

RHYTHM RUSH



Created by NEXUS

Aidan Ryder • Amarie Fasoro • Ikem Enebeli • Ruaridh Murdoch • Yousuf Shahabuddin

Human Centred Design • DE1

Rhythm Rush

Digital Game

- Bright lights and dark background for high contrast and energy.
- Characters that move in sync with each player.

Junction Point

- Dance, spectate, or bypass?



The idea for this group project was centred around "Urban Play". We researched into various problems with communities and what factors affected social positivity, before we arrived at Concert Queues.

A group of up to 4 people walk up to the screen, and activate the game with a gesture. Their dance moves are mapped to models we created on the screen, and a dance score allows for some competition between. A dance guide pops up too so everyone can join in!

Those who prefer to not dance, can still feel included in the spectator zone, allowing them to see all the action.

Curved Screen Frame

- Sleek housing for the main display and lighting to improve tracking.

Player Zones

- Defined spaces for accurate tracking and gameplay.

UI Display

- Shows time, song information, and score based on creativity, speed, and beat.

MODELS

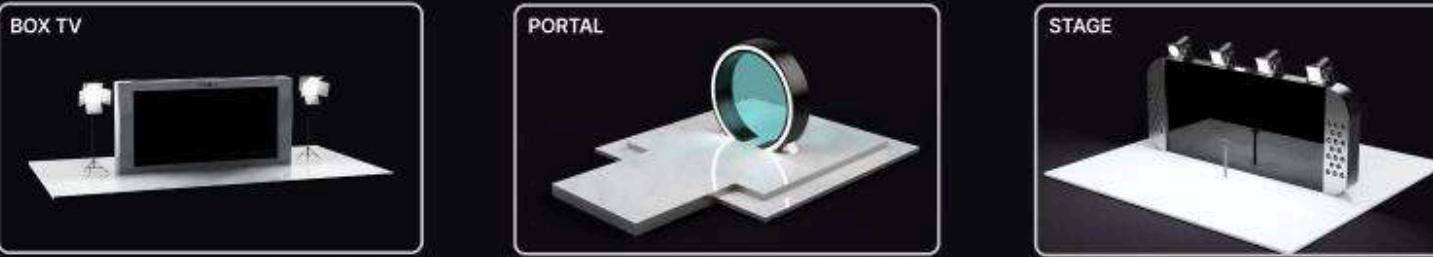
MODEL: CARDBOARD LO-FI

We started with low-fidelity prototyping, to explore a range of different screens using cardboard mock-ups. These were used to quickly iterate through different component placements.



MODEL: CAD TESTING

Once we had a clearer sense of which ideas resonated with us as the designers, we then refined the selected prototypes in CAD software to produce a more realistic and professional visual.

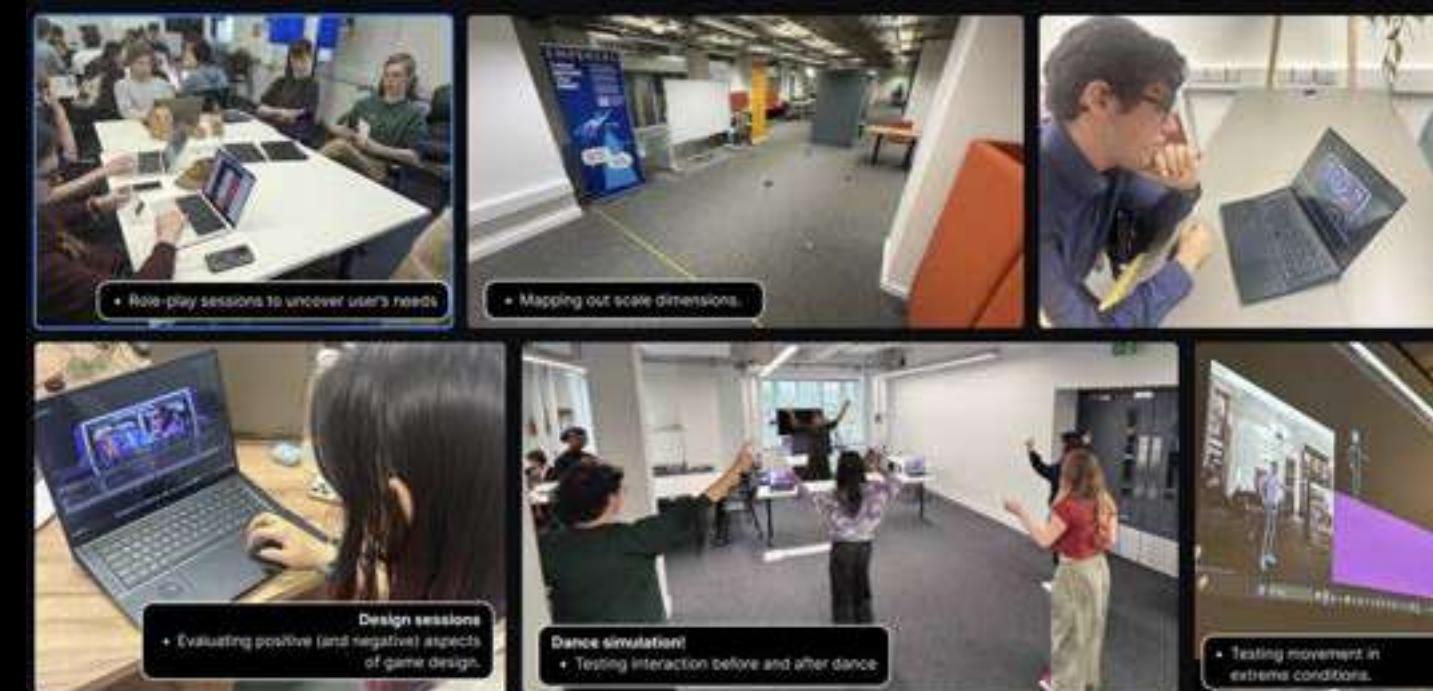
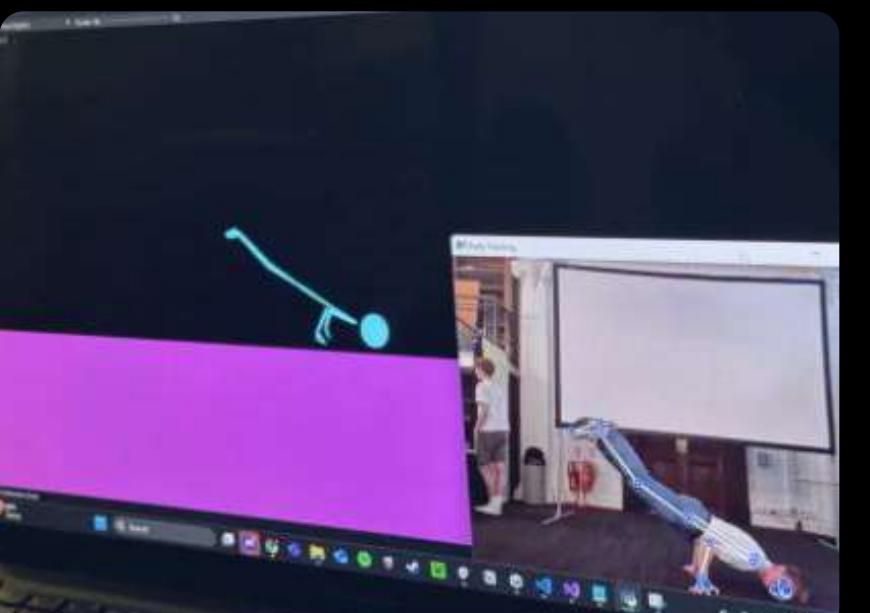


These models were then tested with users to gather feedback on the visual impact, usability and themes.

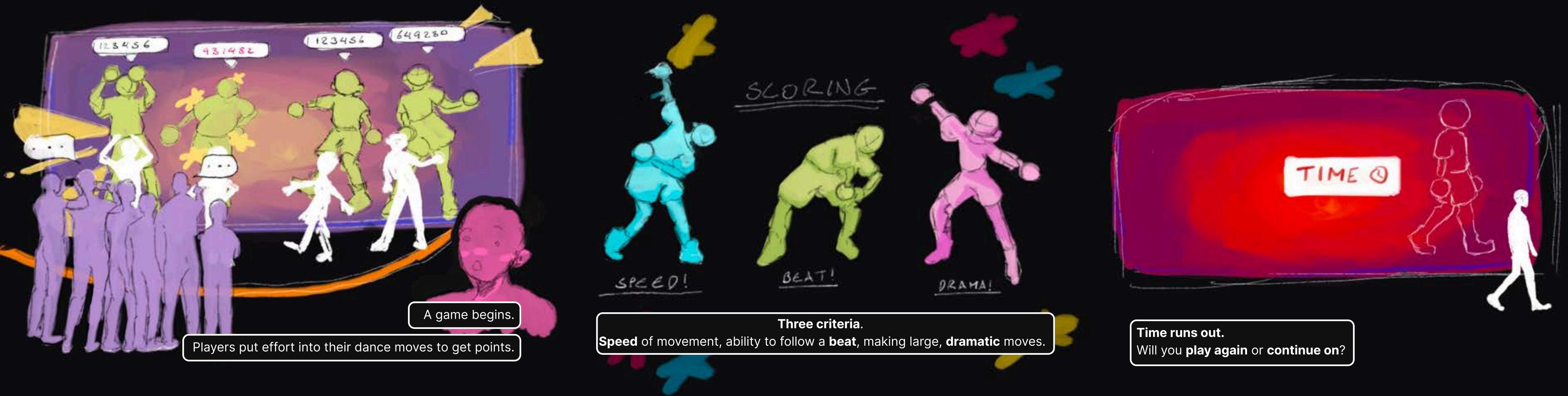


- Created physical & CAD models.
- Many many sketches and co-design sessions to land on our final design and game idea.
- Tested prototypes with people to record their reactions and validate our idea in the real world

Testing our body-tracking code



THE JOURNEY



VIRTUAL

SONGPLAYING • ARTIST 02:37

58430

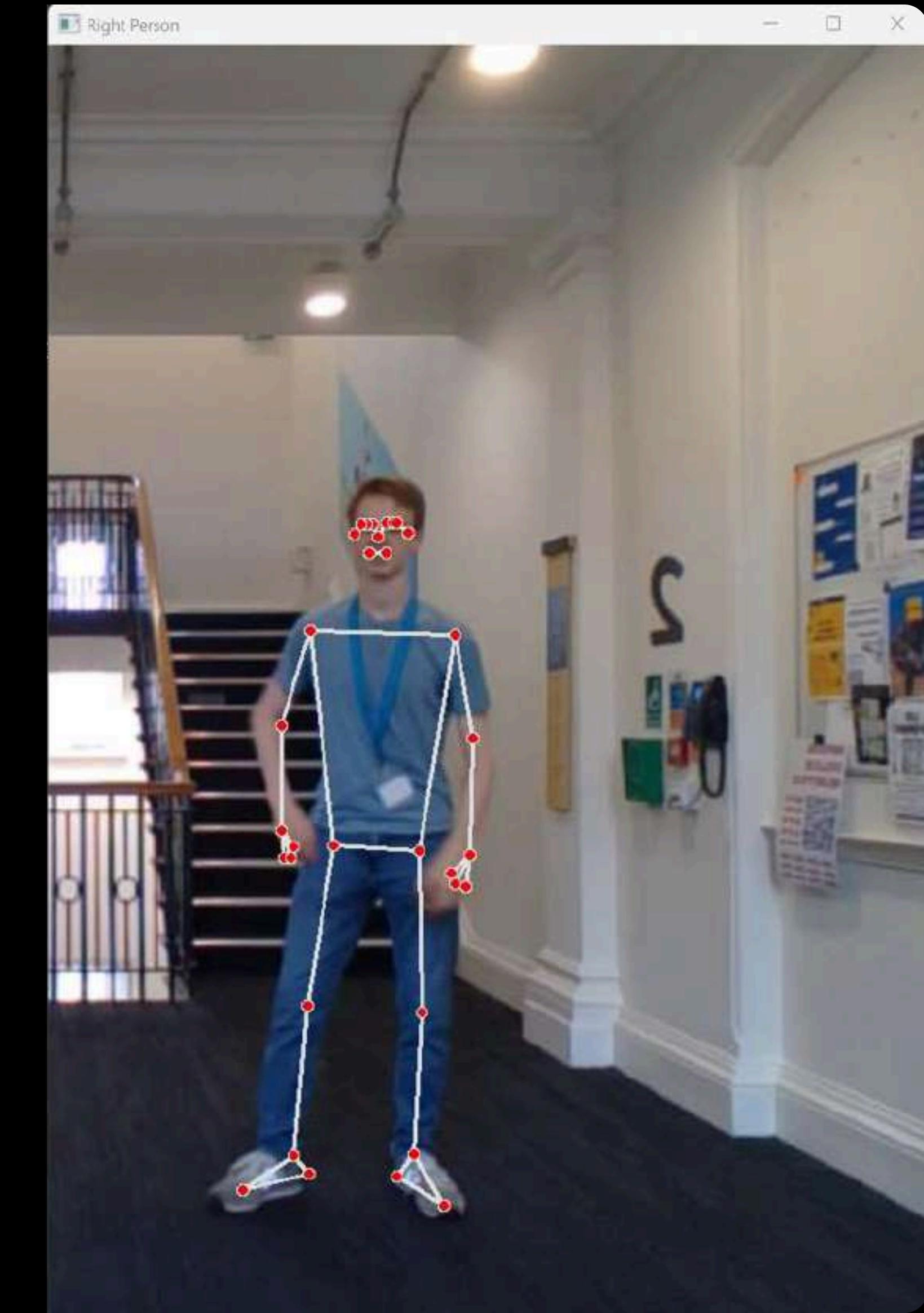
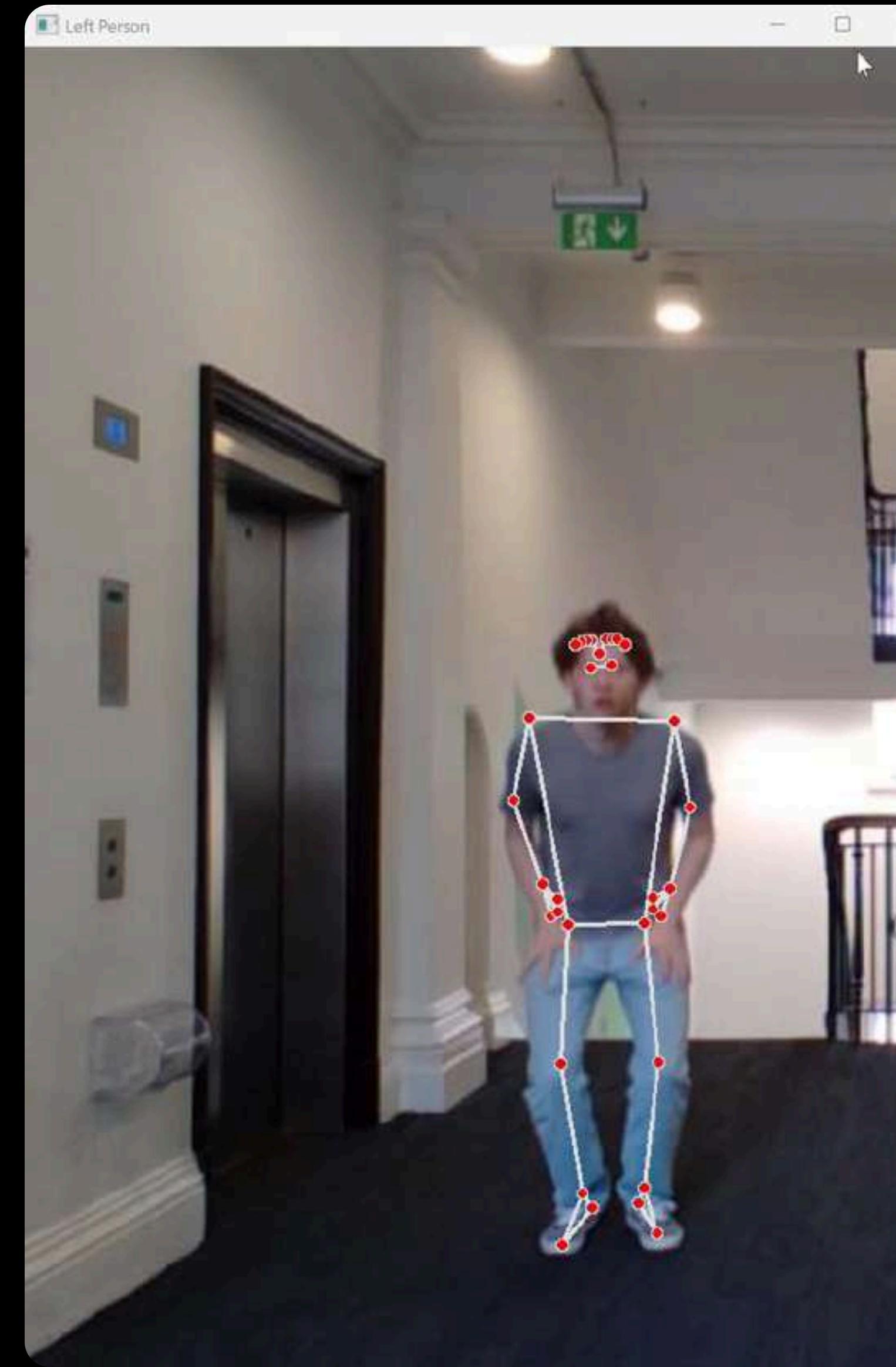
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VIRTUAL



Discovery Report

Aidan, Amarie, Ikem, Ruaridh, Yousuf

EVENT QUEUES

Created by NEXUS

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DESK RESEARCH: CONTEXT

80%^[11]

Of queuers at events report that long queues are one of the “most significant drawbacks” of attending events.

