Budget and Cost Analysis Report

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Abstract

This is report showcases a cost analysis and budget plan following the design criteria for the project. The concept chosen is described with a storyboard or illustration of the simulation story and discussed in relation to the design criteria. The idea is summarized and budgeted along with a risk analysis. The project is summarized with key equipment listed and concluded.

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1. Introduction:

This deliverable gives the project timeline, cost estimate, and testing plan necessary for the successful fulfillment of our VR simulation project in GNG1103 – Engineering Design. The aim is to have all three project prototypes designed, tested, and perfected before the end of the semester. A well-planned schedule with task assignments, responsibilities, and estimated time will govern the development process, and a detailed Bill of Materials (BOM) will ensure effective budget allocation. The deliverable also includes a comprehensive test plan for the first prototype to ensure feasibility and reduce risks. By planning our resources, time, and testing process in detail, we will try to make the prototyping process more efficient and arrive at an effective end product.

2. List of equipment:

Hardware:

- **VR headset**
- **Gaming Laptop**
- **Motion Controllers**
- **External sensors**
- **Hand tracking devices**
- **Microphone and headset**
- **Green Screen & Camera**

Software:

- **Unity**
- **Sidequest VR application**
- **3D Models & Textures**
- **NVIDIA PhysX**
- **Climate Simulation Datasets**

Miscellaneous Resources:

- **USB-C Link Cable**
- **Extra Cables**
- **Notebook/ Planning Tools**

3. Concept Idea and Design Criteria:

Number	Need	Design Criteria

1	A length of time for a virtuality reality simulation of 3 minutes.	Time is measured in minutes for the simulation.
2	Types of copyrighted music and ensuring sound effects are not restricted.	Non-copyrighted sound effects and music.
3	Graphics that stimulate interaction in the simulation.	A simulation that has activities or tasks for the user to interact.

Main Concept Idea Selected:

The selected concept for the simulation is having the user escape a house that has been caught in the path of a deadly forest fire. However, the user was caught off guard by the disaster, so they

must follow the markers and search their house for important items that cannot be lost to the fire before they exit, collecting them as they go.

After obtaining all required items, the user is directed to the house's exit where they are then instructed to arrive at an evacuation spot; and the simulation ends after a brief conversation with a firefighter where he explains that the reason the user was unprepared for the fire was because global warming had caused unprecedented levels of drought and heat in the area, and nobody could accurately predict how fast the wildfire would spread. To pace the simulation and make sure the user completes it within the three-minute limit, my plan is to overlay a two-minute time limit for collecting all special items and leaving the house. If the user fails to leave within the allotted time limit, they will be automatically teleported to the checkpoint outside the house to continue the experience.

To assist the user in exiting the house within the time limit, markers will be placed to guide them through the house as well as show which items need to be collected. For sound effects in the simulation, firstly, there will be no music to enhance the realism of the experience. In the same vein, sounds of fire crackling and burning wood will be played while the user is inside the house, along with distant sounds of fire truck sirens, barking dogs, and people yelling to give the simulation a lived-in feel. Lastly, the simulation's graphics will be realistic enough to make the user feel the urgency of the situation and empathy for victims of similar events, but not so realistic that it will frighten them. This balance will be achieved through using real landscapes and accurately modeling the house they must escape from, while using obviously artificial fire graphics.

4. Project Planning and Mitigation of Risks:

Project Planning:

	Task	Description	Date	Group Member
Simulation Prototype I	**Team Meeting**	Team Meeting to go over our plan, deliverables, task allocation and prototype.	**March 2nd**	All Group Members
	Deliverable F	Prepare document and apply customer feedback.	**March 2nd**	All Members with Specific Parts for Each Member
	Design	Design product as per design criteria and concept.	**March 2nd**	All Members with Specific Parts for Each Member
	Testing/Debugging	Test simulation and debug.	**March 2nd**	All Members with Specific

				Parts for Each Member
Simulation Prototype II	**Team Meeting**	Team Meeting to go over our plan, deliverables, task allocation and prototype.	**March 9th**	All Members with Specific Parts for Each Member
	Deliverable G	Prepare document and apply customer feedback.	**March 9th**	All Members with Specific Parts for Each Member
	Re-Design	Re-design product as per design criteria and concept.	**March 9th**	All Members with Specific Parts for Each Member
	Testing/Debugging	Test simulation and debug.	**March 9th**	All Members with Specific Parts for Each Member
Simulation of Prototype III	**Team Meeting**	Team Meeting to go over our plan, deliverables, task allocation, prototype and presentation.	**March 23rd**	All Members with Specific Parts for Each Member
	Deliverable H	Prepare document and apply customer feedback.	**March 23rd**	All Members with Specific Parts for Each Member
	Re-Design	Re-design product as per design criteria and concept.	**March 23rd**	All Members with Specific Parts for Each Member
	Testing/Debugging	Test simulation and debug.	**March 23rd**	All Members with Specific Parts for Each Member
Design Day	**Deliverable I**	Present Project at Design Day	**March 26th**	All Members with Specific

