Homelessness Simulator for the

Chicago Coalition for the Homeless

CHICAGO COALITION
FOR THE HOMELESS

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I Project Description

1 Project Overview

The project that the team proposes is a simulator-type game that demonstrates how it is like to experience homelessness. It would include a variety of different hazards that the player would have to keep track and be wary of—such as hunger, thirst, police awareness, and the weather—in order to survive as long as possible while exploring environments that non-homeless people would not have experience in.

2 The Purpose of the Project

The homelessness simulation, if handled with care and done properly, will demonstrate to the masses what it is like to be homeless and how stressful it can be, and hopefully change the perception of homelessness from being one of ridicule to one of sympathy.

2a The User Business or Background of the Project Effort

The Chicago Coalition for the Homeless (CCH) is a nonprofit organization that is dedicated to assisting those who are homeless and furthering efforts into eradicating homelessness in Chicago. Part of what the CCH does is raise awareness and give opportunities for those who are struggling to get on their feet and support them through their struggles. However, despite their contributions, many people still have misconceptions about homelessness and how it affects those who suffer through it, believing that homelessness is something that is the fault of the homeless.

2b Goals of the Project

The goal of the project was to have a way to simulate what it is like to be homeless to those who are not homeless in the form of a simulation game. This is so that more awareness is brought to the public about how dangerous being homeless is and how it should be prevented.

To assist the organization in demonstrating just what exactly homeless people experience, those who still have those misconceptions need to be able to see what homeless people go through. The CCH needs a way to bridge the gap between those who know nothing about homelessness, to those who do and need help to pull themselves out.

Considerations that should be taken into account when building the foundation for this project is to be aware that homelessness is a serious problem that is an unfortunate reality that many people face in Chicago. It should be portrayed as it is without sugarcoating it for those who have never experienced it, so that the CCH can emphasize what exactly they wish to prevent.

2c Measurement

A way that the success and goal achievement of the project can be measured is by the donations that the CCH receives after the simulator is launched.

If a noticeable increase in CCH's support and donations, especially donations that are repeated by the same donors, is recorded after launching the simulator, it can be said that the reason that for it was because players interacted with the simulator and swayed their thoughts on people who are homeless and decided to support the CCH.

The success of the simulator can also be measured by a survey before the user tests the simulator and after a user tests the simulator. The beginning survey would take the users previous thoughts and any additional information about previous donations they had made to organizations that help the homeless. After the user experiences the simulation, they will take an exit survey that records their experience and how they felt about it, and how it changed their previous notions. If the exit survey demonstrates a more sympathetic and changed perspective from their respective entrance surveys, it can be correlated to the simulator changing the user's perspective on how it is like to be homeless, which consequently makes it more likely that the user will assist the CCH with their mission by donation, or tell others about their experience to get others to do the simulation as well.

3 The Scope of the Work

The simulation developed will be used within the scope of the Chicago Coalition for the Homeless staff, who will be the main host for the simulator. The CCH will use the simulation as a means of demonstration and interactivity for their organization for others to experience as a way to show how the homeless have to live day by day.

3a The Current Situation

Currently, the CCH provides only a newsletter and webpage of upcoming events as a means of shedding light on the homeless of Chicago. While this certainly keeps those already invested in the cause informed, it doesn't do much to garner the attention of those uninitiated to the homelessness crisis. The goal of this project is to provide a more interactive means of bringing awareness to the struggles faced by homeless people, using technology that will allow users to experience the difficult choices homeless people must make in order to survive.

