Development Project Description: Make-or-Break

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1 Project Description

1 Project Overview

Make-or-Break is an application utilizing real-time physics simulations in order to test virtual building designs against the forces of nature. Make or break allows users to create, edit, and load real-world recreations of buildings and structures in the 3D environment. Users will be able to test their creations against the forces of nature, such as torrential rain and flooding, earthquakes, and extreme wind/tornadoes. While Make or Break is meant to be used for realistic simulations and structural planning, at its core it is still a game so the users will be able to enter a **Challenge Mode.** In challenge mode, users will be able to design and create structures in order to survive waves of challenges, varying from real world and fantastical. In addition to the challenge mode, users will also enjoy a **'Sandbox' Mode**, granting them the freedom to design their buildings without budget limitations or disaster constraints, allowing for the formulation of personalized gameplay strategies. Make or Break is meant to inspire creativity, foster strategic thinking, and empower users to navigate the dynamic interaction of nature and architecture, Make-or-Break promises an immersive experience where innovation meets challenge, shaping the future of virtual construction and simulation gaming.

2 Purpose of the Project

Make-or-Break provides a platform that empowers users to simulate and test the structural integrity of buildings against each of the various natural disasters. By offering a real-time physics simulation, Make or Break aims to **assist designers, engineers, and architects** in designing safer and more resilient structures.

2a The User Business or Background of the Project Effort

Make-or-Break operates within the domain of structural engineering and architecture, focusing on ensuring the resilience of buildings against natural disasters. The platform serves as a simulation tool empowering users, primarily designers, engineers, and architects, to assess and enhance the structural integrity of buildings in the face of diverse natural calamities.

The reason behind Make-or-Break stems from the pressing need to mitigate the catastrophic impact of natural disasters on buildings. With the escalating frequency and severity of such events globally, there is an urgency to fortify structures against earthquakes, hurricanes, floods, and other natural hazards. A smaller scale example that happened recently was the heavy snowfall in Texas last winter, which left many houses heavily damaged due to poor design and preparation planning. Make-or-Break strives to address this by providing a platform that enables professionals to anticipate potential vulnerabilities and reinforce structures accordingly. Ultimately, the motivation is to foster safer and more resilient communities by promoting best practices in architectural and engineering design.

2b Goals of the Project

The goal behind Make or Break is to help create safer environments by promoting safety and sustainability in construction and design practices. Through our platform, users can explore different construction materials, building designs, and disaster scenarios to optimize their projects for maximum safety and durability. By offering a real-time physics simulation, Make or Break aims to assist designers, engineers, and architects in designing safer and more resilient structures. Make or Break empowers professionals to make informed decisions that mitigate risks and enhance the resilience of their structures in the face of all kinds of environmental hardships. Our mission is to revolutionize the way buildings are conceptualized and constructed, fostering a culture of innovation and resilience in the architectural and engineering communities worldwide.

2c Measurement

1. **Increase in Safety Standards:** Measure the reduction in structural failures and casualties in real-world construction projects after architects and engineers have utilized Make-or-Break simulations to optimize their designs.
2. **Innovation in Design:** Assess the number of architectural concepts and engineering solutions generated by users in the various game modes, indicating the platform's success in inspiring creativity and fostering innovation.
3. **Resilience Improvement:** Evaluate the ability of structures designed using Make-or-Break to withstand extreme weather events and natural disasters, measured by the reduction in damage and downtime experienced during such occurrences.

4. **Customer Satisfaction:** Measure user satisfaction through surveys or ratings, assessing the platform's usability, effectiveness, and value in aiding design processes and decision-making.

