 2), which we have at our disposal. The results from this test are required before we start modelling our assigned section because that task is dependant upon this test. The analysis time also includes time to make itirations if we come across inconsistencies and we believe it to be reasonable to start this week.
2	Analyzing 3D models to determine the scale at which we want to reduce the printed model for de-risking.	We will use an analytical prototype to complete this test because we must analyse the dimensions of our models. To complete this test, we must have a completed 3D model of the largest section of our building. We must also know the maximum dimensions for a print job for the 3D printers in the MakerLab. Then, we scale the model to fit the dimensions of the 3D printer. Following that, the other parts of the building will take on the same reduced scale. The test software will be Onshape in our case, but any 3D modelling software is appropriate. The prototype can be built using the modelling skills we learned in the previous labs.	The data to gather will be the dimensions of the models, as well as the maximum dimensions of a print job that the 3D printers we have at our disposal can handle. This data will determine the scale at which we reduce our model.	This test is very straightfoward, because we essentially divide the printer's maximum allowed dimension by the largest dimension in the model. This gives the ratio at which we scale down the model. However, this task has dependencies that we think will take a while to complete. The dependencies are the completed models on our 3D software, Onshape. We hope to have this dependency completed by the end of the week of Nov. 13 at the latest, because the printing depends on the results of this test. The times are reasonable and the results will be here in time to make a difference in the project.
3	Determine the total amount of 3D filament we need to print our physical model to determine cost and for de-risking.	We will use an analytical prototype to complete this test because we must analyse the dimensions of our models. Additionally, we will also make use of the scale factor that we found in the previous test. By using Onshape to find the volume of the model and by multiplying that by the scale factor, we will have the exact volume value for the printed model. Using this information, we can determine the cost of the 3D printing filament we must use by using the $/gram formula given to us. The test software will be Onshape in our case, but any 3D modelling software is appropriate. The prototype can be built using the modelling skills we learned in the previous labs.	The cost will be measured and it will be recorded into our Costs spreadsheet in an Excel file. The cost is important to know so we do not go over our allocated budget for the project.	The test will depend upon the test above (Test ID: 2). The test itself is a simple calculation. The final printing of the model will depend on this task. We would like to star this test by the next weekend (Nov. 19). We need the test so that we ensure that we do not go over the budget. The times are reasonable and the results will be here in time to make a difference in the project.
		Stopping criteria: We will run the test results and give all the members a look. If they have things to add, they are free to do so. We will repeat the process until everyone has nothing to add to the tests.		

Since this will be your team's second prototype, your justifications and reasoning for this prototype should include a short explanation of your results from your previous prototype and how this second prototype continues the development of your solution. This second prototype should be of a **critical** (or *the* most critical) subsystem, in order to ensure that your design will work (keeping in mind the total course budget of $100 or 50$). Get creative in order to improve your results.

Wrike

https://www.wrike.com/workspace.htm?acc=4975842#/folder/1227809996/timeline3?viewId=216525172

Conclusion

Using the provided feedback given by our peers, client, and potential clients we have devised a second prototype which is informed by a detailed prototyping test plan. The feedback provided has helped us steer in the direction of a user-oriented building that surpasses the client's expectations.