3b The Context of the Work

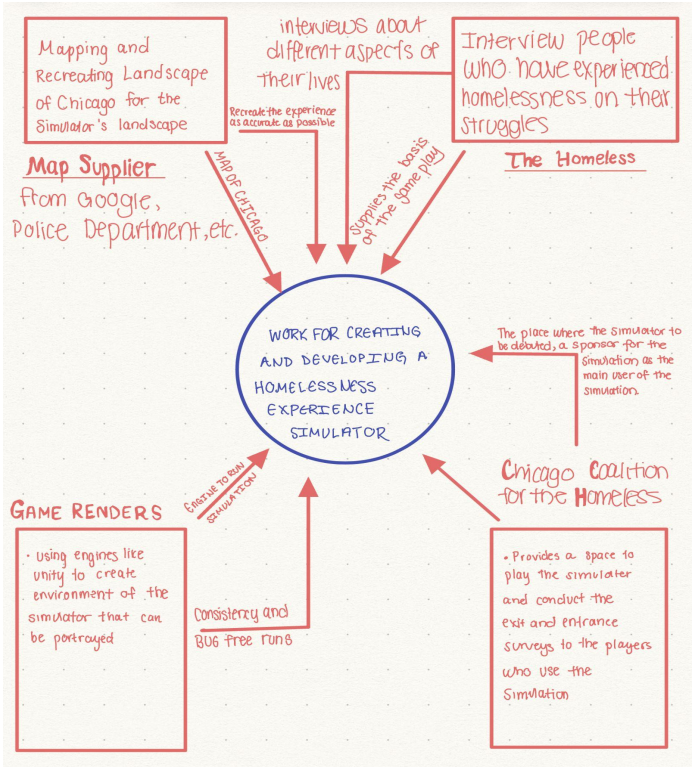

Figure 1 - A graphical representation (Hobson's Choice) of the work in context to the client it is meant to serve

The boundary of the work can be determined by how it can be expected to be used by the CCH. The CCH will not be expected to actually work on the simulation itself nor be responsible for major maintenance. The simulator will solely be a means of the CCH to bring people in to assist in their cause and provide knowledge from the homeless people that they assist for the simulator model and creation.

3c Work Partitioning

Event Name	Input/Output	Summary
Mapping landscape	Virtual environment -> out Map data -> in Weather/Time ->in	The Homeless Simulation will render a scene from a particular location the user chooses to enter using real map data, as well as factoring in in-game time and weather data.
Interview Homeless	Stories from real people -> in Simulated Scenario -> out	The Simulation will require the user to experience scenarios and make decisions that actual homeless people had to live through.
Game Renders	Game engine -> out	The Simulation will likely be built with an engine in order to render the various scenes as well as handle the user's input when handling game scenarios.
Chicago Coalition for the Homeless	Host space -> out	The CCH can provide a space for users to experience the simulation for themselves in order to have a better understanding of what the homeless have to endure every day.

Table 1 - A representation of how the work of the project is partitioned amongst the parties that are involved in its production

3d Competing Products

Another product the Chicago Coalition for the Homeless could choose to use is Hobson's Choice, a choice-based game where the user is presented with a dilemma represented with a picture, followed by 4 choices leading to further dilemmas. While our simulator may function in a similar "choose-your-own-adventure" format, the choices presented in Hobson's choice as well as the amount of situations for the user to be placed in is extremely

limited. Our Homeless Simulation would include significantly more storylines and situations for the user to experience, as well as other variables to account for throughout the simulation, such as body temperature and hunger, which will affect the options available to the user as well as present new situations depending on their values.

4 The Scope of the Product

The Homeless Simulation serves the community outreach subset of the CCH's work. The primary goal of the program is to educate, specifically targeting individuals who are currently more distanced from the problems of homelessness so that they may be more sympathetic to the cause.

4a Scenario Diagram(s)

