DELIVERABLE E: PROJECT PLAN & COST ESTIMATE

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1. Introduction

The following technical document outlines the detailed design plan (including a detailed drawing) and cost estimate for the VR experience. It specifies the selected/optimal design solution established in the previous deliverable, which has been refined following the second client meeting. Furthermore, the document will be accompanied by a spreadsheet with a preliminary project budget, in addition to specifying all equipment (software, plug-ins, etc.) that will be necessary in order to complete the project. The final objective of the document will be to discuss potential risks that could threaten the project, and a test plan to evaluate prototypes that are generated in future.

2. Chosen Concept

2.1 Client Feedback on Conceptual Design

Our second client meeting was very informative towards the project and allowed us to understand some key takeaways.

At the second client meeting, we had initially proposed our second design concept which was more ambitious and involved lots of extra details, such as perspective changes and quick transitions. However, due to the time constraint that we have on the project with design day approaching, we were told that it may be too complicated.

That being said, we decided to go with our first design concept - "Walking in the city". It happened to be our best global concept based on deliverable D. The concept itself is simple and doable within the time given and has a narrow but clear focus on the task at hand.

2.2 Rough AI Sketches of "Walking in the City"

These were our AI generated sketches of this design concept based on our previous deliverable. However, these are subject to change as can be seen later in this deliverable since we are considering factors such as cost, complexity, time etc. when prototyping this design.
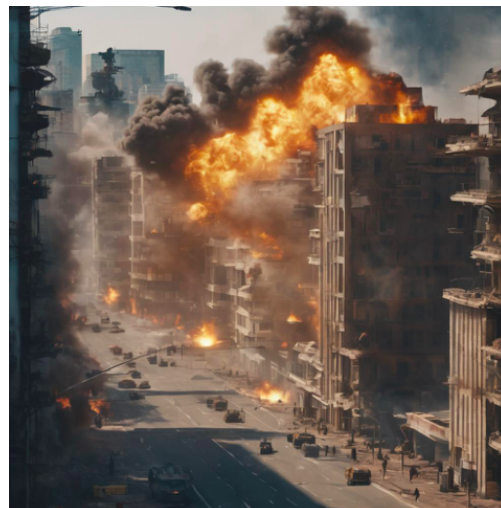
2.3 Description of Chosen Concept

In our chosen concept, the user starts off by walking around a typical city. Initially, the environment looks normal. It would include familiar objects and surroundings such as tall buildings, trees, park benches etc. The surroundings could be tall to limit the amount of coding that needs to be done to the environment. Once the user reaches a certain x distance, the surrounding environment begins to change. Animations can be created for smoother transitions of objects (for example: trees turning into burning trees).

At a certain timestamp, the city transitions into an environment under the influence of autonomous weapons. There is a lot of evidence of this change, including warning signs/posters, red lasers, fire, pollution/smoke, face scanning centers, killer robots as security, shelters/tarps, characters under panic etc. As the distance x increases, the intensity of the damage increases as well. Visuals become more disturbing and sounds become more intense, if any. Near the end of the video, somebody yells something along the lines of "They're coming!", "Watch Out!" or "Duck!", and then the scene cuts to black. At that moment, it is indirectly implied that the user has become part of the environment and may have gotten injured/killed. A message will pop up on the black screen about the downside of autonomous weapons. This message will be something along the lines of: "If we don't ban autonomous weapons, this could be our future - is this what you want?".

Our concept is simple, yet engaging and portrays how the influence of autonomous weapons can affect civilians. The user is walking through and experiencing the environment, without being affected by it (except the ending). In terms of coding, there is little interaction between the user and the environment and mainly only interactions between the environment and the objects in the environment. The experience looks fairly realistic and is copyright free.

2.4 Detailed Design Drawing of Chosen Concept

For our design concept, we are focusing on three specific ways that humans choose to protect themselves from autonomous weapons.