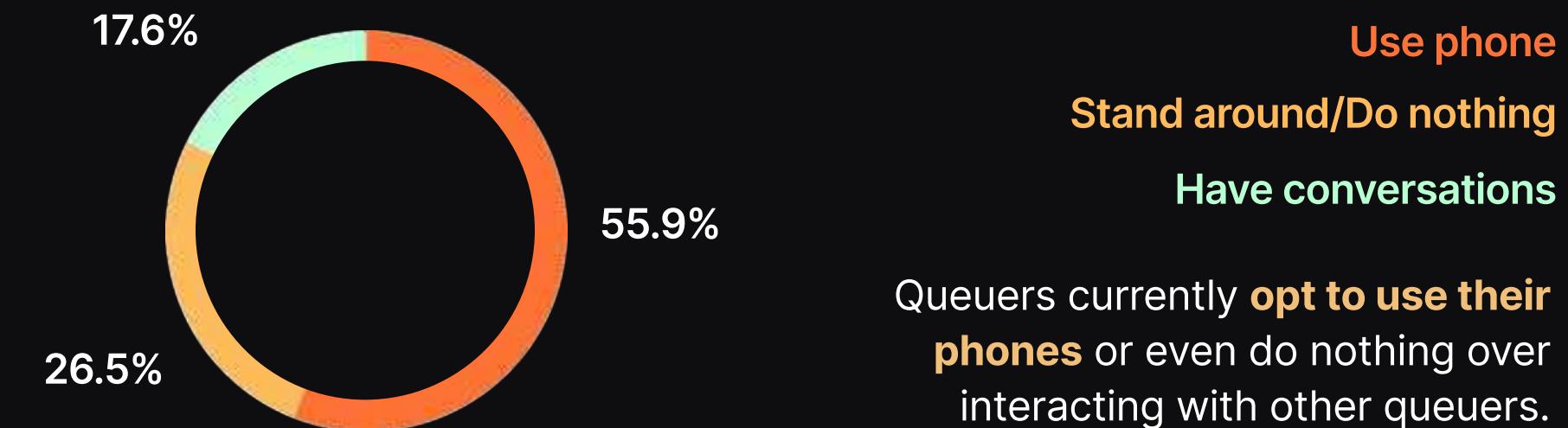
- 27% of queuers get annoyed by other queuers.^[12]
- Poor queue management can reduce satisfaction by 30%.^[11]
- 97% of queuers do not feel excited to queue.^[1]

- On average, people are willing to wait for 36 minutes to enter events.^[13]
- Brits spend 6.7 years waiting, approximately 11% of their life.^[14]
- 72% of queuers believe queuing is a “waste of time”.^[15]

THE PROBLEM: QUEUES LACK SOCIAL ENGAGEMENT

Queues are a cornerstone of British culture: efficient, orderly, and often silent. In London, a fast-paced cosmopolitan city, we've designed systems to reduce waiting times. But what if we reimagine waiting, not as wasted time, but as an opportunity for social engagement?

Survey: What do you do while queueing? ^[1]



Use phone
Stand around/Do nothing
Have conversations

Queuers currently opt to use their phones or even do nothing over interacting with other queuers.

FOCUS: EVENT QUEUES

We started with digital experiences but realized they lacked social interaction because everyone assumed others were too busy to engage. This led us to focus on an environment where people naturally have downtime: queues.

Queues are a unique social setting where people are physically together but remain disconnected, making them an ideal space to encourage social engagement.

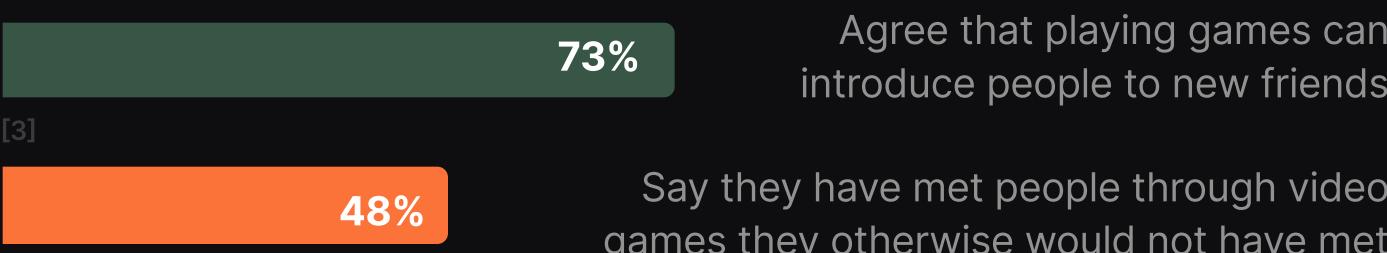


[16]

STRATEGY: GAMES



Gaming makes social interactions easier by providing a shared activity that reduces the pressure of direct conversation, allowing people to connect naturally. It offers a common goal or challenge that encourages teamwork, collaboration, and organic conversations.



Additionally, gaming is inherently fun, making social experiences more enjoyable and helping people relax and be themselves.

WHO

Queuers for events such as; Concerts, Sport Events, Conventions, Theme Parks. Likely 18-35

WHAT

Creating opportunities for queuers to play and interact with other people.

WHEN

During peak venue hours, typically later in the evening and at night, when social energy is high.

WHERE

In queues designed to accommodate large capacities in Britain, particularly London.

WHY

They are a social setting, where people have similar interests, resulting in an ideal space for socialising.

MAIN ASSUMPTIONS

- Queuers find queues boring, but find it a necessary evil.
- People are hesitant to interact with each other in unfamiliar contexts - why risk having a negative interaction with a stranger.
- People in public want to engage with others but often struggle with how to start a conversation.

RESEARCH: OVERVIEW

OBSERVATIONS

We observed people in **existing urban spaces** to understand their behaviour in interactive environments. **Our focus was on attention spans and engagement levels.** By analysing how individuals interacted with their surroundings and with each other, we gained insights into patterns of social behaviour.

STREET INTERVIEWS

To explore how people interact with strangers in public, we conducted structured interviews with **21 individuals**. These interviews provided qualitative insights into social behaviours, personal comfort levels, and attitudes toward interactions with strangers. The responses helped us understand barriers, social norms, and motivations for engaging with others.

VISUAL VS. TEXT

We designed an experiment to test **how people interpret instructions** by presenting students with two versions of the same task; one using step-by-step images and the other using written instructions. By analysing their preferences and reasoning, we gathered data on effective communication methods.

VOLUNTARY SOCIALISING

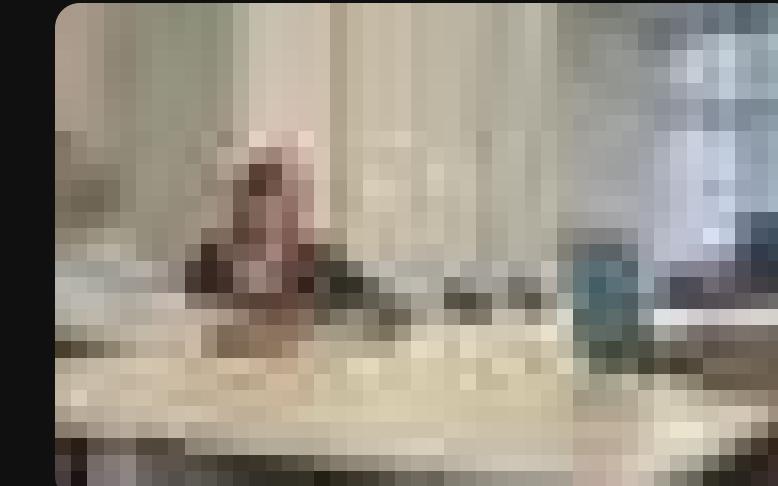
We conducted a public experiment to examine what encourages people to engage with others. A table was set up with **two different forms of voluntary interaction**, one focused on conversation and the other, a high five. This experiment was repeated, however **the interaction was changed to gaming**. Observing engagement, emotion, and behaviour before, during, and after the activity helped us refine our understanding of social cues and engagement strategies.

IN-DEPTH INTERVIEWS

To further investigate public social behaviour, we conducted interviews with university students, focusing on their experiences in **social settings and event queues**. Participants ranged in extroversion levels, allowing us to examine different perspectives. These structured yet conversational interviews reinforced findings and **defined locations**.

QUEUE SURVEY

To gather additional data on queuing experiences, we designed a survey that collected **24 responses**. The open-ended questions uncovered personal preferences, frustrations, and expectations related to queuing. This survey provided **quantitative and qualitative insights** that tied together themes from our previous research, identifying key factors that influence engagement in queues.

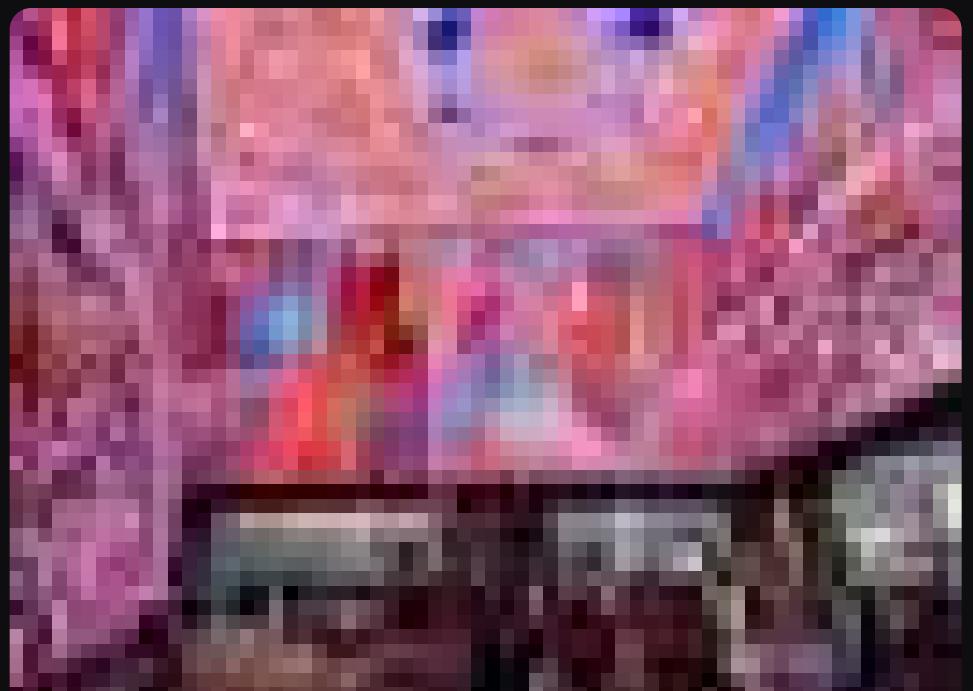


RESEARCH: EXISTING SPACES

OUTERNET

A large-scale, immersive, digital experience that attracts huge crowds

Located next to a busy tube station and shopping district, Outernet's audience are mostly passers-by. It has immersive advanced LED screens, and features digital art installations, and a giant Tetris game designed for public interaction.

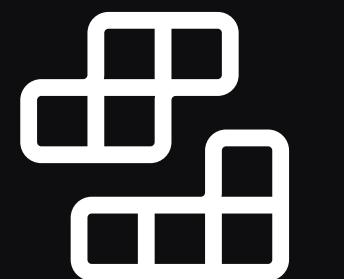


Labelled: 'London's most visited attraction'

OBSERVATIONS

While people were certainly **attracted to the novelty of the experience**, they didn't interact much with Outernet or the other people.

- **47% of visitors were on their phones** when they entered, mostly to take pictures or videos. Many continued to stay on their phones, becoming less engaged and appearing less approachable.
- The average time visitors spent at Outernet was **41 seconds**. Groups tended to stay longer but isolated themselves from others.
- Most visitors were coming from **Tottenham Court Road station**, briefly experiencing the space before continuing on their way.
- Only 7 people could play the Tetris game at a time while over 50 people were present, further hindering engagement.
- The game felt **neither collaborative nor competitive**, meaning players showed little interest in each other.



STREET INTERVIEWS

We made observations and **interviewed 21 members of the public** about how they interact with strangers.

52%
0%

were comfortable with starting a conversation in a place like Outernet. However...
of visitors approached anyone new during our stay.

WE ASKED: What stops you from talking to others?

- **Fear** of "encroaching on their personal space"
- **Pressure** from "social norms"
- **Anxiety** from thinking "I might not be interesting enough"
- **Awkwardness** as "everyone is on their phones"
- **Assumption** that others "might be busy"



"much more comfortable in a bar setting"

Many visitors shared this opinion, which reinforces the idea that social norms play a significant role. It suggests that for people to feel comfortable interacting with each other, a space must be **perceived as inherently "social."** Venues like clubs, bars, concerts, and events all share this characteristic.

INSIGHTS

- Some settings are explicitly recognized as social spaces, creating an expectation for interaction. Without this context, individuals feel like they are intruding on people.
- There are perceived barriers to conversation: fear of annoyance, lack of common ground and concerns about safety. Phones and group settings also discourage interaction.
- There is an underlying desire to connect but almost everyone struggles to initiate.

DIRECTION

We have realised how ineffective Outernet was at fostering social connections. This allowed us to understand some of the major issues and barriers that prevent positive interactions from occurring. This pointed us in the direction of future research and set basic rules to define a location. It needs to be defined as a social space.

Further data on Notion/Interviews, Surveys & Experiments/Street Interview

RESEARCH: TESTING IMPLEMENTATIONS



EXPERIMENT: VOLUNTARY SOCIALISING WITH STRANGERS

Over two days outside Imperial's library, we tested people's willingness to engage in voluntary social interactions. We defined interaction as a conversation. To ensure voluntary participation, we let the public approach us rather than initiating contact. We received 55 participants in each.

PART 1: High Five vs. Conversations

People were prompted to either high five a team member or choose a conversation topic out of a hat. If they chose the latter, they were asked to talk for one minute, but most of them happily talked for longer without being asked.



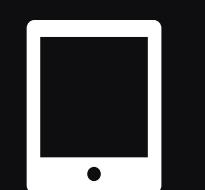
PART 2: High Five vs. Playing 2-Player Games

People were prompted to either high five a team member or play a two-player game with another team member. Gaming broke the ice and allowed for easy conversations despite it not being the focus.



OBSERVATIONS

- In the gaming experiment, interactions doubled, indicating more engagement when a game was involved.
- Males much preferred "shoulder-to-shoulder" interaction, as it felt lower pressure and less confrontational.
- When people were already interacting with us, passers-by in the conversation experiment walked away, unwilling to wait. Whereas, the gaming experiment drew spectators who stayed to watch.
- The game experiment sparked more smiles and laughter, even with spectators, and overall left people happier than the other experiment.



INSIGHTS

- People avoid interrupting conversations but gather around gameplay, as it creates a shared focal point, fostering connection. Once an interaction has begun, more people are suddenly willing to join.
- Gamified interactions turn passive observers into active participants, while casual small talk lacks the same draw. Structured play feels lower risk, lower effort and higher reward than open-ended conversation.
- Strangers usually keep to themselves, but simple, friendly competition quickly builds a sense of togetherness, even among complete newcomers.

DIRECTION

This helped us finalise on including a gamified experience to our designs and started the converging process by adding a limiting factor of people being discouraged when there were already people playing. This meant there had to be a constant flow of people. Ultimately, it all came down to one thing - queues.

SURVEY 2: QUEUING

A survey was conducted to explore people's experiences and perceptions of queueing in various situations, such as concerts, grocery stores, sports events, and theme parks. This was to understand how individuals feel about waiting in line, their willingness to engage with others, and what factors might improve their queueing experience.

We gathered 24 responses

What might improve the experience of long queues?



"Activities scattered along it."
"Interesting people to talk to."
"A reward or compensation"
"Disney-land: Queue for alien encounter was part of the ride."

Further data on Notion/Interviews, Surveys & Experiments

INSIGHTS

- Queues are seen as frustrating and negative experiences. Most people associate waiting in line with boredom and irritation rather than an opportunity for engagement.
- Most queuers would choose to participate in activities and entertainment over using their phone, given the opportunity. Those who have done it before noted it as 'memorable'.

DIRECTION

The survey confirmed our belief that entertainment is the most effective way to make queueing enjoyable and demonstrated strong interest in the idea. This validation strengthened our commitment to the idea, giving us greater confidence in our approach.



SURVEY 1: VISUAL VS. TEXT

34 University students were asked whether they preferred pictures or text to make an origami boat and why.

People prefer a mix of images and text but favour more images, as they reduce cognitive effort. Text-heavy instructions can be a barrier, especially for neurodivergent individuals or those with reading difficulties. Visuals improve accessibility.

Further data on Notion and Page 13

RESEARCH: IN-DEPTH INTERVIEWS

INTERVIEW 1

Angelina, an enthusiastic concert goer.

Angelina stood out because of her **experience with concerts and fan events**. When we spoke, she'd just been to a concert alone, so we were keen to hear what it was like navigating event queues without a group. The interview explored her **social behaviours**, preferences in public spaces, and how factors like environment, age, and shared interests influence her interactions.



What age range would you be comfortable talking to?

"I think I will be fine with anybody similar to my age, or if I have to give a range about 16-25."

When you're out and about by yourself, what do you tend to be doing?

"I normally like having headphones on, I don't have music on I just have it for the noise cancelling aspect."

INSIGHTS

- Age proximity can influence social comfort. People feel more at ease interacting with those close to their own age, while larger age gaps create hesitation.

- The constant flow of people and fleeting connections make individuals feel like strangers, which fosters a sense of alertness. Leading some to seek personal space.

DIRECTION

We focused on solutions that reduce anonymity, reinforcing the queue demographic. The shared challenge creates a collective experience, making people feel less like strangers.

INTERVIEW 2



Safiyya and Phoebe, second year university students.



What would make you speak to more people and stay in contact?

"I would only speak to someone if they matched my energy and vibe."

"Unless if I have a really similar interest, I wouldn't start a conversation."

What do you do in concert queues?

"I normally just go on insta and scroll, or, If I am with someone I would talk to them."

"I just read my book - I wouldn't interact with anyone"



INSIGHTS

- Shared interests make conversations easier by creating an immediate sense of connection, reducing social barriers. People are more likely to engage and open up when they have common ground.

- People engage when they sense compatibility through personality, body language, or shared enthusiasm. Tools that highlight matching energy and connection can make interactions easier.

DIRECTION

This helped us better understand user needs, such as increased interactions when there's a shared interest, which aided in converging around events. We also recognized the potential of using games to match people's energy, fostering more natural and engaging interactions.

INTERVIEW 3

Sara, a reserved second year university student

She is **mostly opposed to interacting** with strangers and is content with this, though she notes that interactive public activities at events "could be cool." The interview explored Sara's social habits, preferences for activities with friends, comfort with waiting and interacting with strangers, and their approach to meeting new people.



Have you ever spoken to someone random in a queue?

"If someone spoke to me, I would probably talk to them, although I wouldn't start a conversation with a stranger unless I need to. I generally try to avoid talking strangers. Partly for safety because I don't know them."

INSIGHTS

- People typically avoid talking to strangers unless there's a clear reason, driven by safety concerns and the uncertainty of others' intentions, especially in unfamiliar settings.

- Time constraints in shorter queues make it hard to form connections. Solutions should target people in longer queues.

DIRECTION

We focused on encouraging social interaction by providing clear, safe reasons for engagement, especially in unfamiliar settings, with a focus on longer queues where people have more time to connect.

PERSONAS & JOURNEY MAPPING

Anita Wait: Eager Sports Fan

Anita is impatient and dislikes waiting, eager to get through quickly and enjoy the football match with her family.