				Parts for Each Member
Project Presentation	**Deliverable J**	Present Project to class and professor.	**March 28th**	All Members with Specific Parts for Each Member
User Manual	**Prepare Document**	Prepare user manual guide for the simulation and final project for future users.	**April 4th**	All Members with Specific Parts for Each Member

Risks and Uncertainties in the Project:

- Winter storms and planning to meet on campus for meetings can be difficult given the season. There is uncertainty with the ability to meet in person in cases such as these.
- The team has varying coding capabilities, and everyone is new to using unity. Building the simulation will require patience and learning.
- There is uncertainty with being able to develop a project that meets the clients desired needs.
- There is risk in the simulation working properly during our design day.

Risk Mitigation for Project Development:

- We can mitigate this risk by utilizing hybrid methods to meet and to meet after our classes and labs if we need to make up missed time.
- We can help each other learn and use our different abilities in learning to make up for others lack in skill. Also using tutorials to help us with our work.
- By asking more questions to the client we can mitigate this risk and work closely to the desired product.
- By practicing in various locations and testing the product in different settings, we can mitigate this risk.

Prototype I Test Plan: Environment

Test Number	Probable critical issue	Test Objective (why)	Test Description (what)	Analysis Method (how and when)	Determine Measurables	Metrics
1	Visibility	Performance Measurement	Ability to see envionmental detail	Exploring envionment	Quality	1 to 5 rating
2	User can move through environment(with and without oculus)	Performance Measurement	User interaction test: Basic mouvement and controlling functions will be placed and tested	User(i.e. the tester) will have to look around and pick something up. If the user is unable to do so, the protoype fails.	The silumation's ability for interactiveness	pass or failed
3	Loading time	Performance Measurement	Environment loads quickly	Test peed of loading time	Loads in less than 5 seconds	pass or failed

	Results	Interpretation and Feedback
1	Moderate results. Has lack of detail.	Pass. But needs to be improved
2	Movement in environment is limited	Fail.
3	The average loading time is 10 seconds	Failed. Needs to be worked on.

For the first prototyping test plan of our project, we want to verify the function of the environment. We will put in tests that would prove that the environment of our concept functions well. In order to do this, this prototyping test run will verify that one of the main subsystems of our simulation work well. We will be testing the visibility of the environment, the freedom of movement and the loading time of the environment. These are meant to be performance management tests, which will test the programs' functionalities. The first test will be a visibility test in which we will examine how effectively we can see the environment and its details. The second will test the degree of freedom the user would have and the user's ability to interact with the environment. We will do this by rating the degree of freedom the environment gives. The last test will measure the loading time speed of the environment. We will test this by loading the environment and record its loading time. The loading time has to be lower than five seconds to pass. We will test the environment 3 times, and if the environment fails all three tests by the last round, another environment will be chosen. This process will; continue until one environment is chosen.

4. Conclusions and Recommendations:

With the project timeline, budget, and test plan laid out in this deliverable, we have now established a clear roadmap for building our VR simulation. By breaking tasks into achievable steps, assigning responsibilities, and setting realistic timelines, we ensure steady movement toward our end goal. The detailed Bill of Materials (BOM) enables us to allocate resources effectively within budget constraints. Our test strategy for the initial prototype will reveal technical challenges early, enabling us to iteratively improve our design. Further, risk analysis and contingency planning guarantee that major project roadblocks are anticipated and addressed in advance, reducing delays and setbacks. With these planning approaches in effect, we can be certain that we will be capable of effectively reaching project milestones and having a complete, functional innovative engineering solution at the end of the semester. The systematic manner of doing things not only enhances the development process but also enhances problem-solving and engineering design skills, setting us well for upcoming challenges as we proceed in the field.