1. Warning Signs / Posters

    → signs indicating prohibition of cell phones because location can be tracked

    → tunnel directions for citizens to travel safely

2. Shelters / Tarps

    → blankets covering transparent windows

    → blankets connecting tall buildings from above

3. Radio Broadcast

    → voice reiterating the presence of the posters and shelters

    → gives clarity to the audience as to what to be mindful of
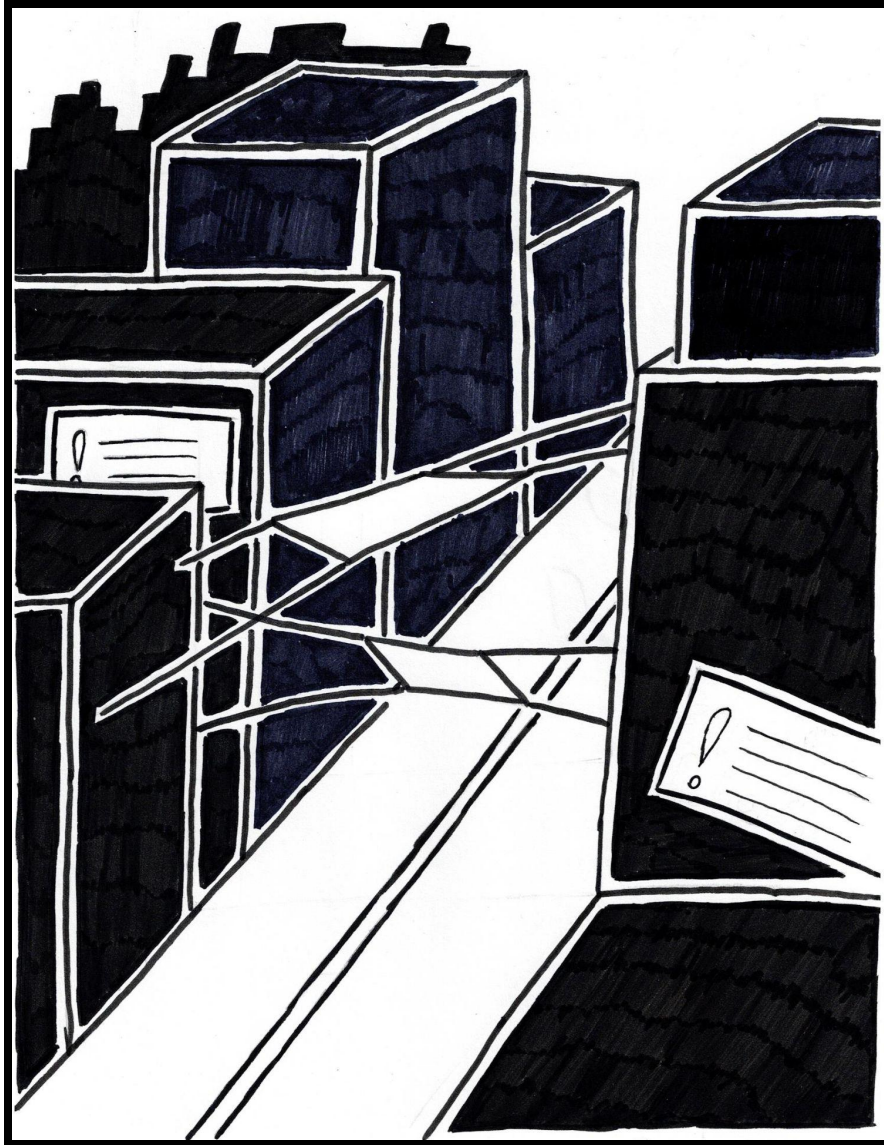
3. List of Equipment

The following equipment will be necessary in order to complete the VR experience. Due to the nature of the final product, there is little equipment that is necessary, and some of it may or may not be used based on the scope of the finished project.