Wants:

- Distraction to make the queue feel faster.
- Feel progress near the entrance.

Pain Points:

- Frustrated by slow movement up front
- Stuck with nothing to do



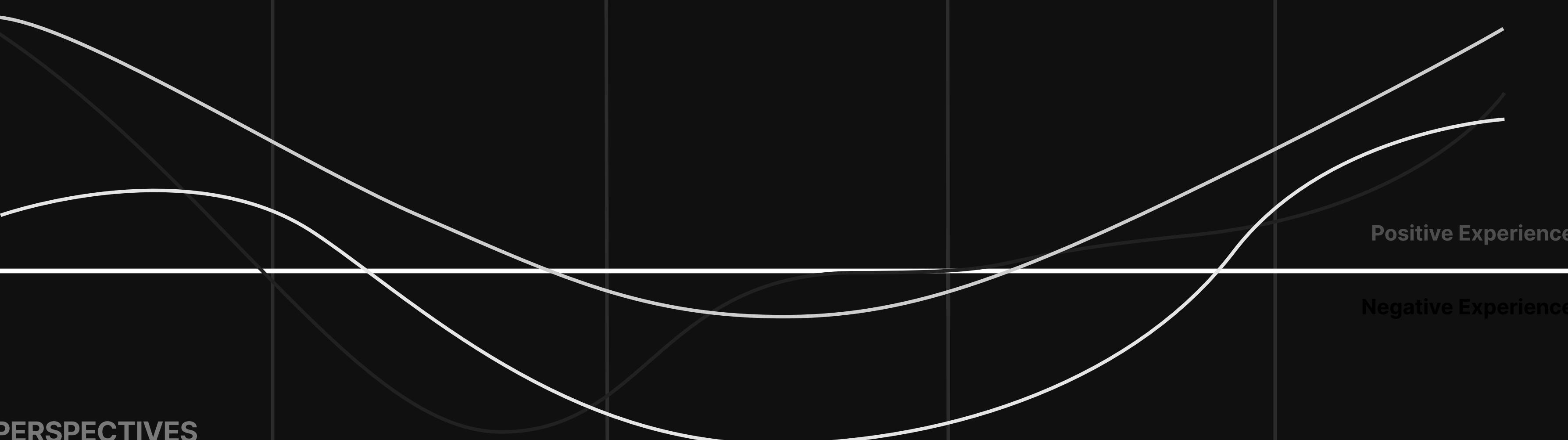
Before entering

Beginning of queue

Queue stagnation

Queue begins to move

After leaving queue



Ben Wishaw: Reserved Musician^[6]

Passionate about indie music and reading, attending solo on a second-hand ticket, finds the queue distracting and uncomfortable.

Wants:

- Get inside quickly
- Stay engaged while waiting
- A less crowded, cooler space

Pain Points:

- Too uncomfortable to read
- Hates waiting in line
- Feels isolated alone



PERSPECTIVES

"Nice, we're so early we're gonna whizz through this queue"



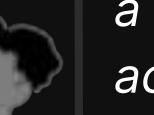
"Just need to get in, then I can focus on the music. That's what I'm here for."



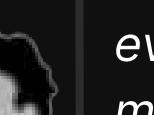
"OMG let's go, we'll have so much fun together. I wonder who we will meet"



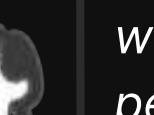
"You're kidding me, there so many people, I got here early for what?"



"Yeah, it's crowded. I just... I really want to get inside soon."



"Can't wait to get in, hopefully the music is good and the queue is worth it."



"We're gonna be here for a while may as well accept it."



"I'm never going to get inside at this rate. It's too hot and I can't even concentrate on my book."



"This queue is so lame. I want to talk to some new people but I don't know how"



"About time! Let's just hope this doesn't stall again!"



"Finally, it's moving. I can feel the air change already. Just need a little more patience."



"It's awkward now but should be amazing once we get inside"



"You know what, that could've been far worse."



"Relieved. That was the worst part. Now I can actually enjoy myself."



"This is so sick, I don't even give a \$&£! about the queue"



Brianna Quinn: Vibrant Club-Goer^[7]

Likes to go clubbing with her friends and meeting new people.

Wants:

- Natural opportunities to initiate conversation
- To make memories with friends

Pain Points:

- Experiences disappointment when social interactions during queuing feel limited or forced



OPPORTUNITIES

How might we initiate meaningful interactions between queuers?

DIRECTION

This showed most people's experiences drops at the beginning of the queue, refining the location of the design. It also highlighted how extroverts engage easily while introverts need low-pressure prompts.

RESEARCH: CONCLUSIONS

INSIGHTS

INTERVIEWS

Most people rarely talk to strangers due to discomfort, social norms, or fear of intruding.

- There is a shared social belief in our individualistic society that everyone is busy and preoccupied, and do not want to be disturbed. ●

People are hesitant to engage with strangers due to concerns about personal safety. However, when they share a common interest—such as an event—they experience a connection that lowers social barriers.

- This shared context fosters familiarity and trust, making interactions feel more natural and organic, reducing the discomfort of engaging with others. ●

EXPERIMENTS

In social gatherings it takes just one person/group to break the surface tension.

- Once a space has been deemed 'social', people are happy to join in. This herd mentality results in more people talking. ●

People hesitate to interrupt conversations but eagerly gather around gameplay due to the shared focal point that games creates, reducing the pressure of direct engagement but still fostering connection.

- Contrary to typical assumptions, spectatorship increases approachability rather than creating a barrier. ●

Gamified interactions are more effective for socialising.

- In contrast, conventional conversation starters lack the same compelling draw.
- This indicates that structured play creates a psychological invitation perceived as lower risk and higher benefit compared to open-ended conversation. ● ●

OBSERVATIONS

Phones act as social shields in queues.

- When people are on their phones they are already engaged with familiar activity, making them less receptive to new connections.
- While technology keeps them socially engaged, it isolated them from their immediate surroundings. ●



GOAL

Create an atmosphere that encourages social interactions that leave people happier.

PRIMARY HMW

How might we design a gamified experience that naturally encourages social interactions in queues while maintaining flow and engagement?

SECONDARY HMWs

How might we create an interactive experience that adapts to the pace of a moving queue without causing delays or disruptions?

How might we make the process of joining conversations feel more inviting and less intimidating for others so that individuals take the first step in overcoming social tension.

How might we design engaging, low-pressure activities that allow both active participants and spectators to feel included in the experience?

HMW's CREATION

- Transformed research findings into key insights.
- Defined an overarching goal for the project based on these insights.
- Created a primary HMW question to capture the core approach.
- Formulated secondary HMWs to address supporting challenges to aid us in the ideation

GROUPED CATEGORIES

- : Social Barriers
- : Shared Context & Connection
- : Play & Interaction

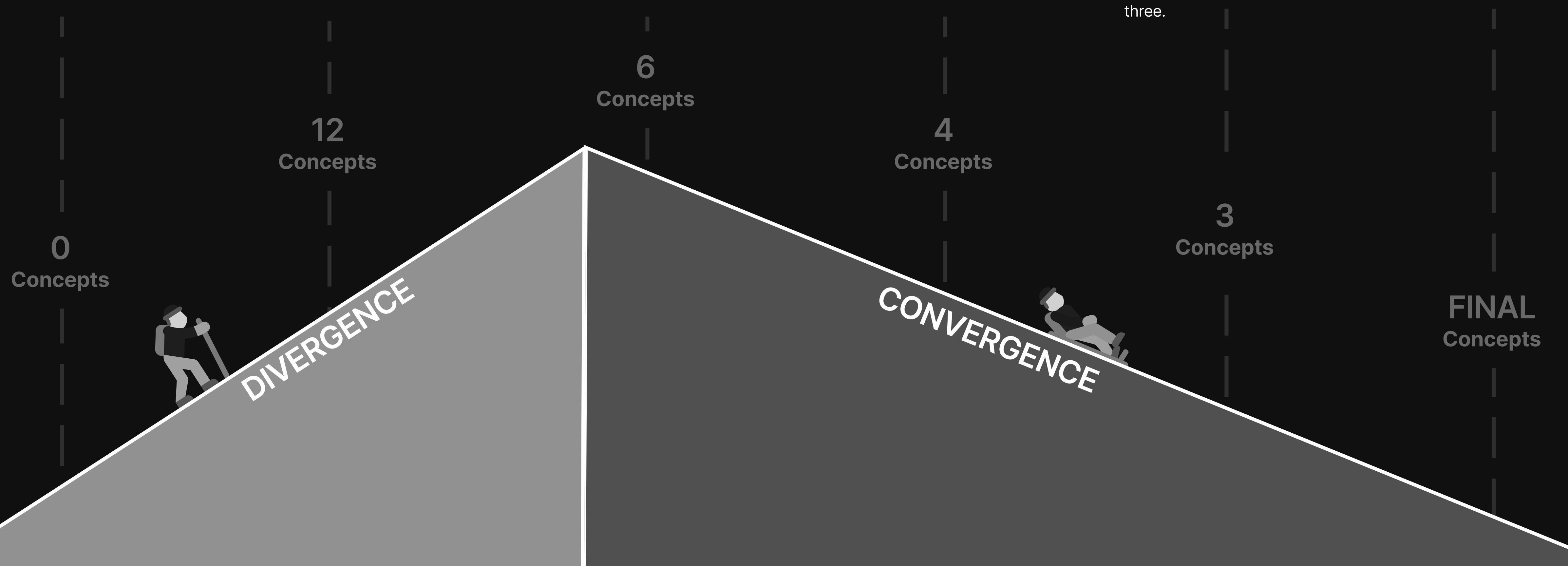
IDEATION: OVERVIEW

REQUIREMENTS

To create and evaluate ideas effectively, we refined our initial insights into **clear requirements** that each concept had to meet. This approach ensured that every concept could be tested objectively **while aligning with our research goals**.

BRAINSTORMING

We conducted a group brainstorming session that generated a **broad range of ideas**. Following this, we **filtered** the ideas through several stages to identify those that adhered most closely to the initial requirements, ensuring each idea fit our established goal.



EVALUATION

We evaluated **12 concepts** based on five criteria, **prioritising desirability** above the rest. The criteria were initially designer-based, with user input to follow later. After analysing the data in a table, the **upper scoring half of the concepts were selected for further development** in the co-design session.

CO-DESIGN

In the co-design phase, we used **opinion-based attributes to create a rating system** that enabled participants to evaluate the six selected ideas. Along with the structured ranking, we collected **detailed feedback on each concept**, allowing participants to express their thoughts more freely.



PROTOTYPE

To minimise designer bias, we developed a **low fidelity digital prototype** for one of the ideas. This simple two-player game was designed to simulate the concept, allowing us to **observe user interactions objectively**, independent of our opinions. This step helped narrow the concepts down to the final three.

DEVELOPMENT

The next phase involved further developing the final three concepts to make them more concrete and well-defined. This was achieved by **carefully reviewing the user feedback** from the co-design session and **iteratively reassessing and adjusting the concepts**.

IDEATION: CONCEPTS

GROUP BRAINSTORMING

How might we design a gamified experience that naturally encourages social interactions in queues while maintaining flow and engagement?



REQUIREMENTS

- Must be designed for slow-moving queues.
- Must incorporate a game to engage participants.
- Must minimise phone use by offering a compelling alternative.
- Must lower barriers by signalling the space as social.
- Must allow quick and easy participation with minimal setup.
- Must operate without requiring staff supervision.
- Must be cooperative or competitive

Using these requirements as a foundation, we generated 12 initial ideas. We began by sketching out rough concepts, then refined and expanded on them to develop more polished versions. Throughout the process, we ensured that each idea aligned with the core definition of a game:

GAME

/geɪm/

- [9] • an activity that one engages in for amusement or fun.

*The game uses a camera to track the player's movements and display their digital body on the screen, allowing it to interact with various digital elements.

In the UK, the **Equality Act 2010** ensures provisions like separate or fast-track queues to support disabled individuals. As these measures create different queueing experiences, our movement-based games have been designed with the general queueing context in mind, while respecting these existing arrangements.^[8]



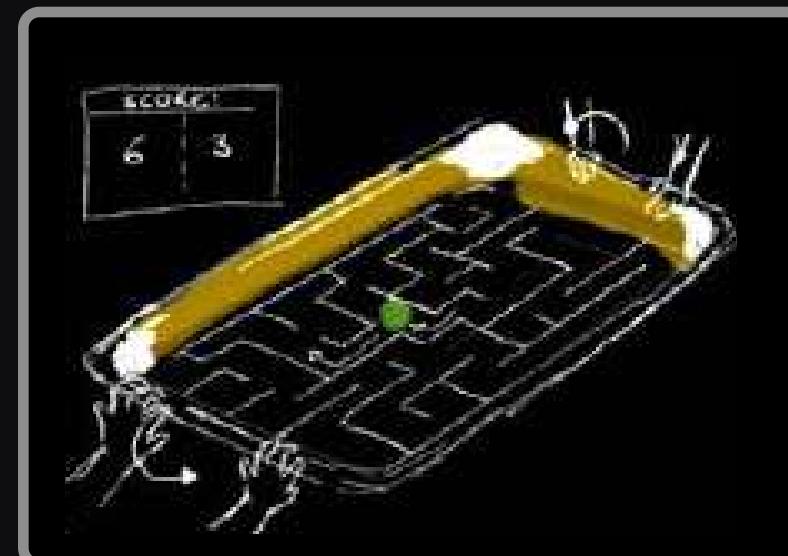
Kinetic Games*

1



Group Mural

2



Tilting Table

3



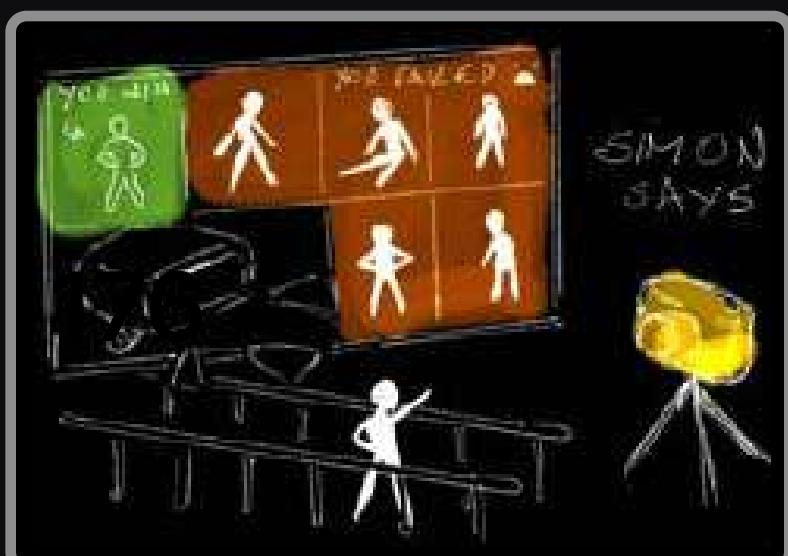
Musical Touch Pad

4



Queue Trivia

5



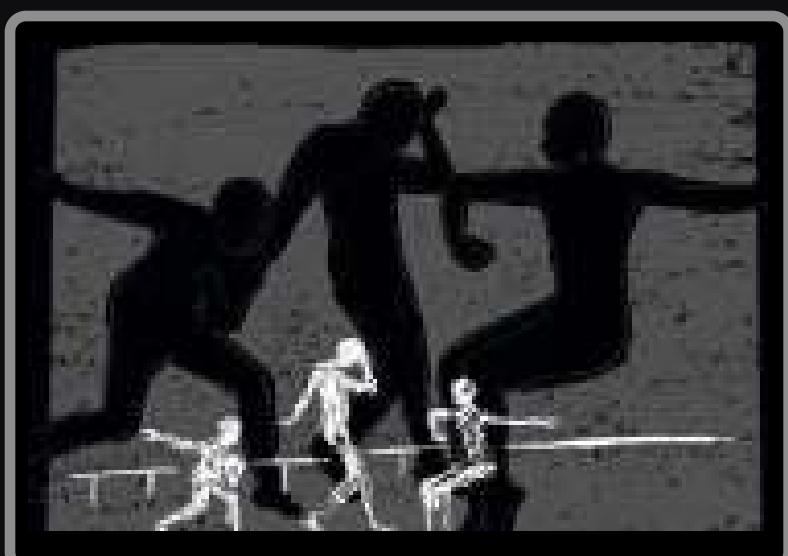
Simon Says

6



Dance Versus *

7



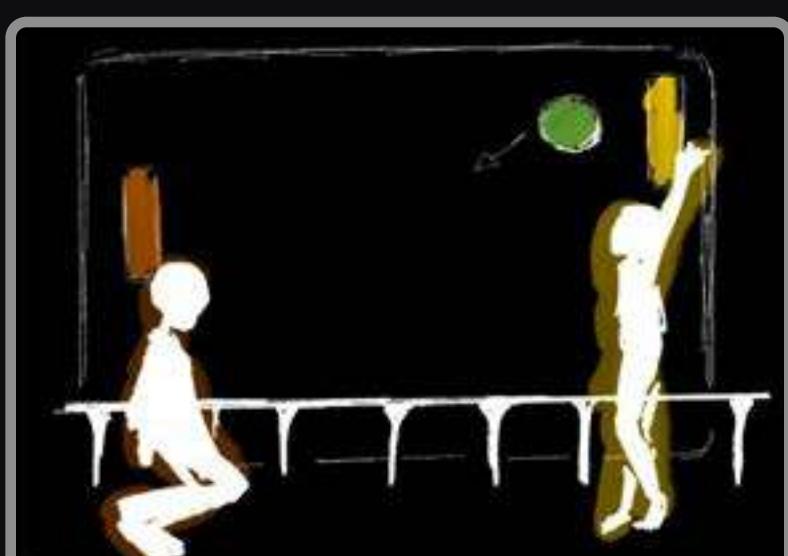
Hole in the Wall*

8



Dress-up Mirrors*

9



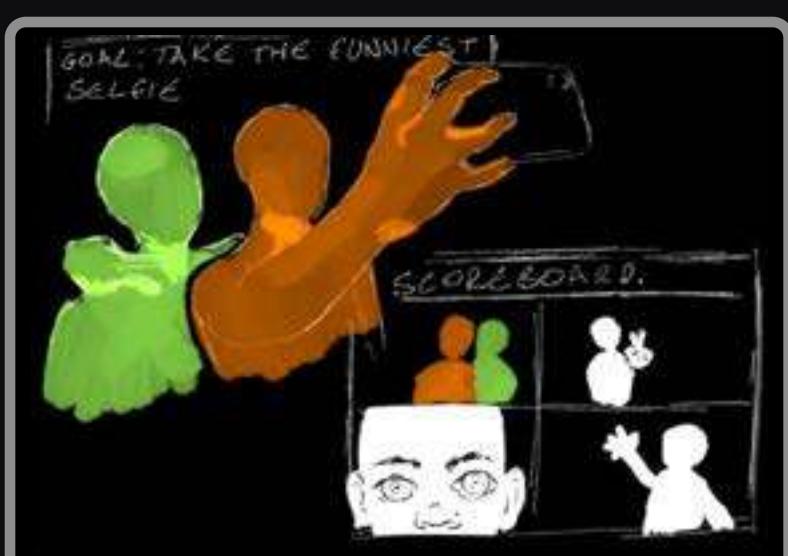
Physical-Digital Pong*

10



Make-a-Story

11



Selfie Games

12

IDEATION: EVALUATION

CRITERIA: CONVERGE TO 6

No.	Feasibility	Desirability	Affordability	Longevity	Originality	Total
1	3	10	2	4	4	23
2	5	3	5	5	1	19
3	3	4	2	2	4	15
4	5	4	4	3	4	20
5	5	3	4	5	1	18
6	5	3	3	5	1	17
7	3	9	2	4	2	20
8	3	8	2	4	3	20
9	4	9	3	4	3	23
10	3	6	3	4	3	19
11	3	4	4	5	3	19
12	4	6	4	5	4	23

We analysed all 12 concepts using five key criteria, primarily from a designer's perspective:

- **Desirability:** How attractive would it be to the demographic?
- **Feasibility:** How easy would the idea be to manufacture/prototype?
- **Affordability:** How expensive would it be for us to make?
- **Longevity:** How long does the product last? Is it likely to wear out quickly?
- **Originality:** How unique is the idea?