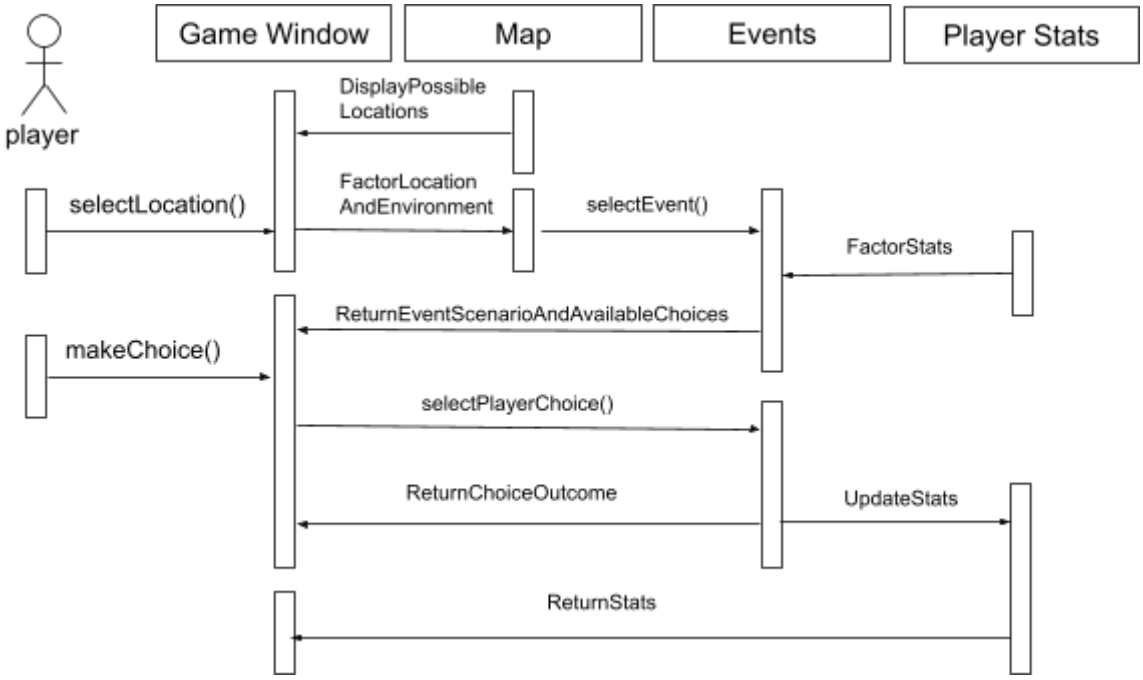

Figure 2 - A scenario diagram that demonstrates how certain elements of the game interact with one another.

4b Product Scenario List

Product Scenario	Actors Involved	External Information
Dynamic Environment	User, Game Environment	The environment unpredictability in relation to gameplay
Unpredictable Dilemmas	User, Game Events	Emulates scenarios that happen randomly
Difficult Choices	User, Game Scenarios, Player Inventory, Stats	One choice will have an effect on other aspects of gameplay

Table 2 - Product Scenario List of ventures to explore within the simulation

4c Individual Product Scenarios

Detailed below are different product scenarios elaborated in detail, which is representative of how the simulation would work.

Dynamic Environment: Morpheus is in the middle of a playthrough of the Homeless Simulation. He was having a fairly easy time not attempting to find a shelter, even thinking that he himself would be able to survive without a shelter in real life. But then the temperature in the game starts to decrease, and without shelter, his character gets sick. Now he must learn what the homeless must do in order to survive the colder seasons, gaining a new perspective.

Unpredictable Dilemas: Neo, who prides himself on his logical thinking, begins a new playthrough of the Homeless Simulation. So far so good until he realizes that despite making many seemingly good decisions, his character gets robbed while on the street and he is back to square one. Now he must figure out how to recoup his losses while simultaneously protecting the little money he has.

Difficult Choices: Trinity was previously under the misconception that homeless people are in their situation because of their own poor decisions, until in her own playthrough of the Homeless Simulation in which her character is unable to afford groceries after losing her job and must choose either to sell her car which she uses for shelter, or risk jail time selling drugs again after a year of sobriety. Trinity is no longer sure that she knows the correct decision to make.

5 Stakeholders

5a The Client

The client of the product is the Chicago Coalition for the Homeless (CCH). The organization will be the main beneficiary of this simulation as they will be the organization that is supporting its creation.

5b The Customer

The customer for this product is the Chicago Coalition for the Homeless (CCH), who is also the client.