3.1 Necessary Software

i) *Unity* - This software is needed in order to build the VR experience. It is used for video game development and will allow us to create a 3-Dimensional environment for our VR experience in addition to writing scripts that will allow character/camera movement as well as environment interactivity.

ii) *Blender (potentially)* - As seen during our project specific lab, this software can be used in tandem with google maps in order to scan in real world terrain and paste a high resolution scan in Unity. While this could be useful, it is doubtful that this will be used in the final product. Individually placing buildings and textures may be more tedious and time consuming, but it allows us to personalize our experience to a much greater degree.

iii) *Mixamo (potentially)* - This software was also shown as a potential asset during our project pacific lab. It is essentially a library of character movements that can be matched to character models to allow dynamic movement of characters in a Unity environment. While this is a neat concept, in order to reduce the overall scope of the project, we likely will not use any characters whatsoever. As a result we may not use this software.

3.2 Necessary Hardware

i) *Headphones* - It will be necessary to have headphones (or some sort of audio device) in order to evaluate the sound effects and sound quality of the VR experience during the prototyping/testing phases.

ii) *Computer (with mouse and keyboard) & Monitor* - This equipment will be necessary for creating the prototype as well as running any prototype scripts or showing off any sample/prototype environments.

iii) *VR headset (ideally)* - If possible, having access to a VR headset during the prototyping, and/or testing phase, will allow us to see our VR experience as a true virtual environment (as it will be demonstrated on design day), and thus will allow us to tailor our experience more to the virtual environment.

4. Bill of Materials

Our BOM was created on Excel and has also been pasted below.

Here is the link to the Excel file: https://bitly.ws/Yqjb

Item name	Description	Quantity	Cost ($CAD)	Link
Building Package	This asset contains: 10 different buildings in 5 different styles and variations, different doors for different buildings, animated fans, night versions from each building with new windows	1	12	https://assetstore.unity.com/packages/3d/environments/building-pack-with-interiors-10-buildings-229457

	material.			
Street bench	This asset contains two street benches which are optimized for the Unity game engine.	1	0	https://assetstore.unity.com/packages/3d/props/exterior/street-bench-656
Lemon trees	This asset contains lemon trees optimized for mobile VR with high quality textures. Contains 4 models and versions with fruits.	1	0	https://assetstore.unity.com/packages/3d/vegetation/trees/lemon-trees-200372
Road Materials	This asset contains: 11 PBR materials, 77 textures, a text resolution of 4096 by 4096, a texture format of TGA, and the texture type is seamless.	1	0	https://assetstore.unity.com/packages/2d/textures-materials/roads/road-materials-137087
Fabric Textures	This asset contains: 11 high quality original PBR materials. Up to 4k resolution.	1	0	https://assetstore.unity.com/packages/2d/textures-materials/fabric-textures-4k-179123
3D Cartoon Road Warning Signs	This asset contains 50+ signs. Ranging from road signs to hazardous warning signs.	1	0	https://assetstore.unity.com/packages/3d/props/exterior/3d-cartoon-road-warning-signs-260531
Apartment Buildings	This package contains a high-quality,	1	0	https://assetstore.unity.com/packages/3d/environm

	realistic 3D model of an apartment building			ents/urban/apartment-building-73310
Abandoned Buildings	This package contains two 3D models of abandoned buildings	1	0	https://assetstore.unity.com/packages/3d/environments/abandoned-buildings-62875
Urban Buildings	This package contains a model of an urban industrial type building	1	0	https://assetstore.unity.com/packages/3d/props/exterior/urban-building-130318
Storage Building	This package contains a 3D model of an industrial storage building	1	0	https://assetstore.unity.com/packages/3d/environments/industrial/storage-building-50430
Industrial Building/Garage	This package contains a series of 3D models which can be assembled to create a industrial garage	1	0	https://assetstore.unity.com/packages/3d/environments/industrial/free-industrial-building-garage-123146
Sky Textures	This package contains a series of Unity textures that can be used to replicate a sky	1	0	https://assetstore.unity.com/packages/2d/textures-materials/sky/free-real-skies-87740
Building Pack	This package contains a series of 3D models of downtown urban buildings for use in Unity	1	0	https://assetstore.unity.com/packages/3d/environments/urban/city-voxel-pack-136141
Subtotal:			12	
Total (+taxes):			13.56	

5. Project Risks and Contingency Plan

Project risks include available assets not being compatible either visually or in a style sense, as well as textures not being able to be fully displayed due to the way the headset renders the world. Another possible project risk is in the coding portion, the code could be too long or may not function together, or certain physics may not work.