As our approach was human-centred, we placed greater emphasis on **desirability**, weighting it higher than the other criteria. While most factors were rated out of **5**, desirability was rated out of **10** to reflect its importance. We also considered **originality**, realising that people are naturally drawn to anomalies. Unique experiences are more likely to get people's attention and encourage more participation

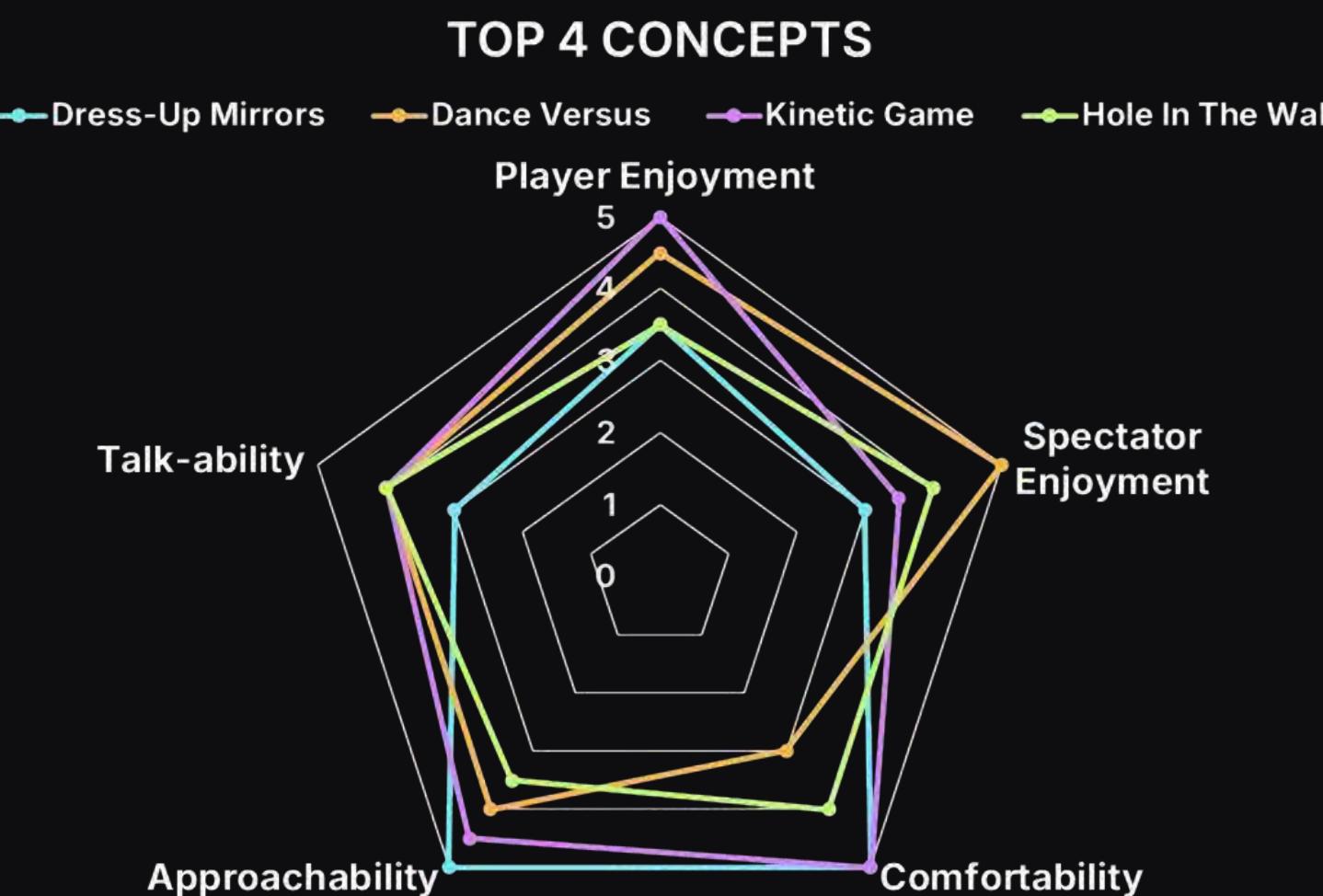
After scoring each concept, we totalled the results and selected the top six for further development in the **co-design session**.

Converged 6:
Kinetic Games, Musical Touched Pads, Dance Versus, Hole in the Wall, Dress-up Mirrors, Selfie Games

CO-DESIGN: CONVERGE TO 4

After narrowing down to six concepts, we took a human-centred approach by running a co-design workshop. Participants ranked each idea individually, followed by a group discussion on pros, cons, and improvements.

Their feedback helped us refine and select the top four concepts while **minimising designer bias** and gaining deeper insights into

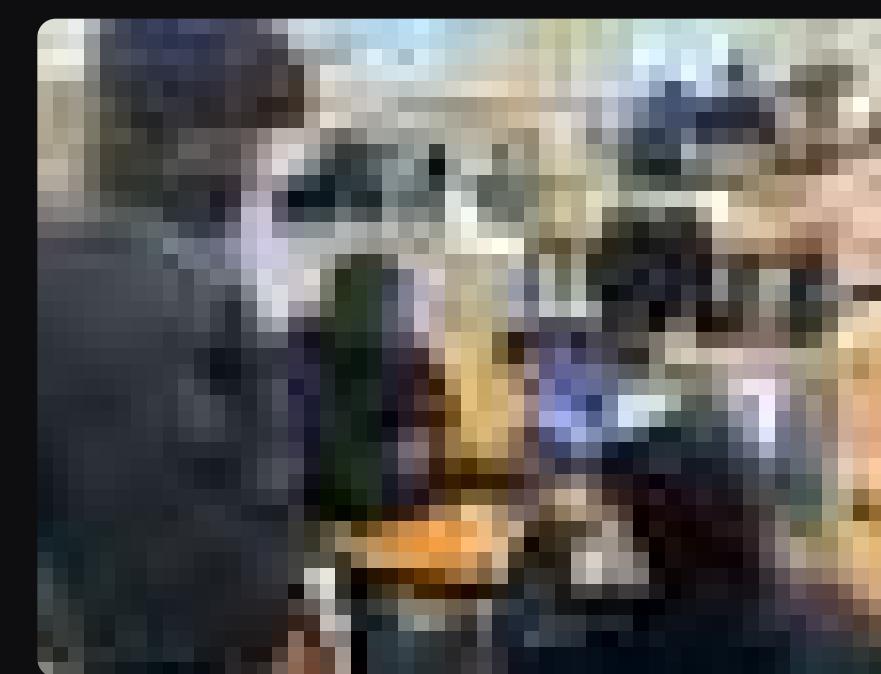


These were the **highest-scoring concepts** from the co-design session. The participants also provided **insightful comments** on our ideas:

- One suggestion was to create a **portal system** for the kinetic game, allowing people to interact from different spots within the queue.
- They identified key challenges for us to address, including **potential sound pollution** when there are separate "Dance Versus" going on at the same time.
- They also helped by proposing that the mirror could display **genre specific attire**, such as Victorian era clothing.

Converged 4:

Kinetic Games, Dance Versus, Hole in the Wall, Dress-up Mirrors



LO-FI PROTOTYPING: CONVERGE TO 3

Due to group members believing in the high feasibility and design of the "**Hole in the Wall**" design, we wanted to get other opinions to prevent designer bias. So, a digital lo-fi prototype was created using '**Unity**' to allow the user group to interact with the potential design.

Feedback revealed several issues with the concept. Overall, these findings led us to discontinue this idea, as the lack of sustained engagement, unclear instructions, and limited spectator appeal suggested it **would not be effective** in the queueing environment.

Further information and download on [Page 14](#)

This approach used three methods: designer analysis, user group feedback, and lo-fi prototyping to observe real user interactions. We used the feedback gathered from many users to facilitate the further development of three concepts.

IDEATION: CONCEPT DEVELOPMENT



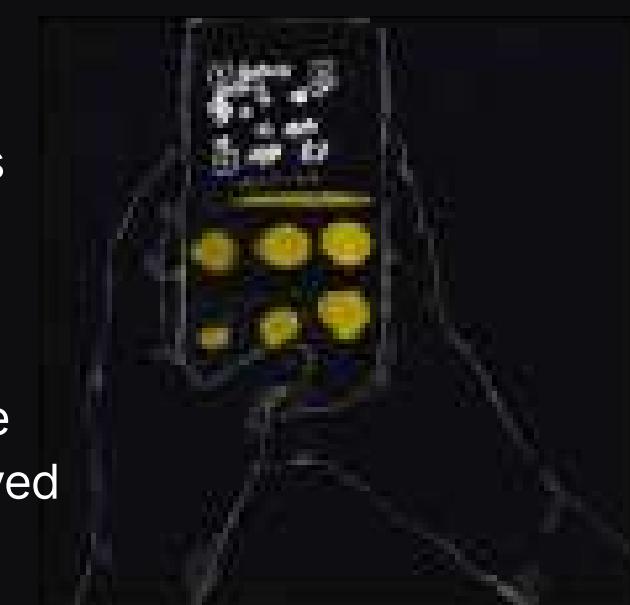
For all designs, when there is no queue the screens can be used to project advertisements to generate revenue to pay for itself.

DRESS-UP MIRRORS



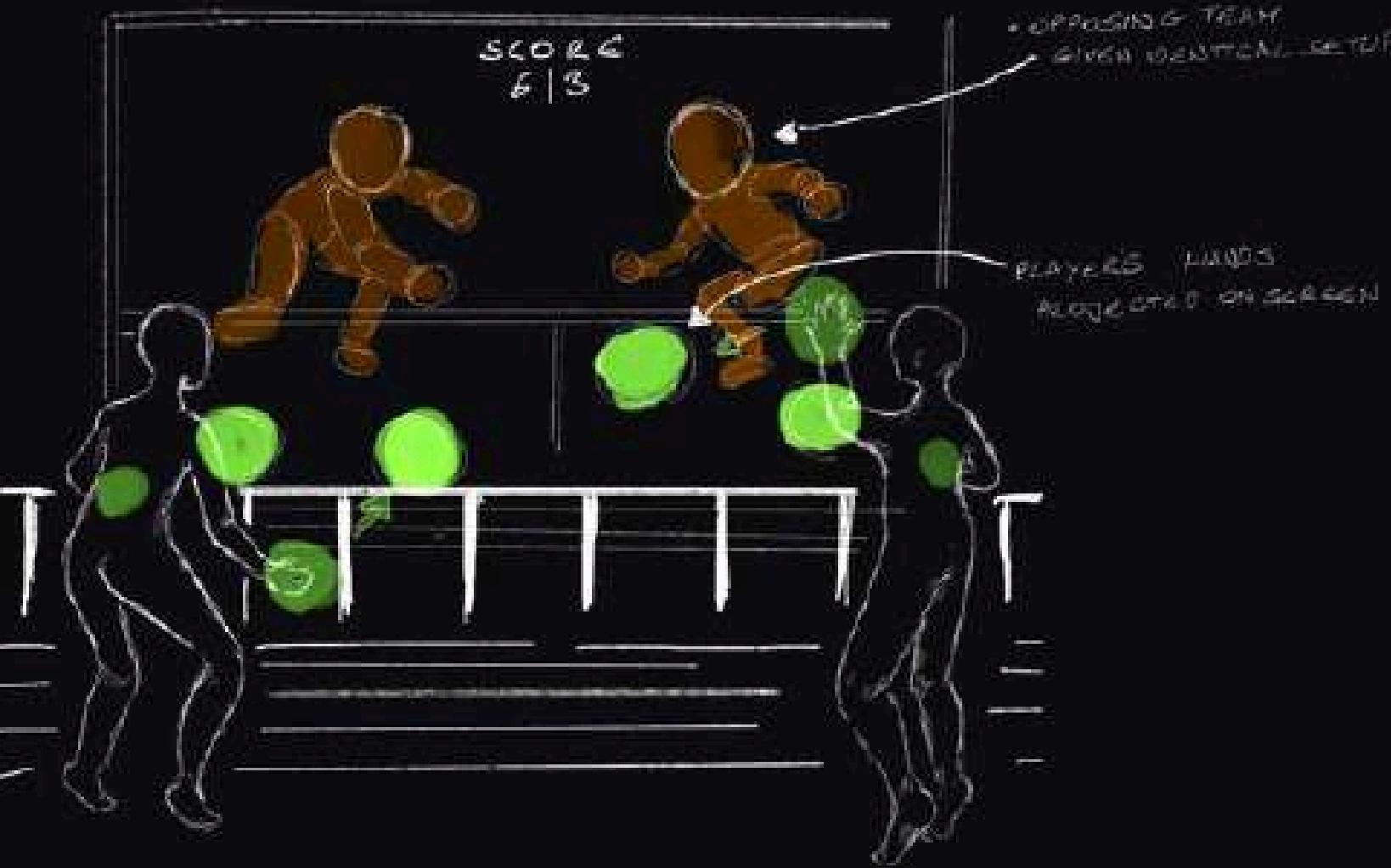
The screen functions like a mirror, using a camera to display players on a large screen. Each player has a control interface that allows them to customise their appearance by selecting clothing. The chosen items are digitally displayed on the player's reflection in real time.

Spectators can engage by scanning a QR code, allowing them to send reactions to the screen, **increasing spectatorship enjoyment** which was rated one of the lowest on the co-design feedback. The reaction emojis will be carefully selected to minimise negative comments. To further encourage engagement and improve the **talk-ability** rating, people will be set up in a curved pattern, allowing for easier interaction.



Multiple screens can be placed throughout queues, each featuring different fashion genres such as Victorian, Emo, Cyberpunk, Western, or Movie-themed styles.

KINETIC PORTALS



Using two screens and body-tracking technology, up to four players can participate in a variety of competitive games. The screens act as "portals," connecting different areas of the queue. The game automatically adjusts based on the number of players available on each side. If one side has two players and the other is empty, a 1v1 match will start. If both sides are full, a 2v2 match starts.

Each player sees their own hands represented as paddles on the screen, allowing them to control their movements and interact with the game. **Both sides can also view the other team's camera feed**, creating a sense of direct interaction despite being in different locations. A game is randomly selected to play together. Potential games include ping pong, squash, Frisbee and volleyball.

Our research suggested that in co-operative and competitive games, players naturally communicated despite no expectation to do so. The shared experience of competition made gameplay a comfortable icebreaker, allowing players to bypass initial awkwardness.

RHYTHM RUSH



Rhythm Rush is a game in which a **maximum of six people** have a dance battle, which is set in the middle of a **concert/nightclub queue**. Using motion-tracking, digital representations of the players are displayed on a large screen and they compete based on dance enthusiasm and creativity.

Positive comments are displayed on the screen to show which players are doing the best, **enhancing player enjoyment**, further by making the experience **more rewarding**. The directed speakers play music selected from popular tracks that match the genre of the performing artist or the overall nightclub atmosphere.



To ease the more hesitant players, dance move prompts are displayed during periods of inactivity, **improving overall comfortability** and making the environment more inviting.

Delivery Report

Aidan, Amarie, Ikem, Ruaridh, Yousuf

CONTEXT: RESEARCH SUMMARY

How might we design a gamified experience that organically encourages social interactions in event queues while maintaining flow and engagement?



WHY A GAMIFIED EXPERIENCE?

Our previous research showed that a gamified experience lowers the social barrier by offering an easy, shared activity that feels less risky and more rewarding than a typical conversation with a stranger. [1]

DESK RESEARCH: GENERAL OPINION

73%

Agree that playing games can introduce people to new friends

48%

Say they have met people through video games they otherwise would not have met

WHY A QUEUE?

Using mixed methodologies, our research showed queues as underused social spaces where most people disengage, making them ideal for playful interaction.

82% of queuers either go on their phones or do nothing while queueing. [3]

Poor queue management can reduce satisfaction by 30% [5]

97% of people do not feel excited to queue. [3]

Percentage who believe queueing is a waste of time 72% [4]

OUR DEMOGRAPHIC

We are designing for 18–35 year olds queuing at large events like concerts, sports games, conventions, and theme parks. These queues often happen in the evening at busy venues, especially in London, where people share common interests, making them great spaces for social interaction and playful experiences.

Through our second survey with 34 people from our demographic, we found that most prefer to receive information through a mix of text and images, with a stronger preference for visuals.

Our prior observations at existing spaces supported this data, also suggesting people can get disinterested if there are extra steps to interact with a product such as QR codes or a downloadable app.

KEY INSIGHTS: INTERVIEWS



People are hesitant to engage with strangers due to safety concerns. From 24 interviews, we found that shared interests, like attending an event, can help lower social barriers.

- This shared context fosters familiarity and trust, making interactions feel more natural and organic, reducing the discomfort of engaging with others.

KEY INSIGHTS: EXPERIMENTS



In social gatherings it takes just one person/group to break the surface tension.

- Once a space has been deemed 'social', people are happy to join in. This herd mentality results in more people talking.

Gamified interactions are more effective for socialising.

- In contrast, conventional conversation starters lack the same compelling draw.
- This indicates that structured play creates a psychological invitation perceived as lower risk and higher benefit compared to open-ended conversation.