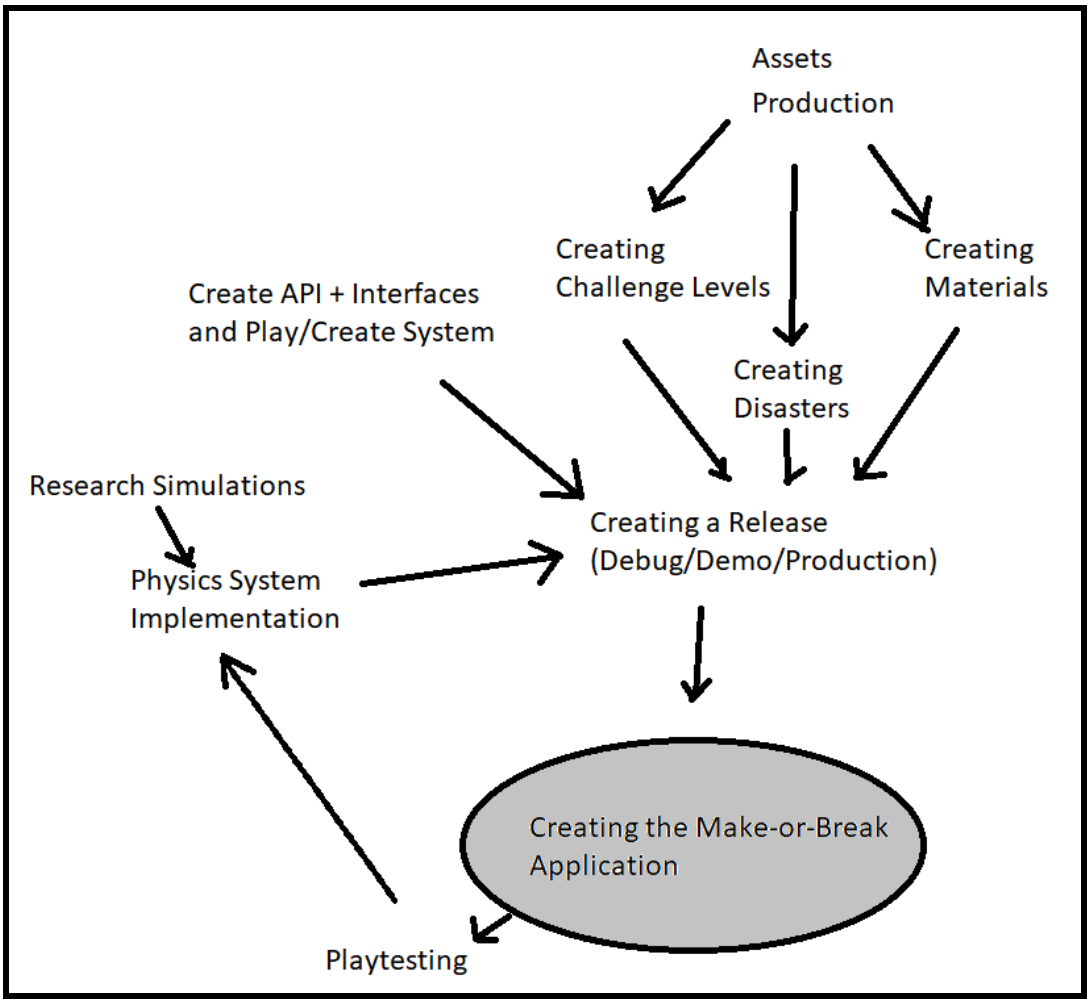
3 The Scope of the Work

When considering the development and release of a game in today's mature gaming market, standing out is paramount. Many contemporary games rely on standard physics engines, but Make or Break seeks to innovate in this regard. We plan to utilize a physics engine that prioritizes realism, determinism, and accuracy, such as Havok or Jolt, or even explore the possibility of crafting our own engine specifically tailored for architecture and engineering. By focusing on authenticity and precision in our physics simulation, Make or Break is poised to offer players an unparalleled gaming experience. Moreover, understanding the current landscape and context of gaming, as well as the nuances of the working activities performed by players or teams, is crucial. This involves examining how our game interacts with its surroundings, partitioning work by business events and their responses, and understanding competing products to ensure our offering stands out in the market.

3a The Current Situation

The kind of person who would buy this product enjoys physics-based and puzzle-based gameplay. They like to view a challenge, think of different ways to solve it, and be able to accomplish that challenge in a timely manner. This player also would have a focus on realism while also being able to enjoy interesting reactions emerging from the game state. This kind of player is a problem solver, and is willing to go through a series of increasing challenges. This player also enjoys being able to compete with others, such as finding the easiest way to pass a level, or even creating the most outlandish set of inputs that can complete a level. They also like to compete with other players, while creating and sharing content for their community. Another kind of player we are aiming to create the product for is the creative and analytical kind. They like to learn about different options they can use, research them, and find out more about them through more gameplay.