5.1 Issues with Assets, and contingency plan

1. Buildings:

    The buildings in unity can be scaled and they can have the texture changed, we could run into issues where certain textures in the final product look out of place. The way we can fix this is by limiting how many buildings we change the texture of, and focusing the new textures on smaller buildings, larger buildings especially in cities tend to use similar materials.

2. Miscellaneous:

    This section includes smaller objects such as trash, trees, debris, benches, etc… The issue with these is that some of the free assets have a pixelated texture while some are smooth, the problem with this is the fact that if there's too large a difference in texture the game can begin looking very rushed. To prepare for this we can focus on objects with a specific style, as well as using the players perspective to our advantage. For example, we could have something with a different texture further away to ensure the player cannot see as many flaws.

5.2 Issues with coding, and contingency plan

1. Barriers

    We need to ensure the player can only go where we need them to, for example the player should not be able to go through or see through buildings once they get close, we also need to make sure there is nothing weird that happens on impact as well, such as the player climbing or other unwanted actions.

2. Clipping

    Even with barriers there's still the slim chance for the player character to clip through the assets, to prevent this we can program another zone behind the barrier to reset the player to a certain x, y, and z coordinate.

3. Day night cycle

    An issue with day night cycles is the way the light reacts on the faces of objects, certain objects could be brighter than others. We can fix this by not having a day night cycle, or changing certain textures so they react more appropriately to the light.

4. Player related

We need to program a realistic movement speed, and maybe moving body parts. An issue for this could be the player being too fast or slow, as well as the player's body parts not being synced together.

6. Prototyping Test Plan

In order to ensure that prototypes generated are in line with the client/intended vision for the final product, a prototyping plan is necessary. This is, in essence, a standardized method for evaluating different prototypes and ensuring that they meet the design criteria and target specifications in order to be considered for the final product.

6.1 Boolean Specifications

The simplest prototyping plan will be for specifications in which the evaluation is boolean in nature. For instance, VR experience length. Either the experience meets the target specification of 1 min, or it does not. To test these values, we do not need a rigorous plan. We can simply look at/play through the experience and determine whether the specification is met or not, and immediately stop the test if a 'yes", or "true" result is yielded.

6.2 Audience Test Specifications

In essence, all other design criteria and specifications must be established by an audience test, as they evaluate, for the most part, the audience's (and hopefully, if the design process is undertaken correctly, the client's) reaction to the finished VR experience. To do this correctly, we must balance polling enough people such that we can establish patterns in their interpretation/reaction to any given prototype, and polling few enough that the test is feasible. As a result, the proposed test is as follows:

For any given audience test criteria/specification:

1. Poll 10 audience members selected randomly (i.e., do not select candidates who have previous experience, and/or exhibit strong feelings on the issue of killer robots)
2. If 7/10 audience members are able to successfully identify aspects of VR experience when asked (i.e. Human adaptation - identifying examples of humans evolving in order to cope with the presence of killer robots) or demonstrate a strong affirmative reaction (i.e. claim that they identify/find the VR experience to be convincing) then the stopping criteria have been met.
3. Any prototype/idea that does not meet the threshold stopping criteria, but surpasses 5/10 affirmations from audience members must be reevaluated and iterated upon (i.e. return to the ideate phase and tweak the idea such that it can be improved) or thrown out altogether in the case of a negative reception (4/10 affirmative reactions or less).

7. Conclusion

In this deliverable, we used our client's feedback to make alterations and improvements to our initially proposed design. Using the feedback, we generated our chosen design concept "Walking in the City". We have included clear and detailed design drawings to represent our chosen conceptual design. After thorough research, we included a list of materials as well as our bill of materials for the VR experience. We discussed project risks and our appropriate contingency plan as well as our prototyping test plan.