KEY INSIGHTS: OBSERVATIONS



Phones act as social shields in queues.

- When people are on their phones they are already engaged with familiar activity, making them less receptive to new connections.
- While technology keeps them socially engaged, it isolated them from their immediate surroundings.

SOLUTION STATEMENT

We aim to create a gamified experience that invites optional, low-pressure participation to naturally encourage social interaction in event queues, whether the user is playing, spectating, or simply in the proximity of it. The experience should foster a shared social atmosphere, to act as a conversation aid while maintaining queue flow.

HMWS → DIRECTIONS

How might we create an interactive experience that adapts to the pace of a moving queue without causing delays or disruptions?

- Design Direction:** Test how the interaction between different users and the product affects queue flow. If issues are consistent, design a feature(s) that adjust to movement in real time.

How might we design engaging, low-pressure activities that allow both active participants and spectators to feel included in the experience?

- Design Direction:** A focus could also be put on viewing areas to encourage social interactions among spectators.

How might we make the process of joining conversations feel more inviting and less intimidating for others so individuals take the first step in overcoming social tension?

- Design Direction:** Explore different ways to make the concept more approachable (i.e. providing optional participation).

At its core, the problem isn't about queue boredom, it's about creating moments that feel safe, social, and worth engaging in, even for those who wouldn't normally participate.

IDEATION: CONCEPT SELECTION

CONCEPTS

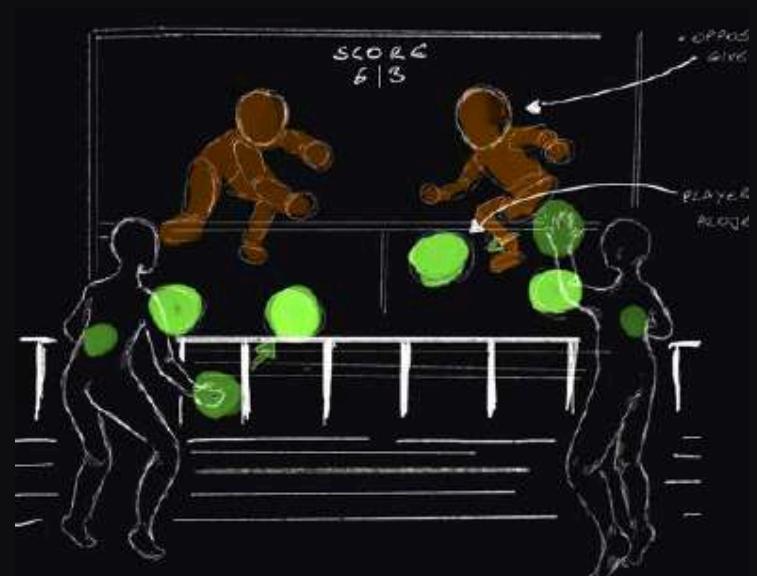
DRESS-UP MIRRORS



The screen acts as a mirror using a camera to show players with **real-time digital clothing** based on their selections from a control interface.

(Conventions & Concerts)

KINETIC PORTALS



Using **two screens** and body-tracking, up to **four players** can compete in games. The screens act as **portals between queue areas**, with matches adapting to player numbers.

(All Events)

RHYTHM RUSH



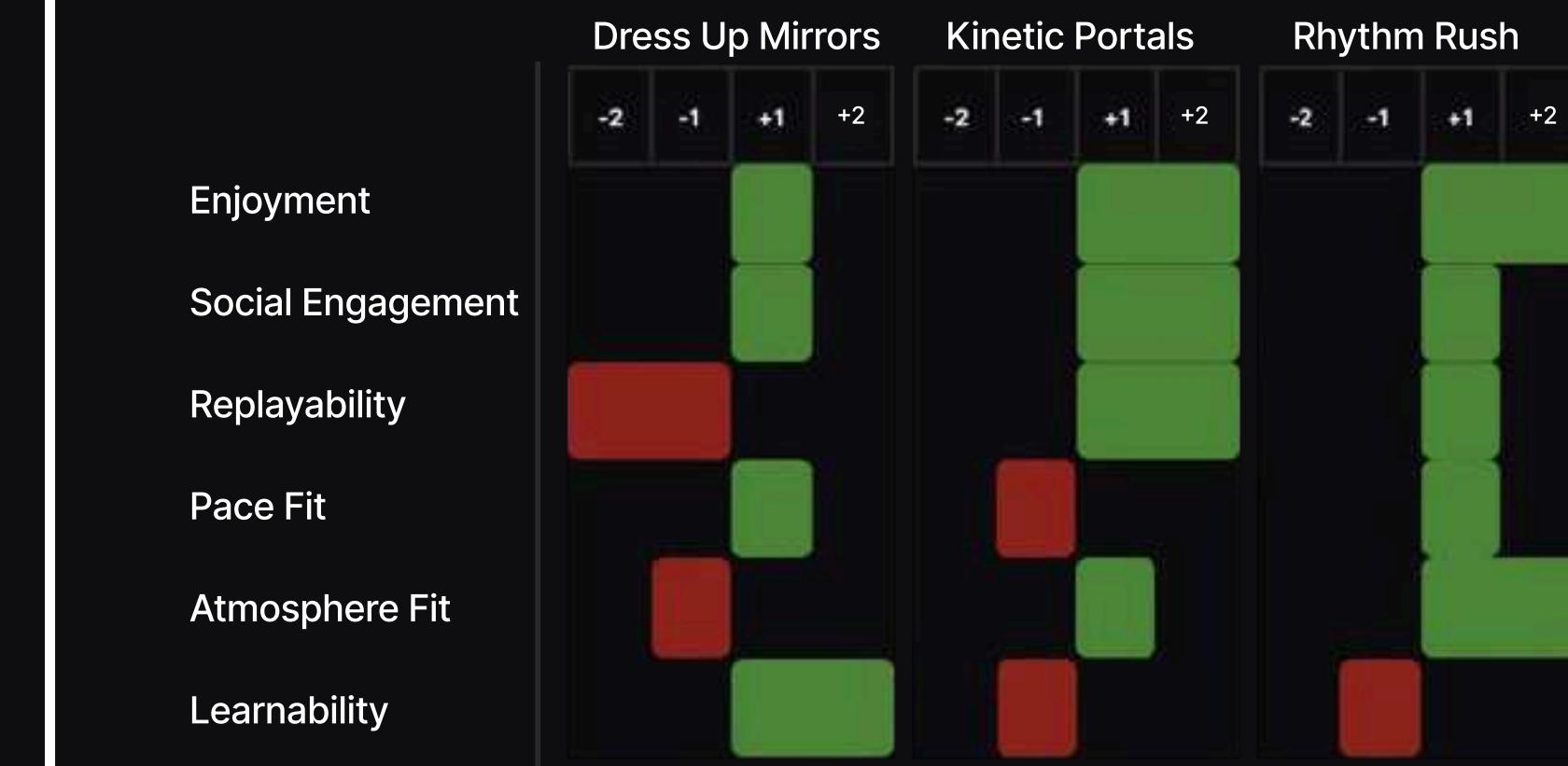
A motion-tracked **dance battle** for up to **six players**, on a large screen. Players compete based on enthusiasm and creativity.

(Concerts)

USER CENTRED EVALUATION

HARRIS: QUANTITATIVE^[7]

While choosing the final concept, we used a **Harris Profile**: a decision matrix where users scored each idea against key **user-centred criteria**. The data was gathered through discussions with university students.



Rhythm Rush was the **highest-ranked** concept with 8 points, ahead of Kinetic Portals (6 points) and Dress-Up Mirrors (1 point).

HARRIS: QUALITATIVE

- Learnability** - users emphasised the need for the game to be intuitive and accessible to players of all skill levels
- Pace-Fit** - The game's practicality in a queue setting was also questioned. People asked things like, "Will my spot be saved?" and "If the queue moves quickly, do I miss my turn?".
- Re-playability** - Greater song variety was also requested amongst participants to increase re-playability.

HARRIS: CONCLUSION

The focus of user testing will be on **reducing the skill barrier** to make the game more accessible to players of all levels, and improving learnability so that users can **quickly understand how to engage with the system**. At the same time, testing will ensure that the product integrates more smoothly with the natural pace and flow of the queue.

EMOTIONAL ANALYSIS

PREMO: QUANTITATIVE^[7]

We asked **six people** to evaluate **all three concepts using emotion cards** to express how they'd feel encountering each one in a queue, both with friends and alone. **PREMO** (Product Emotion Measurement Tool) uses illustrated cards to capture emotional responses. Participants **could choose multiple emotions**, allowing for instinctive and unbiased feedback.



Emotion	Rhythm (F)	Rhythm (S)	Kinetic (F)	Kinetic (S)	Dress-up (F)	Dress-up (S)
Excited	5	2	4	2	4	0
Curious	4	1	3	2	3	1
Amazed	2	1	1	0	1	0
Proud	0	0	1	0	0	0
Shy	2	1	0	2	2	0
Offput	3	3	0	2	2	3
Bored	1	2	0	2	1	2
Refusal	0	3	0	0	1	3

(F) = with friends (S) = solo

EVIDENCE: APPENDIX B: [1]

PREMO: QUALITATIVE

"Excited but I'd need friends to push me"
"I'd enjoy seeing other people take part"
"I don't want to play bad in front of people"
"I'm too shy and would find it awkward, I don't want to be a weirdo"



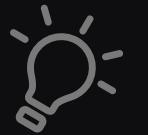
PREMO: CONCLUSION

All three concepts were well-received with friends but became more intimidating when experienced alone. This shows that we need to improve the concepts approachability. This concludes concept collection, with the chosen concept being **Rhythm Rush**.

USER RESEARCH: STAKEHOLDER

REASONING FOR STAKEHOLDER TEST

To ensure our final concept for Rhythm Rush **met real user needs**, we needed to conduct a role-play session to help us **explore different perspectives**, find potential issues, and refine the concept based on their concerns.



SET-UP

Using a set of **four university students** we conducted a **role-play** session to step into the shoes of different stakeholders. Each participant **selected one random stakeholder from a stack of six role cards**, created before the session based on the people affected by Rhythm Rush.

ROLE-PLAY CARDS SELECTED

Stakeholder 2: Casual Partygoer

Name: Sue Spain
Background: You're at a concert or festival with friends. You like to have fun but you're not super into dancing or being the center of attention, too easily go along with what the group's doing.

Your Role Today:
You're in the queue and you notice people playing Rhythm Rush, a motion-controlled game that lets you do different moves in a large screen in front of them. You're curious but unsure.

Think About:
What would make you want to join in? What's most comfortable? What might make you walk away or avoid it?

Stakeholder 3: Competitive Dancer

Name: Eman Lee
Background: You love rhythm games, freestyle dancing, and showing off a lot. You're confident, energetic, and you'll always try to challenge people, especially if there's music involved.

Your Role Today:
You're at a gym or a regular dance centre for fun or practice, dancing in a large screen in the distance and you're ready to dominate it.

Think About:
What would make this feel like a real competition for you? What tricks or moves would you expect? What would make you want to join in?

Stakeholder 4: Parent Guest

Name: Paul Evans
Background: You're attending a family-friendly event with your kids. You're trying to keep them entertained while waiting in line. You want them to have fun but stay safe and have confidence.

Your Role Today:
You're with your kids, a motion-controlled device. Another kid is in the queue playing a single screen, playing in the distance and you're wondering if you should try it.

Think About:
What would make you feel comfortable letting your kids join in? Would you want to join in yourself? What might be a concern for you?

Stakeholder 6: Security Supervisor

Name: Peri Hall
Background: Your job is to make sure the space stays orderly, people follow rules, and nothing disrupts the flow or creates tension. You're always aware of what's happening, and you're focused on general logistics and public safety.

Your Role Today:
You're supervising a Rhythm Rush, a motion-controlled device. You're told to stand by, shown a large screen in the distance. Is something that keeps on breaking your job?

Think About:
Does this kind of activity involve safety risks or hidden dangers and why is this unique? Would you let your job lesson out because of this?

On each stakeholder card it had a brief background on each person as well as some of their role in the session and some **prompting questions** to help make an engaging discussion without any participant being confused.

RESULTS & INSIGHTS

CAPACITY: PLAYER LIMIT

Too many players could cause crowding and increase costs, while too few might **exclude others**. Hence we set the **player limit to 4** to reduce costs while accommodating typical families or small friend groups.

"If too few people are allowed to play, there might be people left out."

MOTIVATION: REWARDS

Solo and group users mentioned that having visible rewards, like **scores or leader boards**, **would increase motivation and engagement**, making the experience more exciting.



MUSIC: THEME

It was collectively agreed that using **music from the concert line-up will not be used** as it could spoil the live experience for attendees.

INCLUSIVITY: SKILL

Parents want family-friendly music and **simpler moves** to join in with kids, while teens may feel **too self-conscious** to participate. Higher-skilled users, however, prefer harder moves for a challenge.

"I would want to dance with my kids and like holding hands or whatever and having fun"

TRANSCRIPT: APPENDIX C

SUPPORT SYSTEMS: SOCIAL COMFORT

Group participants said they'd only **join if their friends did**, and suggested that intermittent tutorials or **mirrored moves** for each player could help **ease social awkwardness**.

"If you had a tutorial, like someone to mirror... intermittently freestyle sections"

PACE FIT: QUEUE POSITION

Participants hesitated to play Rhythm Rush due to fear of losing their spot in the queue, creating **tension between fun and progress**. A solution must be made to let users play, watch, or opt out without affecting queue position.

"What if I want to leave the game halfway through, I'm not super into dancing"

PROTOTYPING: TECHNICAL

BODY TRACKING PROGRAM

The Rhythm Rush game requires **tracking users' movements** to display them on screen and **calculate a dance score**. We needed proof of concept to ensure body tracking was accurate enough for dancing. This was defined as:

- Having a **high frame rate** of detection
- Having enough precision to detect **large limb movements**, not hand/face movements
- Being able to **detect depth** for better tracking and positioning

CODING PROCESS

We used **Google's MediaPipe** system to implement the body tracking, and **Python** for the coding. A webcam feed gets inputted into a program and it tracks a persons movements by setting '**landmark points**' on the limbs of their body. These points are then connected by lines to give a representation of what the person looks like. These can then be sent to a game engine to **animate** our digital characters. [6]

```
body.py

class PoseWorker(Thread):
    def __init__(self, input_queue, output_queue, pid):
        super().__init__()
        self.input_queue = input_queue
        self.output_queue = output_queue
        self.pid = pid
        self.pose = mp.solutions.pose.Pose(
            min_detection_confidence=0.5,
            min_tracking_confidence=0.5,
            model_complexity=global_vars.MODEL_COMPLEXITY)

    def run(self):
        while not global_vars.KILL_THREADS:
            try:
                # Wait for frame half to process
                frame_half = self.input_queue.get(timeout=0.1)
            except queue.Empty:
                continue

            if frame_half is None:
                break # Shutdown signal

            results = self.pose.process(frame_half)
            self.output_queue.put((pid, results))

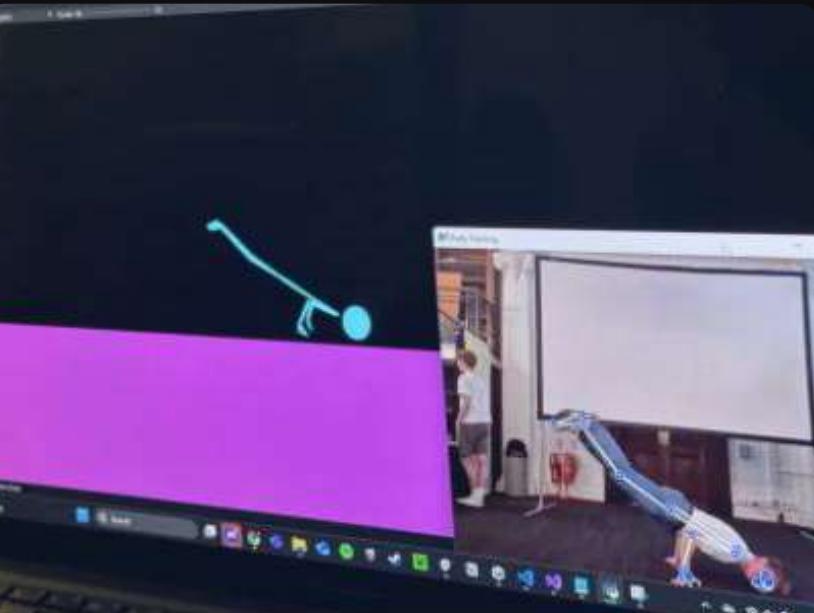
    def shutdown(self):
        self.input_queue.close()
        self.output_queue.close()

    def __del__(self):
        self.shutdown(self)
```

FULL CODE: APPENDIX D

TESTING PROCESS

Each progression in the code was accompanied by a limits test. These tests were conducted with a **small group of volunteers**. While demographic variation was not a key factor, **we included participants of different body sizes** to ensure the system could handle varied proportions.



TESTING: MULTIPLE PEOPLE

This test was conducted with three people in frame. **The people could be detected** using a similar system but accuracy was reduced and the program would **confuse each person with another**, so any scoring would not be user specific.



TESTING: DRAMATIC POSES

We tested more **unique poses, jumps and flips** in the cases that the user would be more dramatic in their dances, as breaking the immersion would ruin the enjoyment. **The program needed to be adapted multiple times** because of these as the person originally had to be grounded all the time.



TESTING: ENJOYMENT

During the testing, even without music, **people were dancing** to see the limitations of the body tracking without any prompting.

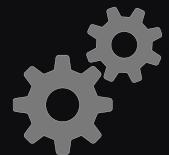
"Wait, this is so cool... look it's like actually tracking everything"

EVIDENCE: APPENDIX B: [2]

IMPROVEMENTS

We learned that it is feasible to track human body movement using accessible and relatively lightweight tools like **MediaPipe**. However, **accuracy and performance** during testing are influenced by a few variables:

- Lighting
- Camera resolution
- Model complexity
- The number of individuals in the frame



And **any delays or inaccuracies cause frustration**, break immersion, and reduce engagement.

- To reduce glitches, the program temporarily uses **the last known position if a person is undetected** for a split second so that it looks smoother.
- Tested low, medium, and high model complexities; and **chose medium for best balance** of accuracy and speed.
- Users need to be well lit, so the screen setup should include proper lighting.

SPLIT-SCREEN TRACKING



To fix the issues with multiple people tracking, **the program divides the camera in half** and checks for one person in each half. This means that the **people will need to stand on specific points** in our area to make sure the program does not confuse with other people.

DISTANCE FROM CAMERA

The people will need to stand at an appropriate distance from the camera for the best view, and the camera needs to be at a specific height. The measured distance was around **2m away** and the **camera would sit just above 1m height**.