3b The Context of the Work



3c Work Partitioning

Business Event List

Event Name	Input and Output	Summary
Update to application code.	Create API + Interfaces and Play/Create System (in)	The general structure of the game is implemented/extended due to the creation or updating of new systems.
A production build is created.	Creating a Release (out)	A new stable major release is created. Either due to a large amount of milestones being implemented, or a stable point of development is found.

Continuous deployment releases production build.	Creating a Release (in) Playtesting (out)	A release of the game is distributed to playtesters or players through a CI/CD pipeline.
Playtest finds physics bugs	Playtesting (in) Physics System Implementation (out)	Playtesters or players find issues with how the physics behaviors work
Playtest finds application bugs.	Playtesting (in) Create API + Interfaces and Play/Create System (in)	Playtesters or players find a a bug or issue with the game's code, either resulting in a crash or unplayable game.
Assets received from production	Assets production (in) Creating Challenge Levels (out) Creating Materials (out)	Production team sends new assets to development team, which team creates new content for next release.
Challenge level updated/added to release.	Creating Challenge Levels (in) Creating a Release (out)	Development team publishes new challenge levels to campaign
New material added to release	Creating Materials (in) Creating a Release (out)	Development team publishes new materials for players to construct with.
New disasters implemented	Creating Disasters (in) Creating a Release (out)	Development team publishes new disasters for challenges to use.

3d Competing Products

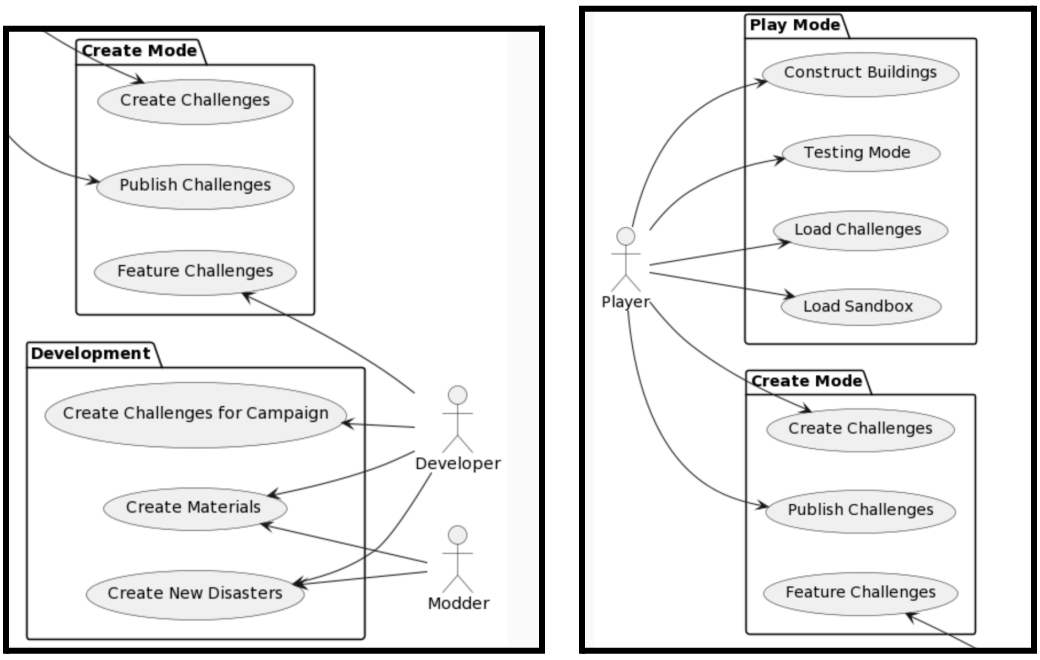
1. **Cities: Skylines:** While not solely focused on testing buildings against natural disasters, Cities: Skylines offers a city-building simulation where players can design and manage entire cities, including infrastructure and urban planning. Some expansions and mods also introduce elements of disaster management.
2. **Poly Bridge:** Poly Bridge focuses on bridge construction and simulation, challenging players to design bridges that can withstand various loads and scenarios. While it doesn't directly simulate natural disasters, it offers a similar experience of testing structures against physical forces.