References

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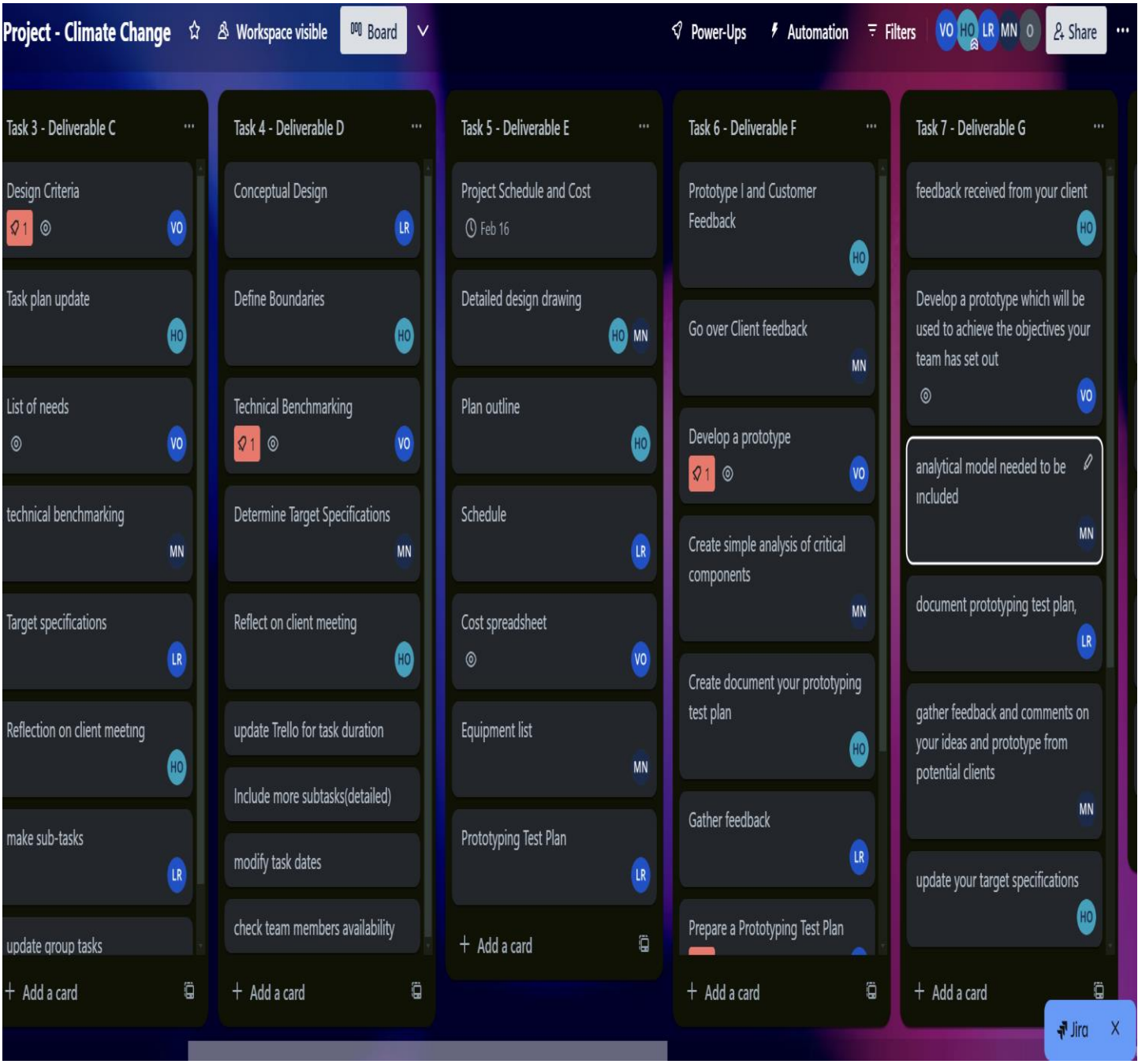
McGuire, B. (2022). *Hothouse Earth : an inhabitant's guide*. Icon Books.

Trello Management

Task	Team member	Notes
Introduction	Lucas	Overview of the simulation story idea
Abstract	Hannah	Summary of project purpose and objectives
Task Planning and Risk Management	Hannah	Outlined tasks and risks
Story board& Concept Paragraph	Everyone	Each member creates their own simulation story idea
Design Criteria Explanation	Everyone	Time, Sound Effects, and Graphics considerations for their idea
Prototyping Plan		
Budget		
Final compilation & Editing	Group Effort	Review for consistency and clarity
Task table & Trello Screenshot	Taha	Summary of who did what, with proof from Trello


Project - Climate Change
Workspace visible
Board
Power-Ups
Automation
Filters
Share
Task 3 - Deliverable C
Design Criteria
Task plan update
List of needs
technical benchmarking
Target specifications
Reflection on client meeting
make sub-tasks
update group tasks
Add a card
Task 4 - Deliverable D
Conceptual Design
Define Boundaries
Technical Benchmarking
Determine Target Specifications
Reflect on client meeting
update Trello for task duration
Include more subtasks(detailed)
modify task dates
check team members availability
Add a card
Task 5 - Deliverable E
Project Schedule and Cost
Feb 16
Detailed design drawing
Plan outline
Schedule
Cost spreadsheet
Equipment list
Prototyping Test Plan
Add a card
Task 6 - Deliverable F
Prototype I and Customer Feedback
Go over Client feedback
Develop a prototype
Create simple analysis of critical components
Create document your prototyping test plan
Gather feedback
Prepare a Prototyping Test Plan
Add a card
Task 7 - Deliverable G
feedback received from your client
Develop a prototype which will be used to achieve the objectives your team has set out
analytical model needed to be included
document prototyping test plan,
gather feedback and comments on your ideas and prototype from potential clients
update your target specifications
Add a card
Jira