5c Hands-On Users of the Product

The main users would be organizations against homelessness, including the current client. These users are responsible for raising awareness about homelessness. They advocate for public policies that curb and prevent homelessness. They lead strategic campaigns and community outreach efforts to highlight the lack of affordable housing in their local communities. They press for equal access to education and job opportunities for the homeless. They provide resources for the homeless, such as temporary shelter, food, and medical care [5]. Due to the nature of their work, these organizations that aim specifically at combating homelessness are experts at understanding homelessness and its effects on those who struggle with it, since they work and interact with homeless individuals on a consistent basis. As a result, the technological experience that these organizations have with regards to their mission would characterize them as journeymen when it comes to utilizing software tools to aid in their goals. They often carry out their mission through in-person interactions rather than software tools. Other characteristics to know about the current users would be that the organizations are very serious when it comes to their work. They care very much about making sure the issue of homelessness isn't taken lightly.

Another group of users correlated with the project would be the general non-homeless US population who have not been homeless in the past. The vast majority of these users have jobs, their responsibilities being dependent on their occupation. The ones who do not have jobs are having their living accommodations paid for them by an individual who does. In either case, no one from this group has experienced homelessness.These users have little to no knowledge of homelessness and its true effects on those who suffer from it. Often, they do not interact or engage with homeless individuals. The technological experience of these users varies vastly, however, as of the time period of this report, a certain level of digital literacy is assumed or expected, and the large majority of these users will know how to install and use the product. Among these users, there exists a varying level of intellectual ability/education, so the simulation must be simple to understand/comprehend. Many of

these users are expected to have preconceived notions regarding the homeless, so the simulation ought to address such notions. Many users from this group also speak other languages as their native language, making it highly ideal for the simulation to have multiple language options. Lastly, the users will vary in age and gender, and as such, the simulation should show homelessness as experienced by people of various ages/genders.

5d Maintenance Users and Service Technicians

No maintenance users or service technicians outside of the development team will be needed to maintain, update, and service the product. While the client and users will be the ones who are using the product the most, they will not be expected to know how to troubleshoot and maintain the simulation.

5e Other Stakeholders

The other stakeholders involved in this product would be homeless individuals, both as interviewees and the testers of the simulation. The project needs insight from real individuals experiencing homelessness to properly identify the various struggles and trials homeless people face on a recurring basis. Their first-hand accounts are valuable in identifying tribulations that are less commonly known or thought about. The developers of the project will work with the client to identify common hardships of homelessness to create a prototype of the simulation application. Homeless individuals are then asked to test the game and provide their feedback on the various hardships covered by the prototype, as well as offer other potential ideas for hardships not covered by the prototype. These homeless individuals and the ideas they have to offer will influence the product greatly, as the product is designed to accurately simulate their lives. In the case of other stakeholders having vested interest in the same homeless individuals for the same purposes as the client, the development team, client, and said stakeholders should look to cooperate with each other and dedicate some number of homeless testers to each. This is mutually beneficial due to the shared goal and mission of the stakeholders.

5f User Participation

During all phases of development, it is expected that the Chicago Coalition for the Homeless (CCH) sets aside a team dedicated to the project who will be able to meet with the project lead at least five hours each week to address the scope of what the organization does and what hazards/situations must be present in the simulation game, based on the organization's experience in working with the homeless.

During the development and post-development stage, it is expected that homeless individuals (those who are willing to test and suggest improvements) maintain a consistent and active level of participation. It is expected that these people will provide valuable feedback on how accurately the simulation represents homelessness and what vital experiences/struggles are missing.

Once a beta version of the project is completed, it is expected that volunteering non-homeless individuals test the application and provide the developers feedback on the ease-of-use of the simulator game. This feedback is crucial for building and improving upon the usability requirements of the application. It is also critical these users provide feedback on how engaging the simulation is, as the purpose of the application is defeated if the hands-on users of it do not find it interesting enough to play.

5g Priorities Assigned to Users

The key users would be the Chicago Coalition for the Homeless (CCH) & other organizations against homelessness. The client and similar organizations will use the product heavily in their efforts to bring mass attention to homelessness. They are very knowledgeable on the topic of homelessness and know what is needed from the application to achieve their goals, and as such, their feedback is vital. These users take first priority.