3. **SpaceEngine:** Although more focused on space exploration and simulation, SpaceEngine allows users to create and explore vast, procedurally generated galaxies and planetary systems. While not directly competing in terms of construction or disaster simulation, it offers a different avenue for creativity and exploration.

4 The Scope of the Product

Post-release, the game should be able to be supported by Developers and from the community by Modders. Developers can Create Challenges for Campaign, Create Materials, and Create new Disasters, as well as Feature Challenges that will be seen in Create Mode. Modders can Create Materials and Create New Disasters.

4a Scenario Diagram(s)



5 Stakeholders

WHO is interested in a service like this? Interest for Make or Break will span various sectors: from architecture, engineering, construction, government agencies, to even educational Institutions.

5a The Client

The main clients we expect Make or Break to pull are:

1. **Architect & Engineering Firms:** Find value in Make or Break due to its capability to enhance the design process, improve structural integrity, and simultaneously minimizing risks associated with their projects.
2. **Construction Companies:** See potential for reduced waste in projects, streamlined construction process, and the ability to ensure the durability and safety in their structures.
3. **Government Agencies:** Offers a way to enforce structures to uphold building codes and regulations. Would also promote sustainability in the development of infrastructure.

5b The Customer

The main customers Make or Break will target are:

1. **Educational Institutions:** Provides an immersive tool for students to learn about the principles of structural engineering and sustainable construction practices through hands-on simulation activities.
2. **Insurance Companies:** Potential to mitigate risks associated with structural failures and enables companies to make more informed decisions, potentially reduce claim payouts, while promoting durability from their insured properties.
3. **Players:** Aspiring architects, designers, and general enthusiasts would be drawn to Make or Break for its engaging gameplay experience. The game would allow for users to explore their creativity, test their design skills, all while learning about the complexities of architectural/structural engineering in a fun virtual environment.

5c Hands-On Users of the Product

Students from high school/university learning intro to engineering courses will use our games hands-on for their projects to introduce them to the field. Other potential hands-on users consist of building architects who create and develop blueprints for structures and buildings and can submit their designs to our game, seeing the results of their work against the simulations of natural disasters. This allows them to prepare for the worst and save the environment from destruction and the lives of many. Gathering information based on the results can save time and money for companies when engineering designs to create natural disaster-proof structures and buildings.

5d Other Stakeholders

1. **Urban Planners:** Allows planners to pick a stable location for building physical layouts of urban spaces. Can test the layout for urban spaces by simulating natural disasters to make the correct decisions for safe and stable urban spaces.
2. **NonProfit Organizations:** Disaster relief organizations can provide input on the game for the impact on the social and environmental effects of the disaster that has occurred.
3. **Contractors:** Contractors that build or renovate homes can use the game to see the results of their renovations and potentially have more clients for their business because of the results that they bring to the table without game.

5e User Participation

While developing the game, users will participate in surveys and add comments, allowing the developers to make changes accordingly. Playtesting will be available for architects, structural engineers, and other professionals to simulate the game and give us feedback on the realism and physics aspects of the game to be as accurate and realistic as possible. Developers will engage with the community of players through various platforms such as YouTube, Discord, and TikTok. Updates and the game's development process will be shared with the community. Users will also be open to sharing their ideas through mods and engagements with the developers through these social media platforms.

5f Priorities Assigned to Users

For our **key users**, we found that the most important users for our product would include **content creators**, as they are the one of the vital parts in growing a community for a game. Another key user would be **structural/civil engineers,** or other construction professionals, as their opinion on how our physics system is able to deliver on realism can determine our success in regards to the educational aspect of our game. Another key user would be **curators,** in regards to players who participate in the community by creating content such as challenge levels or mods. They also are much more likely to engage with any forums and sites related to our game.

Secondary users would be players that buy our product without the intent of spreading it to others. Their opinion is still valuable, we want most players to

enjoy the game even if they don't decide to participate in the community. Another secondary user would be players who aren't knowledgeable about how buildings work in real life, as they would value more outlandish results of games, rather than the realism aspect.

Unimportant users would be players who buy our game just to collect it, as part of their collections of games on stores such as Steam or Epic Games. Another unimportant user would be users who spread malicious or inappropriate content in centers of our player community. This also includes players who download the game from unauthorized sources as they don't have access to full support of our continued development without an official release build.