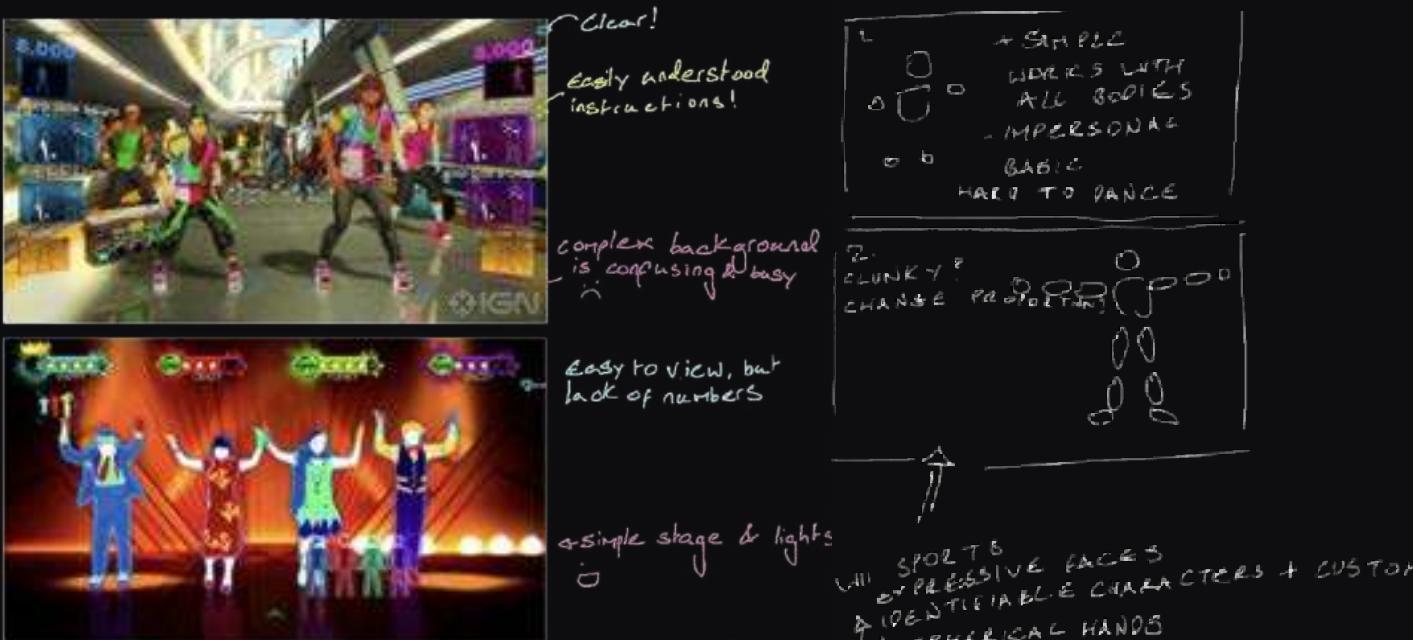
PROTOTYPING: GAME ENVIRONMENT & CHARACTER

REASONING

A player's engagement begins with their first impression of the attraction. **Engaging lights and sound are more likely to attract attention** and curiosity from a crowd, which in turn drives a shared desire to interact through play. Discussing the **aesthetics of the digital elements with stakeholders**, who act as co-designers, allows us to determine the attributes of an appealing attraction.

APPROACH

There was an **initial analysis of dance based games** to determine what works well, and why these design choices are made - **these design decisions were factored into our own process**.



Multiple semi-structured and guided testing sessions were held with the stakeholders, showcasing alternate versions of the base character and the surrounding environment, this was to find the character proportions, the level of realism and the most preferred colour palettes for the theme.

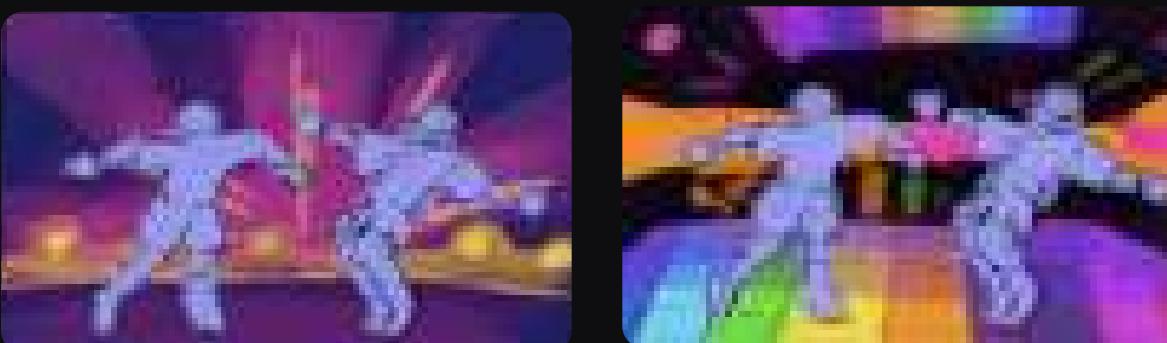
ENVIRONMENT DESIGN

Stakeholders strongly agreed that **a dark, evening-toned colour palette supports the concert and party atmosphere** of the queue. Bright, colourful neon lights were seen as a strong visual contrast that complements this setting well. In comparison, relying only on spotlights was considered too plain and visually unengaging.



BACKGROUND: LIGHTING

Simple background lights were preferred to complex and colourful ones, **as they may be confusing**.



BACKGROUND: OBJECTS

Only a small number of environmental objects is preferred. Enough to **suggest a setting** but not so many that they distract from the gameplay.



This environment was combined with the character designs to **create a unified visual scene** that felt lively, readable, and thematically consistent with the concert-inspired tone of the experience.

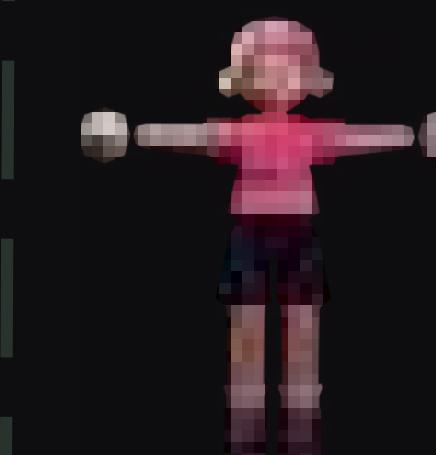
CHARACTER DESIGN

INITIAL EXPERIMENTATION

Simplified limbs provide both visual and practical advantages:

- **Visual:** Uniquely simple style.
- **Practical:** Mitigates the need to track individual fingers and other complex joints.

Unrealistic, childlike proportions give a **sense of cuteness**. Stakeholders enjoyed the unique '*low-poly*' style.



ADDING: LIGHT

Light makes the characters look 3D, appearing **more tangible and relatable** to users.

Purple, blue & yellow lighting was found to atmosphere coherent with concerts.



ADDING: CHARACTER

Each character is given a **near-monochrome colour palette** for unique identification from users.

Individual hairstyles were added to give 'character'.



PROTOTYPING: VISUAL GAME ELEMENTS

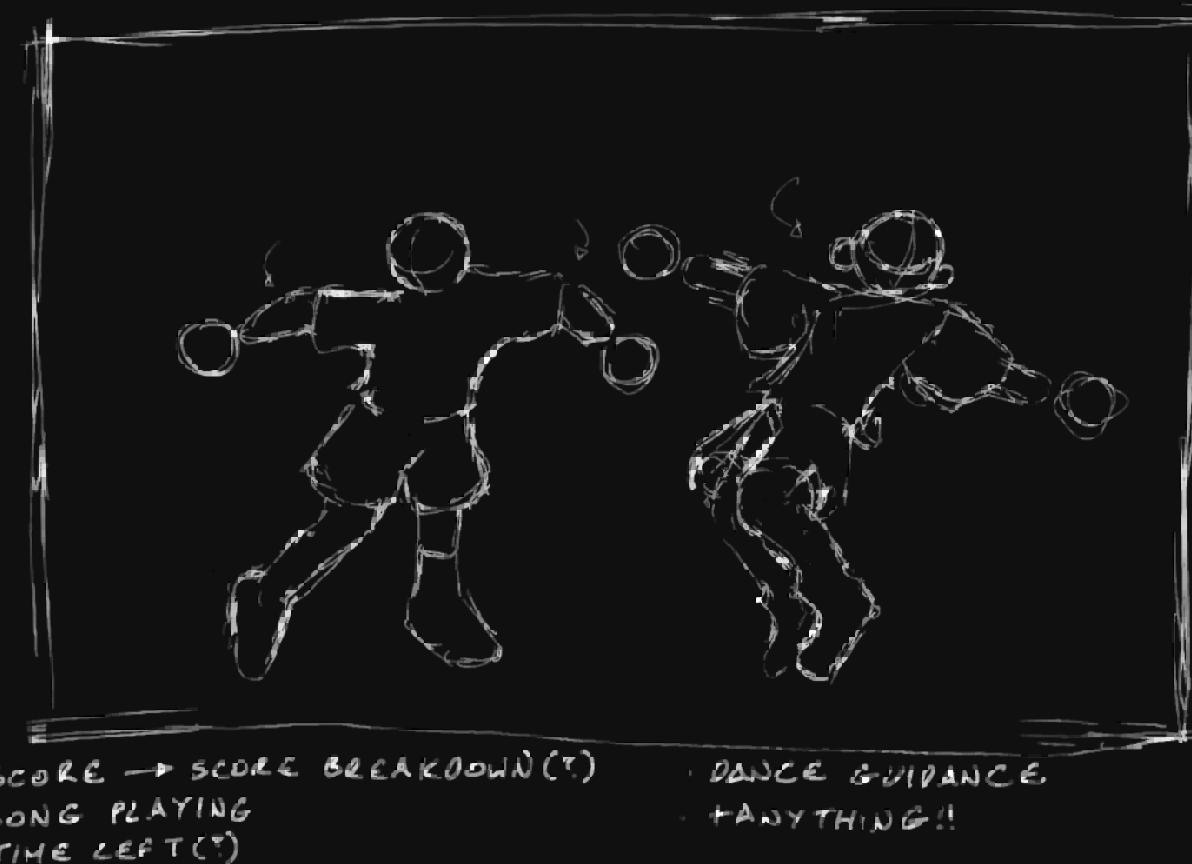
REASONING

The UI needs to be **intuitive for first-time users**, reducing the need for explanation or prior experience.

Feedback from PREMO, Harris profiles, and stakeholder sessions made it clear that **learnability is essential** to get people engaged, **especially in a queue setting**.

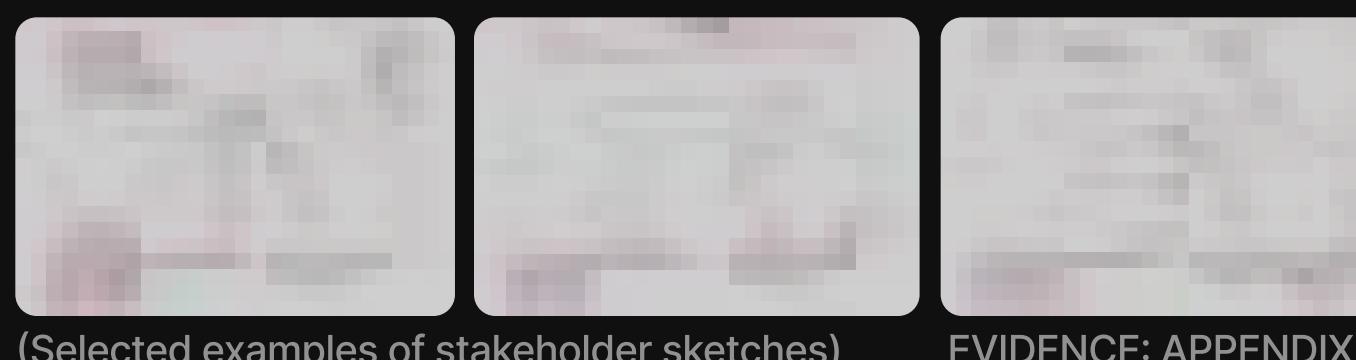
CO-DESIGN

A baseline sketch of the games screen was created, along with a list of UI components we deemed necessary.



Members of our user group were briefed, given the baseline sketch, and were guided to:

- Sketch out their interpretation of UI component placement.
- Add or remove any components they thought would be unnecessary or confusing.



EVIDENCE: APPENDIX A

USER FEEDBACK & LO-FI DESIGNS

We gathered inspiration from initial sketches and **discussed them with users to gain deeper insight**. Using this feedback, we developed **three lo-fi UI concepts** for comparison and testing. These informed the creation of our final UI design.



[Concept A]

(3 votes)

Emphasis on end of song prompting users to leave or switch out:

'It's important to see what each person's scores are'

'I like that you can see when time's done'

Mentioned Positives:

- Easy to view all elements from any position on-stage.
- Clear indication of time.
- Minimalistic UI.



[Concept B]

(1 vote)



[Concept C]

(1 vote)

Larger dance guide and decreased emphasis on song:
'I think ... the dance guide is too big...'

Score is averaged into a letter rank to improve legibility:

'Those kind of ranks would be effective if players had a short time and will only play it once'

FINAL DESIGN

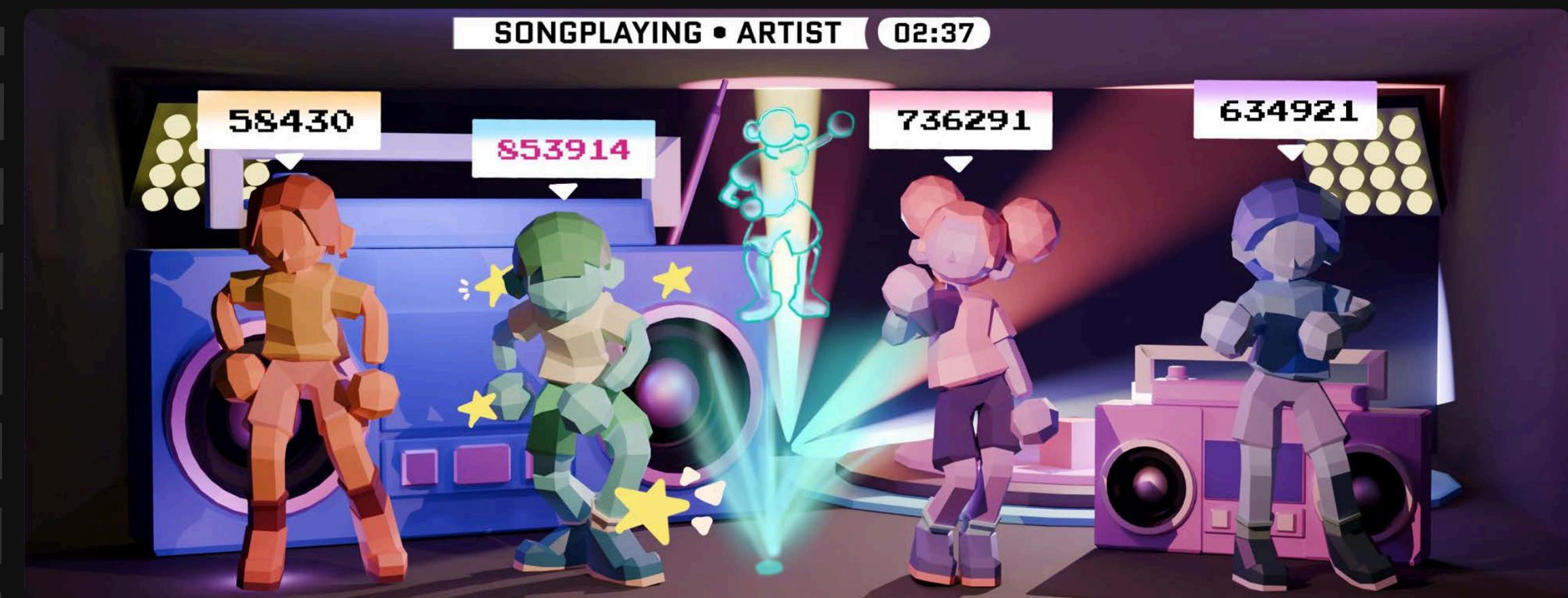
Concept A was the most popular - the final UI is based upon this.

An **idle screen will be used** to make the system feel approachable, and to signal to users that they can step in.



The screen would show the **dance guide moving**, with translucent player avatars raising their hands at calibration points. This would guide users on how to start the game, and **help the program detect them**.

This was based on findings from our **visual vs. text survey** where **animated prompts were preferred over static instructions**.^[1]



Players noted they feel more encouraged by seeing their own personal score, as opposed to a ranking. To maintain some competition, **the winning player gains a unique visual effect and highlighted score**.



The final design takes inspiration from similar early 2000's dance games. Pixelated numbers and the stylisation of the **dance guide as a hologram** retain the effect of **similar nostalgic dance games**.