In context of this project, the secondary users in this case would be the general non-homeless US population. These users, while their feedback is important and can bring about potential ideas for improvement, are not as knowledgeable about the topic of homelessness as the client. The feedback from these users will likely need to be filtered by the client, who will know what feedback will be effective without detracting from the overall goal of the simulation.

6 Mandated Constraints .

6a Solution Constraints

For one of the first solution constraints, the simulation shall operate on Windows 10. The rationale behind this is because the client uses Windows 10 systems and does not wish to change. While the client would wish for MacOS, Android, and iOS versions of the simulation as well, there is an understanding that the budget and time constraints may not allow for such to happen. Given the vast popularity of the Windows operating system, especially for games/simulators, it is the ideal operating system for the product and will allow for the largest possible user base. As of August 2023, the Windows 10 operating system makes up 72% of the global OS market share, so having the simulation support this operating system aligns with the client's goals of spreading homelessness awareness to as many individuals as possible [8]. The simulation shall be approved as Windows 10-compliant by the development testing group.

Another one of the solution constraints is that the simulation shall not have demanding minimum system requirements. The reasoning behind this is due to the fact that the simulation is to be played by a wide range of users on a wide variety of devices. The client wishes for those with lower-end systems to be able to play the game in order to maximize the player base and bring attention to the issue of homelessness to as many individuals as

possible. The simulation should, as its minimum system requirements, support (run smoothly on) a machine with the following specifications:

CPU: Intel Core i3 3210 | AMD A8 7600 APU or equivalent

RAM: 4GB

Disk Space: At least 4GB

GPU: Intel HD Graphics 4000 or AMD Radeon R5 series | NVIDIA GeForce 400 Series or AMD Radeon HD 7000 series

OS: 64-bit Windows 10

Another solution constraint would be that the simulation must be capable of displaying at a 1080p (1920x1080px) resolution. The client will use 1080p displays when showcasing or demonstrating the product to audiences. Nearly all modern screens support 1080p; modern games are expected to output at this resolution. Part of the fit criterion would be that the image quality of the simulation does not decrease when shown on a 1080p display.

6b Implementation Environment of the Current System

The simulation will be installed on and operate on a Windows 10 machine with specs equivalent to or better than the minimum specs fit criterion specified in section 6a). It must interface with the user mouse and keyboard in order for the user to interact with and navigate the game.

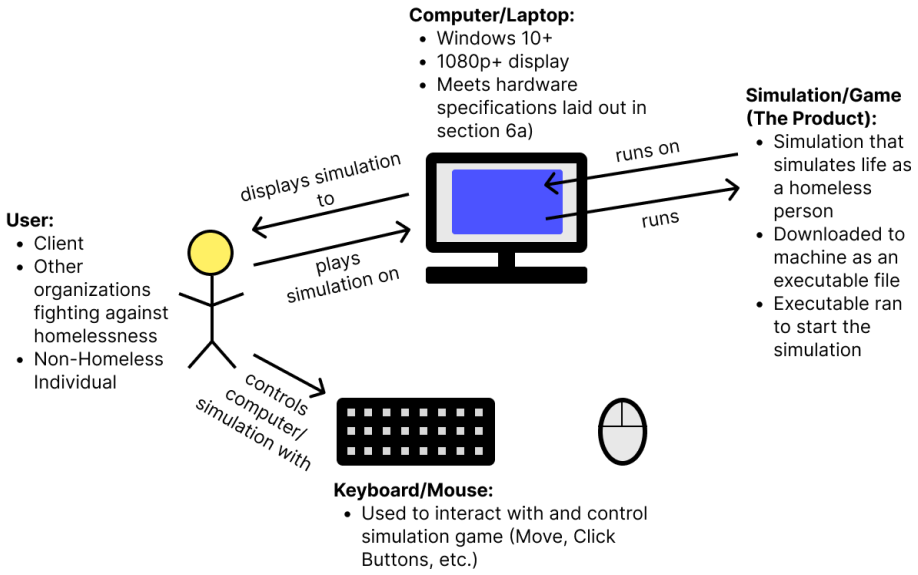

Figure 3 - A diagram that documents the requirements and constraints involved in how the simulation will be interacted with

6c Partner or Collaborative Applications

As a standalone application, the product will not need to be compatible with external applications or commercial packages.