6 Mandated Constraints

6a Solution Constraints

Description: The product will be compatible with Windows, Linux, Mac-OS.
Rationale: Make or Break is a PC only game and its user base will most likely be running one of the three listed operating systems.
Fit Criterion: Make or Break will be tested to work with all three of the listed operating systems

Description: Moderated and secure distribution of Challenge levels to all players.
Rationale: Game updates will introduce new levels to the user which should include any player no matter their difficulty level.
Fit Criterion: Game testers will play and verify each level is fit to match its designated difficulty level.

Description: All levels are forwards-compatible with production versions released.
Rationale: Users may want to access older completed levels to replay.
Fit Criterion: Game testers will play each level in new version releases to ensure they function properly.

Description: Virtual buildings and behavior of the simulation must try to accurately reflect how they react in real life disasters.
Rationale: Users may want to create and visualize real life disasters inside Make or Break.
Fit Criterion: Some example scenarios will be created and run by game testers used to determine the realness of the simulation.

Description: Periodical moderation and security for published content.
Rationale: To prevent large amounts of inappropriate/malicious content published from players in the community.
Fit Criterion: Challenges and mods created from the community must go through a verification process in order to be accessible to the public user base.

6b Implementation Environment of the Current System

Accessible on PC to low-end hardware. Data can be retrieved using external sources such as Steam Hardware Survey. The site lists and sorts hardware used by its users. Make or Break testing will be used on low-end hardware gathered from external sources to ensure the experience is optimal for users.

6c Partner or Collaborative Applications

There are no external applications Make-or-Break must be compatible with; however, an API could be made to extend functionality to other apps. Such apps might be online database rankings for challenges, or a webhook that shows statistics of a player's profile.

6d Off-the-Shelf Software

The game engine in which Make or Break will be created in (ex. Unreal Engine 5, Unity, etc…).

6e Anticipated Workplace Environment

Make or Break is a PC only game, which means the user's environment will more than likely be their home or outdoor environments where a PC is of acceptable use. Some outdoor environments include: Library, Gaming cafe. Conditions vary from user to user and location which will require settings to allow users to customize sound volume and graphics quality depending on their computers power.

6f Schedule Constraints

Planning: 3 months
Pre-Production: 4 months
Production: 8 months

Testing: 2 months
Pre-Launch: 1-2 months
Launch: 1-2 months
Post-Launch: 2-5 years of long term support
(Rough estimation of schedule timelines, will vary depending on team size)

6g Budget Constraints

Content Creation: $10,000 - $100,000+
Software Development: $100,000 - $120,000+
Production: $80,000 - $100,000+
QA Analysis and Testing: $10,000 - $12,000+
Hardware and Infrastructure: $1,000 - $20,000+
Staffing: $50,000 - $500,000 (yearly)
Server and Hosting: $1,000 - $10,000 (monthly)
Legal and Compliance: $5,000 - $20,000+
Game Insurance: $2,000 - $10,000+

7 Naming Conventions and Definitions

Player: person who buys and plays a release version of the game on their system.
Deterministic physics: physics where the outcome is solely determined by the inputs. Same inputs and variables give you the same results with no randomness.
Updates and Mods: modifications made to the game post-release, (mods usually by players, and updates/patches by developers) Forwards Compatibility: any version released after specific content was made can load and access that content through conversion or good data practices.

7a Definitions of Key Terms

Assets: Resources used during development such as textures, audio, 3d models, and UI graphics. Generally released through an executable distribution.
CI/CD: Continuous integration/deployment. A regulated pipeline for seamlessly releasing production builds for playtesters with an emphasis on frequent incremental updates.

8 Relevant Facts and Assumptions

8a Facts

1. Make-or-Break is a simulation application utilizing real time physics simulations for testing virtual building designs against natural forces.
2. The application allows users to create, edit, and load real-world recreations of buildings and structures in a 3D environment.
3. Users can test their creations against various natural forces such as torrential rain and flooding, earthquakes, extreme wind/tornadoes, among others.
4. An estimated 38% of "dedicated PC gamers" use laptops as their main gaming device.

8b Assumptions

1. Users have access to a PC with specifications meeting or exceeding the minimum requirements for an optimal gaming experience.
2. Make-or-Break does not depict real structures or contain any living entities; it is purely a simulation and gaming experience.