(Selected examples of stakeholder sketches)

PROTOTYPING: SCREEN

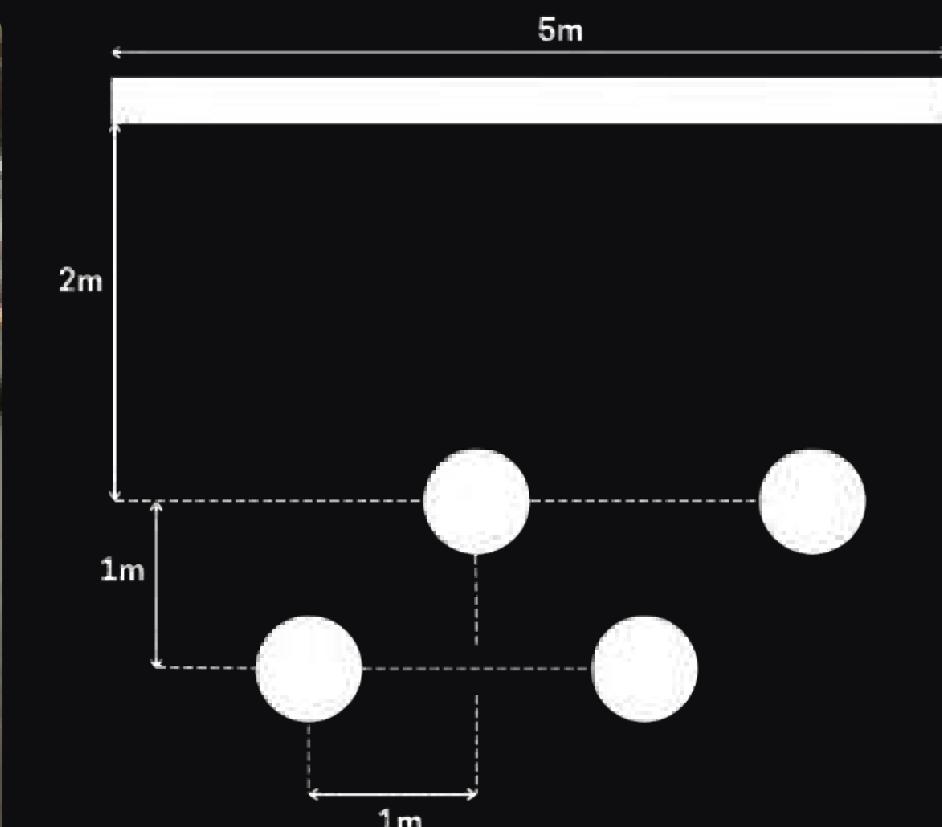
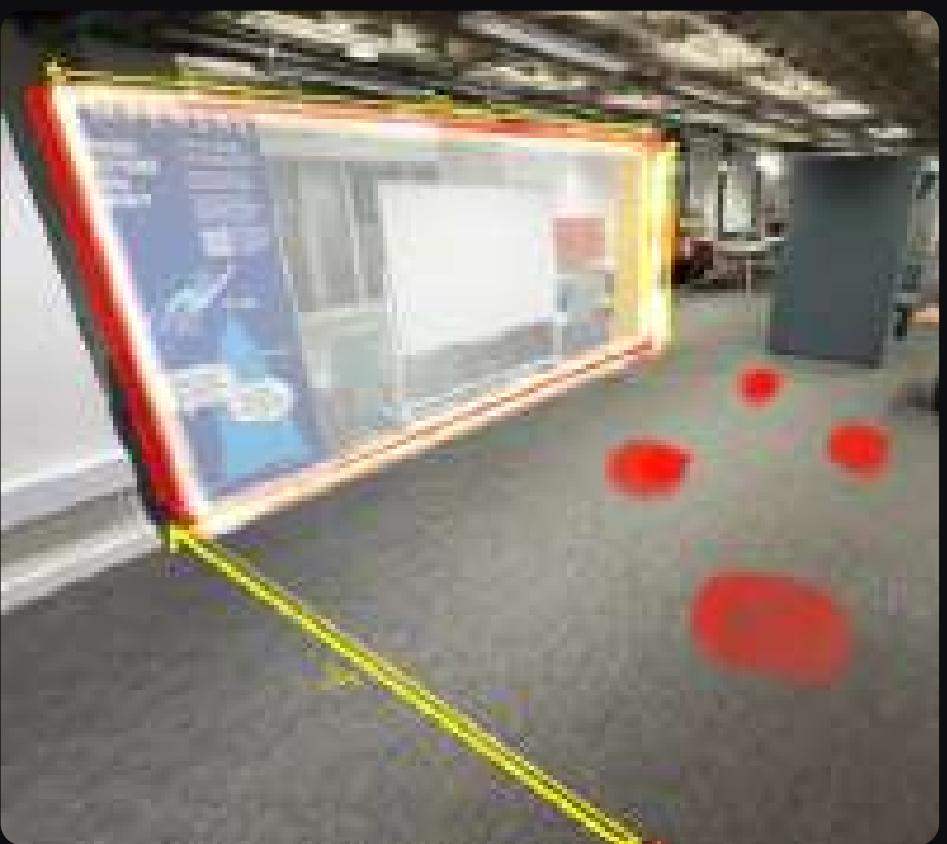
REASONING

PREMO research showed the game **felt intimidating and unclear**, so the setup needed to be more welcoming and visually reflect the game's theme. The technical prototyping highlighted the **need for proper lighting, player distance, a large screen, and speakers**. The final goal was a setup that was inviting, clear, and functionally sound.



FULL SCALE SIZING

Using **technical tests** and **anthropometric data** (98 cm radius per person), we defined safe personal space. **Players were staggered to reduce screen width** and improve interaction. A full-size mock-up (with banners and whiteboards for the screen and placeholder items for people) helped test layout and UI visibility.



- We learned how to **arrange the players** so each person has **enough space to move** without bumping into others during dancing.
- We also made sure the **screen and dance guide were placed so all players could see them clearly**.
- We designed the space so **players could interact with each other without feeling crowded or uncomfortable**.

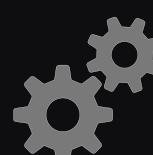
MODELS

MODEL: CARDBOARD LO-FI

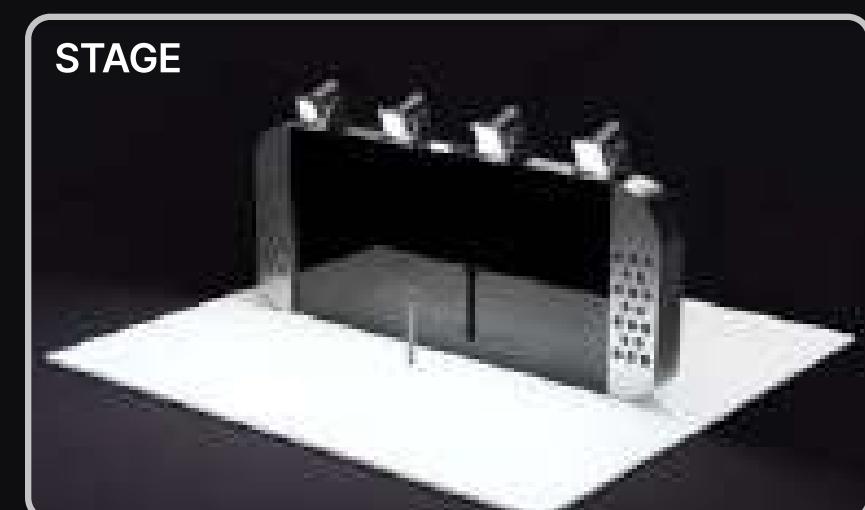
We started with low-fidelity prototyping, to **explore a range of different screens using cardboard mock-ups**. These were used to quickly iterate through different component placements.



MODEL: CAD TESTING



Once we had a clearer sense of which ideas resonated with us as the designers, we then refined the selected prototypes in CAD software to produce a more realistic and professional visual.



These models were then **tested with users** to gather feedback on the **visual impact, usability and themes**.

MODEL: FINAL DESIGN

The final design is a refined combination of the **strongest elements from the three initial concepts**:

- From the 'Stage-Lighting' design, we kept the clear rectangular shape, which made it easy to recognise as a screen.
- From the 'Portal' design, we kept the framed lighting and placed the curved frame into the ground
- From the 'BOX TV' we took the simple style; we did this by placing the speakers under the frame and added an under-display camera.



PROTOTYPING: QUEUE INTERACTION

REASONS FOR TESTING

Both the **Harris profile** and **stakeholder** exercise **highlighted concerns** about the **queue's pacing** and how well our product fits in the scene. This prompted us to simulate a queue scenario to better understand:

- How a flow of a queue works with our design.
- Whether people feel more comfortable with a dance guide
- If users feel rushed or if they want to skip the experience entirely

"I would hog it because I love dancing. I would want to hold my place in the queue though."

"Would it slow down the queue significantly because what if my kids just want to dance"

"What if I want to leave the game halfway through, I'm not super into dancing"



EXPERIMENT SETUP

We simulated our queue using laptops as stand-ins for the screens, running the program. **Distances between each user and the screen matched the intended spacing of the final setup.** A dance guide and upbeat music created the environment. Various methods were used to produce a realistic delay to the queue for natural flow.



RESULTS

APPROACHABILITY: DANCE GUIDE

We learned that people were initially curious but hesitant to dance. When a dance guide was introduced, they felt **much more comfortable**. Seeing one person dance also encouraged others to join in, like a herd mentality.

PACE FIT: RUSHED

Participants **felt rushed when moved along before finishing their dance**, especially when enjoying the experience. This disrupted group dynamics and caused congestion. If the fourth person left, others had to walk across the space, **leading to tracking issues**.

FEEDBACK: SOCIAL

We found that the experience significantly **boosted people's energy and mood**, making them feel '*hyped up*'. However, **being asked to leave while enjoying it dampened that mood**. Participants also **enjoyed chatting** during the experience, so music volume should allow for conversation.

SCORING: ENGAGEMENT

Participants appeared to enjoy the experience more when they could dance freely, using expressive movements. They were **most engaged when moving in time with the music and experimenting with speed and style**.

EVIDENCE: APPENDIX B: [4]

IMPROVEMENTS

Junction System Introduced:

- Participants can choose to enter the game, join the spectator space, or bypass the experience and continue queueing.

Spectator Zone Added:

- Provides a **low-pressure way to engage**, with the freedom to cheer or join when ready.

Reduced Congestion:

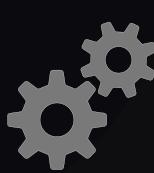
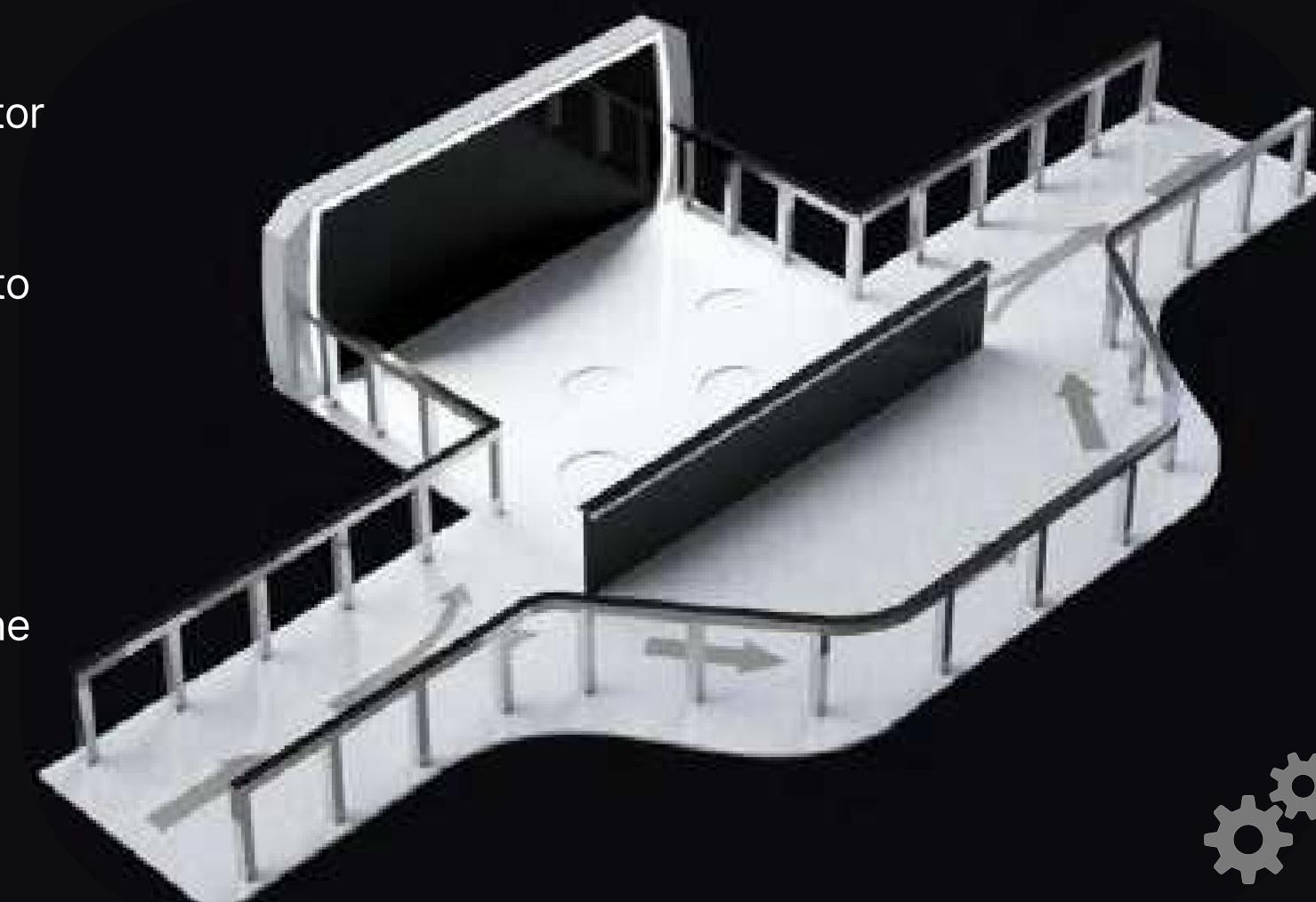
- A wider spectator area helps prevent bottlenecks and **maintain flow**.

Flexible Participation:

- Users can leave at any time, with a **natural exit prompt** at the end of each song.

Scoring System:

- Adapted so that it rewards **creativity, speed, and beat-matching** instead of strict accuracy.

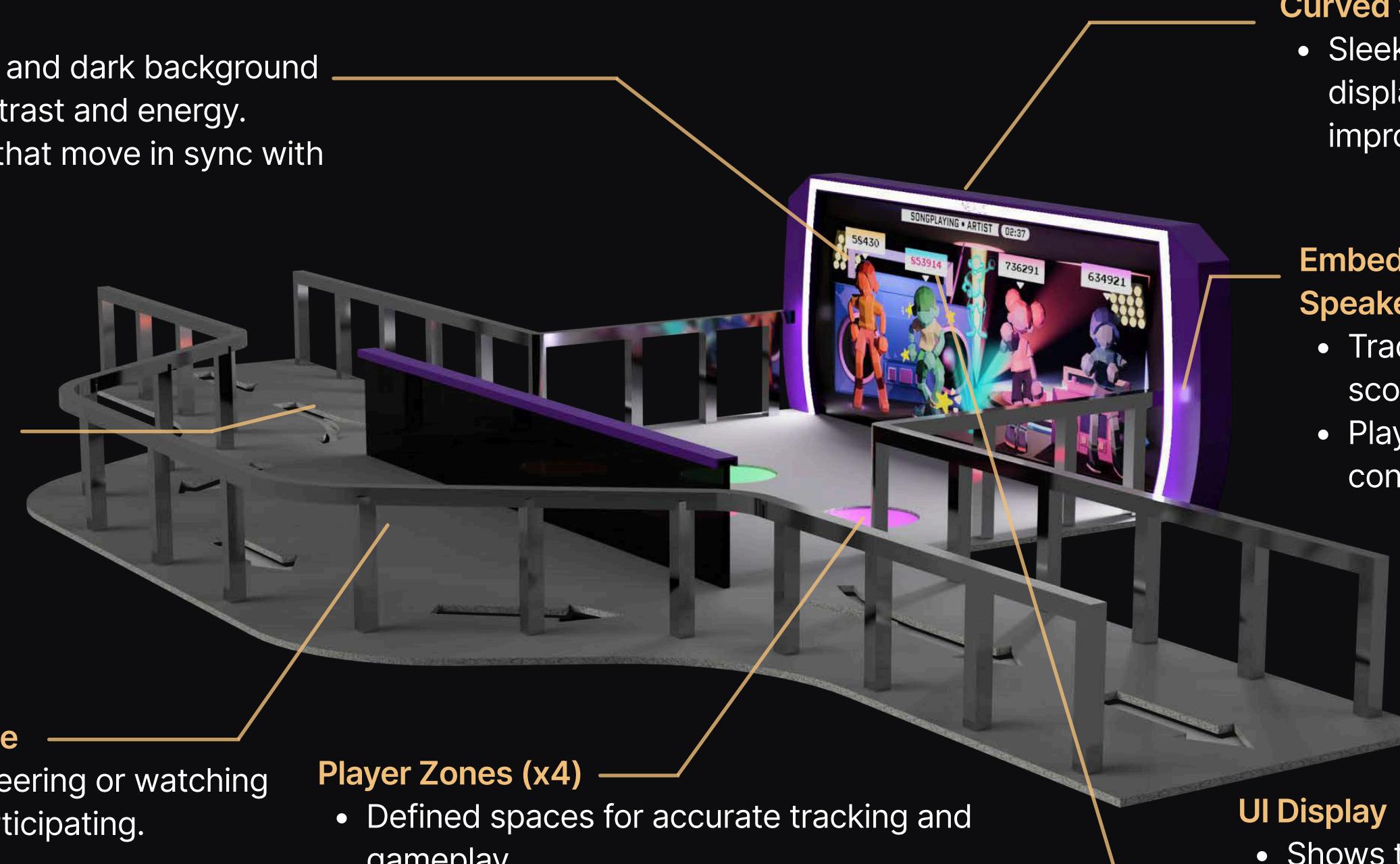


FINAL DESIGN: VALIDATION

ANNOTATED FINAL DESIGN

Digital Game

- Bright lights and dark background for high contrast and energy.
- Characters that move in sync with each player.



Junction Point

- Lets users dance, spectate, or bypass.

Spectator Zone

- Area for cheering or watching without participating.

Player Zones (x4)

- Defined spaces for accurate tracking and gameplay.
- Staggered to keep compact while allowing movement

Curved Screen Frame

- Sleek housing for the main display and lighting to improve tracking.

Embedded Cameras & Speakers

- Track body movement for scoring and avatar control.
- Play music matched to the concert's genre.

UI Display

- Shows time, song information, and score based on creativity, speed, and beat.

VALIDATION REQUIREMENTS

The experience should feel **approachable**



Participation **should be optional** and flexible



The system and interface should be **easy to understand**



The setup should let **users feel safe** and at ease



Users should feel **encouraged to be creatively**



The experience should **work with the flow of the queue**



Spectators should feel **included and engaged**



EVIDENCE

Re-using PREMO showed that participants found the design more friendly and approachable, helped by the playful avatars, minimal UI, and dance guide.

EVIDENCE: APPENDIX B: [6]

The junction system was designed to offer users the choice to play, spectate, or bypass the experience entirely. While not directly tested, it is expected to support flexible participation.

EVIDENCE: QUEUE INTERACTION

The interface was tested with our user group, who responded positively and described it as clear and intuitive. Users understood the experience without additional instruction, suggesting strong learnability.

EVIDENCE: APPENDIX B: [5]

Testing confirmed that staggered player positions reduced physical crowding. Spectators were positioned behind players and faced the same way, reducing feelings of being watched.

EVIDENCE: SCREEN

Stakeholders responded positively to the scoring system, which focused on creativity, beat-matching, and speed rather than technical accuracy, encouraging non-judgemental play.

EVIDENCE: VISUAL GAME ELEMENTS

Queue simulation suggested that the junction and song-end exit points allow players to enter and leave without disrupting flow. While not fully tested, the setup was designed for pacing.

EVIDENCE: QUEUE INTERACTION

Queue interaction testing showed that non-players enjoyed watching others dance, with some expressing increased interest in joining.