6d Off-the-Shelf Software

As the developers will use a game engine (likely Unity or Unreal Engine) to build the simulation, the simulation must include the necessary software packages from the game engine. These software packages provide the framework for the simulation and include libraries pertaining to physics, graphics, and AI that the simulation cannot function properly without [4].

6e Anticipated Workplace Environment

The simulation, depending on the user, will be played in a vast variety of environments. Thus, we can assume some users will intend to play the simulation while out of home or on the move, which suggests the value in having a mobile version of the application. If a mobile version is to be made, then in-game models and text must be large enough to be easily visible and legible. The simulation may be played in noisy environments, and while it is ideal for a user to play the simulation in a quiet place so that in-game sounds can be heard, the simulation must not require that the user has to hear the in-game sound to effectively play/complete the game.

6f Schedule Constraints

A prototype of the simulation showcasing basic features and scenes must be completed by March 25th 2024 (in six months) to allow the client to assess where the project is headed and if any significant adjustments must be made. A beta version of the simulation must be released by September 25th 2024 (in one year) to allow for extensive testing by both the client and test groups. The final version of the simulation must be released by September 25th 2025 (in two years) so that it is ready for use during the winter season, a particularly rough time for the homeless, where generating support for them is even more imperative [3].

6g Budget Constraints

This project has a strict budget of $250,000 for its development [1], [2]. Due to the nature of the client being a nonprofit organization, it was taken into consideration that the organization would be on a strict budget with what they can provide.

7 Naming Conventions and Definitions

7a Definitions of Key Terms

In order to clarify what certain terms mean in regards to the product, the definitions of most used terms are provided below.

Hazard: Refers to a danger or risk. Does not refer to its usage when saying something (e.g.: Bob hazarded a guess).

Homeless: A term used to describe a person lacking reliable access to shelter, thereby forced to live outdoors “on the streets”. In the context of this project, it does not refer to persons who are technically homeless but have access to shelter (e.g.: temporary shelter or “couch surfing”).

Hunger: A term used to describe the feelings of weakness and discomfort due to lack of sufficient food intake. In the context of this project, “hunger” is not used as a general term for desire.

Sugarcoat: To make something more attractive than it really is. Does not refer to adding a coating of sugar to food.

Thirst: Used to describe the feeling of a person to drink something in order to stay hydrated. Not used as a general term for a want or desire.

7b UML and Other Notation Used in This Document

This document aims to closely follow the UML 2.0 standard as specified by the Object Management Group. Any significant deviations from said standard shall be marked as such and given a sufficient explanation.

7c Data Dictionary for Any Included Models

Weather refers to the temperature, humidity and precipitation in the simulated environment. A data structure is to be implemented for the simulator that contains said weather conditions. The temperature property is to range from -20 degrees fahrenheit to 120 degrees fahrenheit. Humidity is to follow a percentage scale ranging from 0 to 100 percent. Finally, precipitation is to be represented by a descriptor of the precipitation type (e.g. rain, snow, etc) and the forecast of the amount is to be represented in inches, ranging from 0 to 12 inches.

There must also be a data structure to represent the player and the various properties related to them in the simulation. These properties include their health, hunger status, hydration status and money. The health property is to have a range from 0 to 100, with 0 representing death and 100 representing fully healthy. Hunger and hydration are to have a range of 0 to 5, with a 0 representing starvation and dehydration and 5 representing sufficient food and water intake. Money to to range from 0 to 1000, with the range representing the dollar amount that the player has available to them.

8 Relevant Facts and Assumptions

8a Facts

Worldwide operating system market share is 39.16% Android, 30.15% Windows, 16.47% iOS and 8.78% MacOS [9].

Operating system market share in the United States is 38.8% Windows, 20.63% MacOS, 18.65% iOS and 14.03% Android [10].

Windows operating system statistics (Worldwide): Windows 10 (or newer) - 95.11% [8].

Windows operating system statistics (United States): Windows 10 (or newer) - 96.2% [7].

Low end personal computers account for 46.9% of the PC market [6].

High end computers account for only 6% of the PC market [6].

8b Assumptions

It is assumed that the user has at least one computer capable of running an application and that the user is able to sufficiently use their computer to, for example, navigate to the project website and download and install the executable for the simulator.

In order to cover all possible users, given the project budget, it is assumed that the users will be running the Windows 10 operating system or a newer version of said operating system.

It is assumed that the hardware possessed by the users will vary drastically, therefore low end and high end configurations must be supported.

It is also assumed that the game will use an off the shelf, easily obtainable and highly compatible game engine such as Unity to create the game.

Unity is assumed to be compatible with development needs for this project.

It is assumed that the target audience has little to no experience with video games or simulators. Therefore, the simulator needs to be easy to navigate and understand for users with no prior experience with video games and simulators.

V Glossary

Donation: Aid provided to an organization or person without the expectation of getting anything back.

Engine: A development environment and/or framework that streamlines game development processes.

Hazard: A term used that refers to a danger or risk.

Homeless: A term used to describe a person lacking reliable access to shelter, thereby forced to live outdoors and “on the streets”.

Hunger: A term used to describe the general feeling of weakness and discomfort associated with the lack of sufficient food intake.

Non-profit: An organization whose purpose is to benefit a community instead of make money.

Prototype: An early version or draft of a product.

Sugarcoat: To make something more attractive than it is in reality.

Simulate: To imitate a feeling or experience

Simulator: Game designed to imitate a real world scenario in order to provide an experience to the user.

Thirst: Describes the feeling of the need to drink something in order to stay hydrated.

UML (Unified Modeling Language): A visual modeling language standard that aids in visualization and design of complex systems.

VI References / Bibliography

[1] “How much does it cost to make a game?,” Auroch Digital, https://www.aurochdigital.com/blog/2021/8/19/how-much-does-it-cost-to-make-a-game (accessed Sep. 30, 2023).

[2] “How Much Does It Cost To Develop A Game,” Rocket Brush Studio, https://rocketbrush.com/blog/how-much-does-it-cost-to-develop-a-game (accessed Sep. 30, 2023).

[3] “How Long Does it Take to Make a Video Game?,” ARC Academy, https://arc.academy/how-long-does-it-take-to-make-a-video-game/ (accessed Sep. 30, 2023).

[4] A. Crivello, “Game Engines,” G2, https://www.g2.com/glossary/game-engines-definition (accessed Sep. 30, 2023).

[5] “About Us,” Chicago Coalition for the Homeless, https://www.chicagohomeless.org/about/ (accessed Sep. 30, 2023).

[6] “Low end desktops and PCs dominate the market: report,” Tech Monitor, https://techmonitor.ai/technology/low-end-and-pcs-dominate-the-market-report-091112 (accessed Sep. 30, 2023).

[7] “Desktop Windows Version Market Share United States of America,” StatCounter Global Stats, https://gs.statcounter.com/windows-version-market-share/desktop/united-states-of-america (accessed Sep. 30, 2023).

[8] “Desktop Windows Version Market Share Worldwide,” StatCounter Global Stats, https://gs.statcounter.com/os-version-market-share/windows/desktop/worldwide (accessed Sep. 30, 2023).

[9] “Operating System Market Share Worldwide,” StatCounter Global Stats, https://gs.statcounter.com/os-market-share (accessed Sep. 30, 2023).

[10] “Operating System Market Share United States of America,” StatCounter Global Stats, https://gs.statcounter.com/os-market-share/all/united-states-of-america (accessed Sep. 30, 2023).

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