EVIDENCE: QUEUE INTERACTION



FINAL DESIGN: CONCLUSION

Rhythm Rush transforms queue spaces into moments of **playful social interaction**. Its **creative**, low-pressure gameplay encourages self-expression while **allowing users to engage** however they feel comfortable. By drawing on the shared energy of the concert environment, it helps spark connection between people and **builds a sense of community** among attendees before they even enter the venue.

STORYBOARD



1) User approaching screen but has not seen it yet



2) User reaches the area and can see the idle screen



3) User steps onto a circle & activates the game



4) Users start dancing while some decide to spectate



5) Scores are depicted by Speed, Beat and Drama



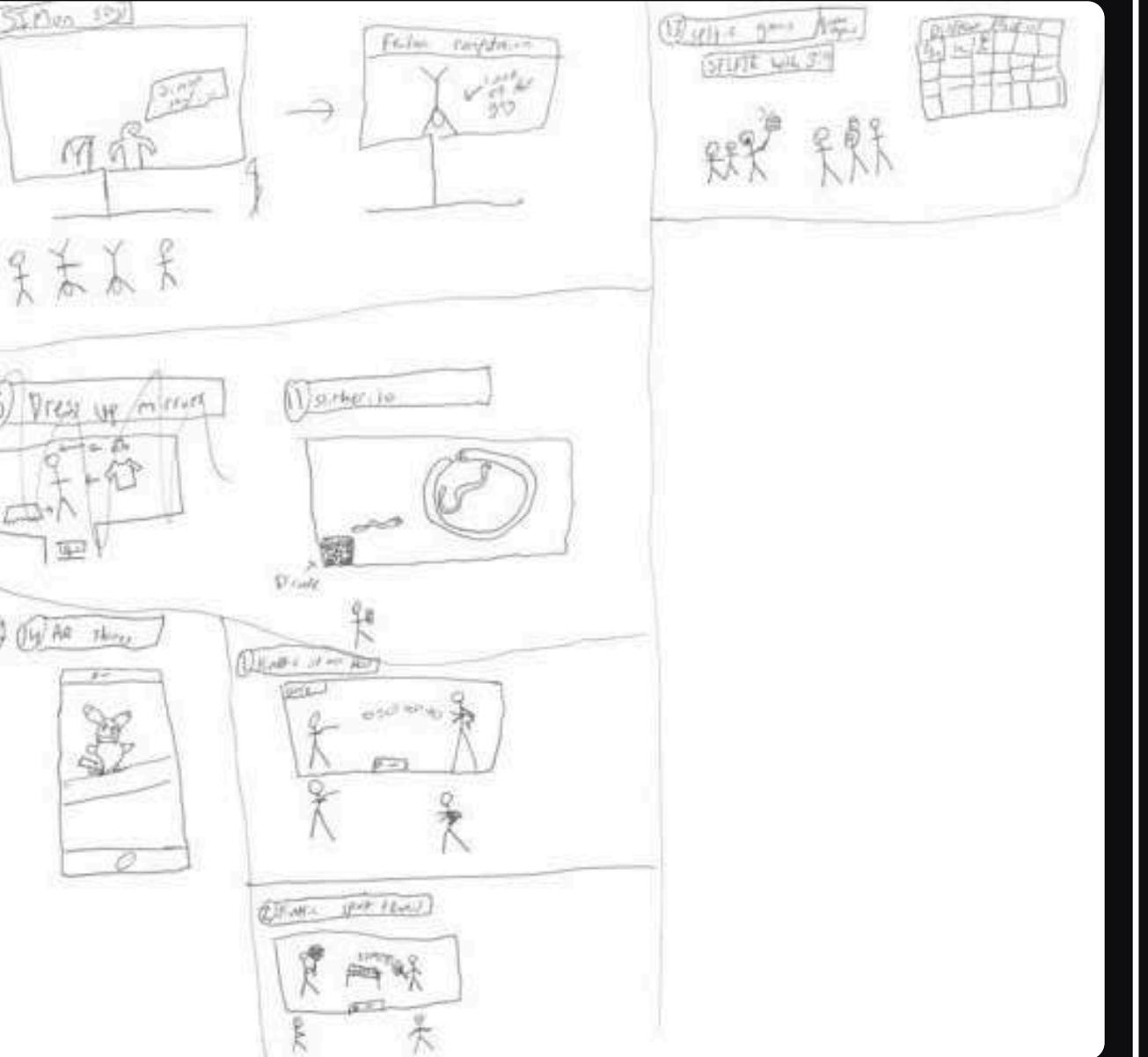
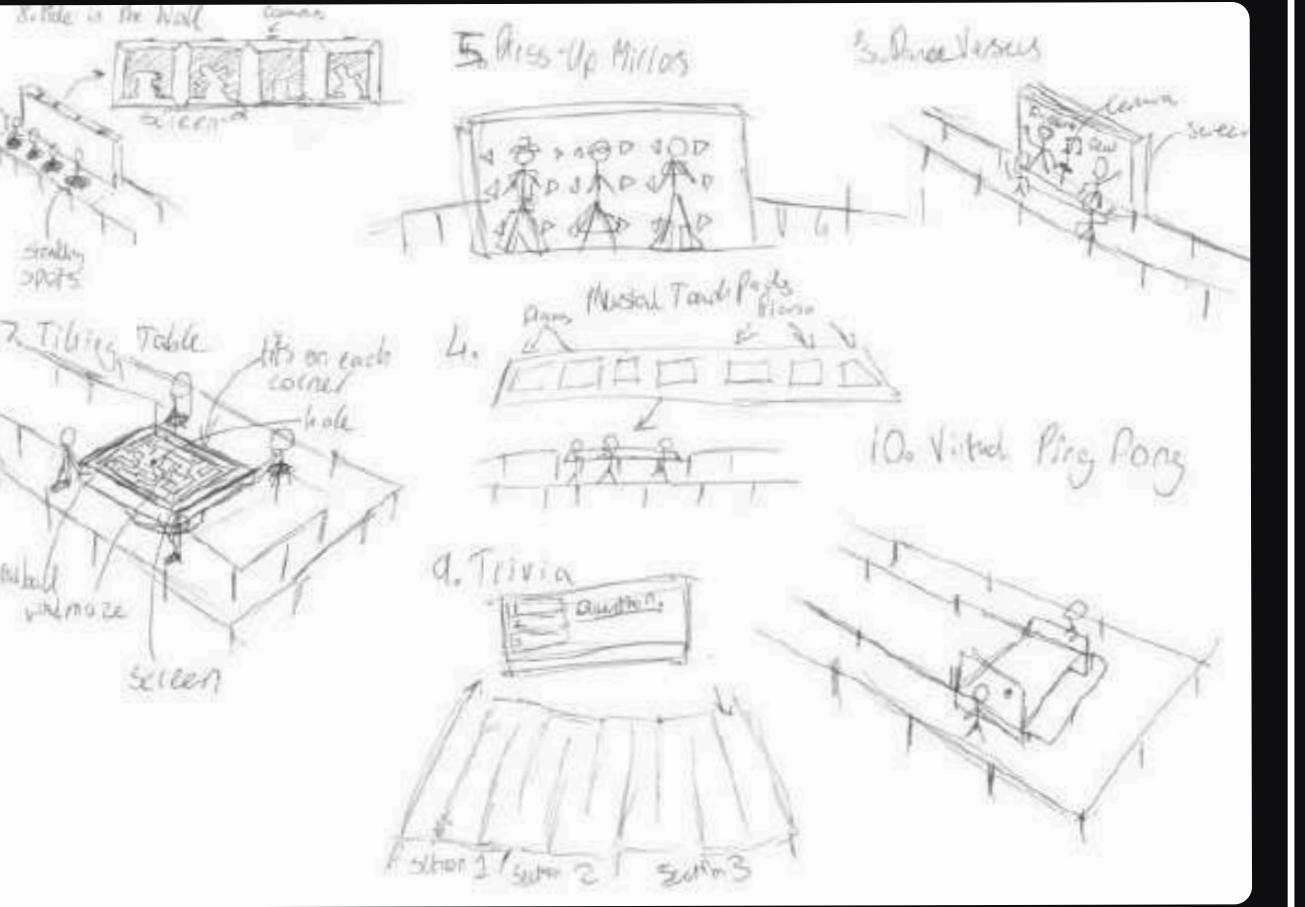
6) Once the song ends the end screen pops to try keep the queue flowing

APPENDICES: 1

GROUP BRAINSTORMING

ALL CONCEPT DESCRIPTIONS

1. **Kinetic Games** - A motion-tracking game that detects hand and foot movements, allowing players to interact with a virtual ball on screen. Different game modes, such as Pass and Tennis, encourage teamwork, requiring players to collaborate in passing or rallying the ball.
2. **Group Mural** - Queuers are given access to an app on their devices. They can draw anything from doodles to large creative pieces both alone and collaboratively, and all drawings are added on a big art screen - mostly likely a particularly visible wall
3. **Tilting Table** - A tilting table with a player on each corner, from two sides of a queue. And they tilt the table to get a virtual ball into a golf hole, this requires teamwork to navigate a maze. Then it resets and adds to a tally when the player scores.
4. **Musical Touch Pads** - Interactive pads installed in queue railing allow queuers to create simple tunes by pressing different spots, encouraging collaborative music-making.
5. **Trivia** - A large competitive trivia game where people in queue sections work together to find the answer. Leader board is shown on a large screen. Trivia can be based on the event, such as if it was a Sabrina Carpenter concert the questions would be on her.
6. **Simon Says** - With a camera and screen showing the people in the queue that zooms in on people who failed. Voice lines with subtitles are displayed on the screen for the task.
7. **Dance Versus** - A motion-tracking dance game where up to 4 players compete to see who can dance with the most enthusiasm. The screen displays each player's body in real-time, and the game scores them based on energy and creativity.
8. **Hole in the Wall** - A competition game, a large screen shows a wall with 4 person shaped holes. There is a camera that tracks the players movement and if the player contorts their body to fit inside the hole then they pass that stage. Players who do not are eliminated.
9. **Dress-Up Mirrors** - A mirror where users can play virtual dress-up games . Where a group of users can try digital costumes on from a virtual closet.
10. **Physical-Digital Pong** - Pong video game but the "rackets" are the players bodies and they have to move up and down to deflect.
11. **Make-a-Story** - An initial prompt is given on a large-screen/on mobile app. A person at the start of the queue is prompted to submit a small sentence, the next person adds a second, the third the third and so forth. A story is created as the process continues - which lets users direct their play through creativity and humour.
12. **Selfie Games** - A large screen assigns interactive challenges to queuers, such as "Take a selfie with the most people" or "Capture the funniest selfie." Participants submit their selfies, which are then displayed on the screen for the queue to vote on, determining the winner in real time.

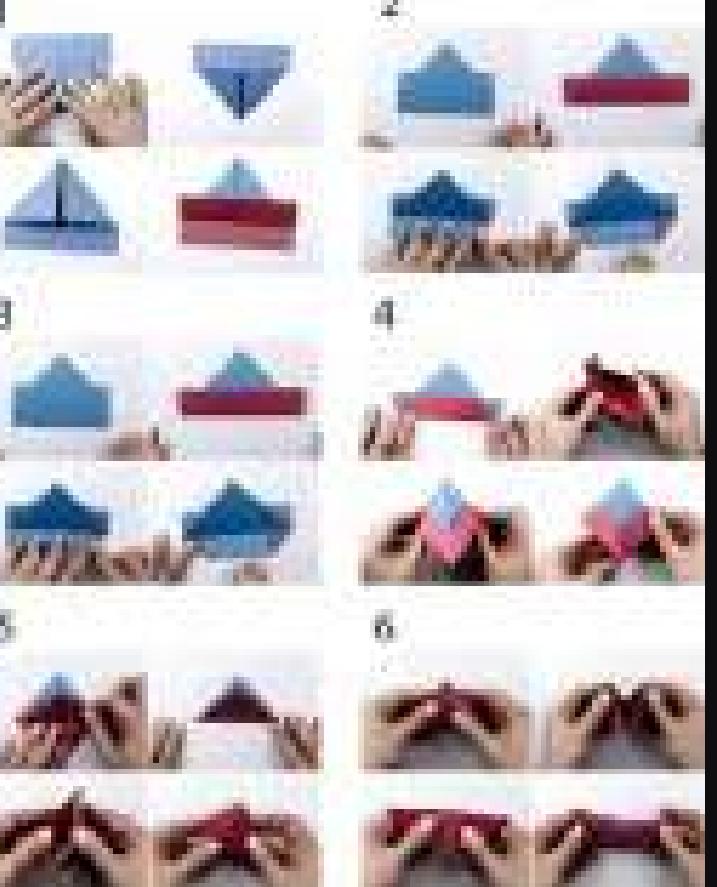


SURVEY 1

Step By Step Paper Boat Origami

1. **Step 1: Preparing the paper:** Take a square piece of paper and fold it in half diagonally, then fold it back open. Fold the paper again along the other diagonal, then fold it back open. Turn the paper over and fold the corners inwards so that they meet at the center point, and crease well.
2. **Step 2: Creasing the sides:** Turn the paper over and fold the outer edges inwards so that they meet at the center point. Turn the paper over again and fold the outer edges inwards so that they meet at the center point.
3. **Step 3: Tucking the flaps:** Turn the paper over and fold the outer edges inwards so that they meet at the center point. Turn the paper over again and fold the outer edges inwards so that they meet at the center point.
4. **Step 4: Flipping the boat:** Turn the paper over and fold the outer edges inwards so that they meet at the center point. Turn the paper over again and fold the outer edges inwards so that they meet at the center point.
5. **Step 5: Final shape:** Turn the paper over and fold the outer edges inwards so that they meet at the center point. Turn the paper over again and fold the outer edges inwards so that they meet at the center point.
6. **Step 6: Making the sail:** Turn the paper over and fold the outer edges inwards so that they meet at the center point. Turn the paper over again and fold the outer edges inwards so that they meet at the center point.
7. **Step 7: Tucking the sail:** Turn the paper over and fold the outer edges inwards so that they meet at the center point. Turn the paper over again and fold the outer edges inwards so that they meet at the center point.
8. **Step 8: Final boat:** Turn the paper over and fold the outer edges inwards so that they meet at the center point. Turn the paper over again and fold the outer edges inwards so that they meet at the center point.

Step By Step Paper Boat Origami



KEY:

INSIGHT

DIRECTION

APPENDICES: 2

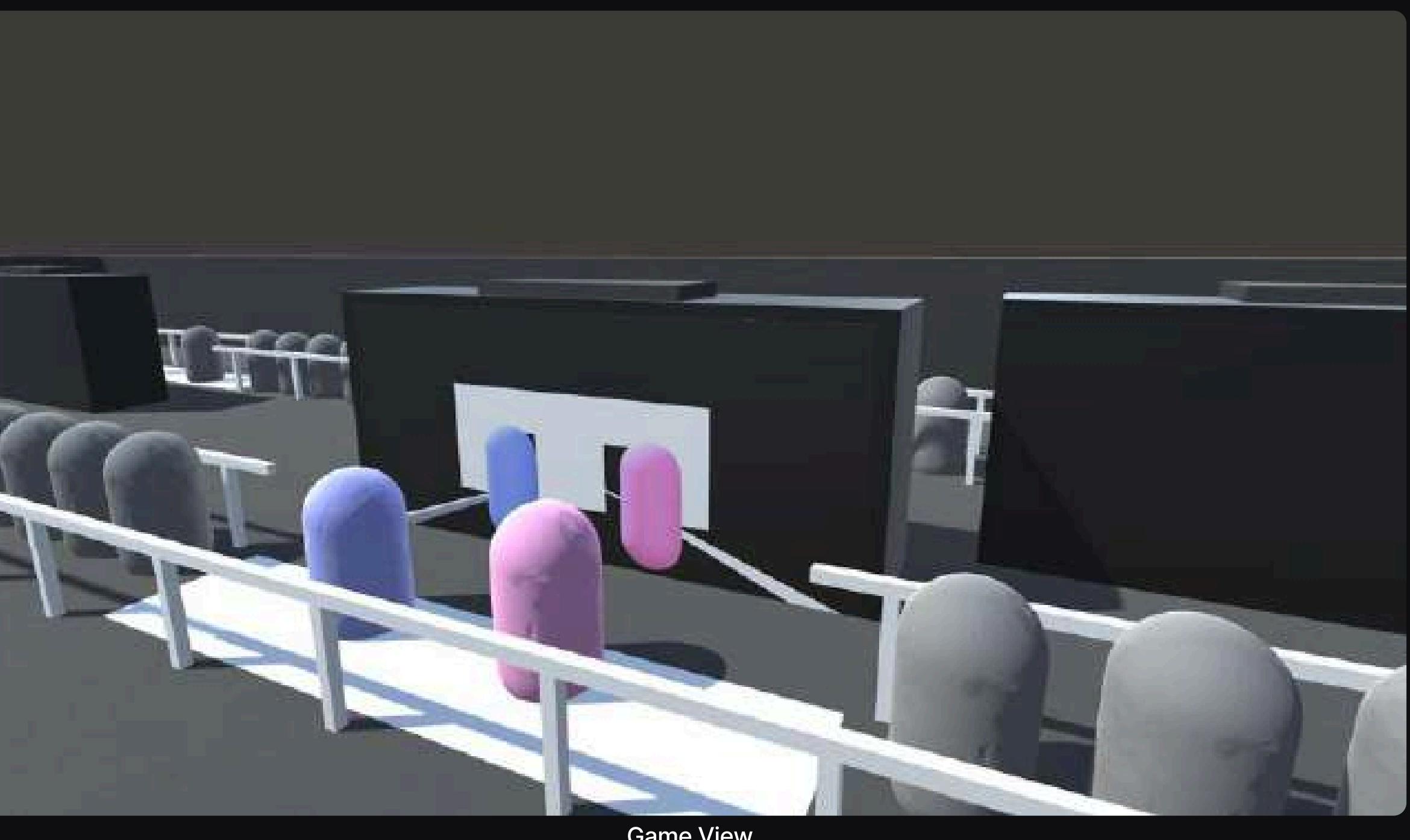
LO-FI PROTOTYPING: CONVERGE TO 3

PROTOTYPING

- The game was made in Unity 3D using C#.
- Two players could be controlled using WASD and $\uparrow\leftarrow\downarrow\rightarrow$. As coding the players to be able to move individual limbs would be far more than low fidelity, they could move side to side and crouch.
- The user would see the two players and a screen showing a representation of the two players in a “digital” environment. The “digital” players would copy what the players were doing.
- The walls were pre-fabricated and would randomly spawn and come towards the digital players.
- If the wall intersected with the player a text stating “Failed” would appear above the player who lost.
- You can view and play the prototype below:
<https://ruaridhm16.itch.io/hole-in-the-wall-prototype>

FEEDBACK

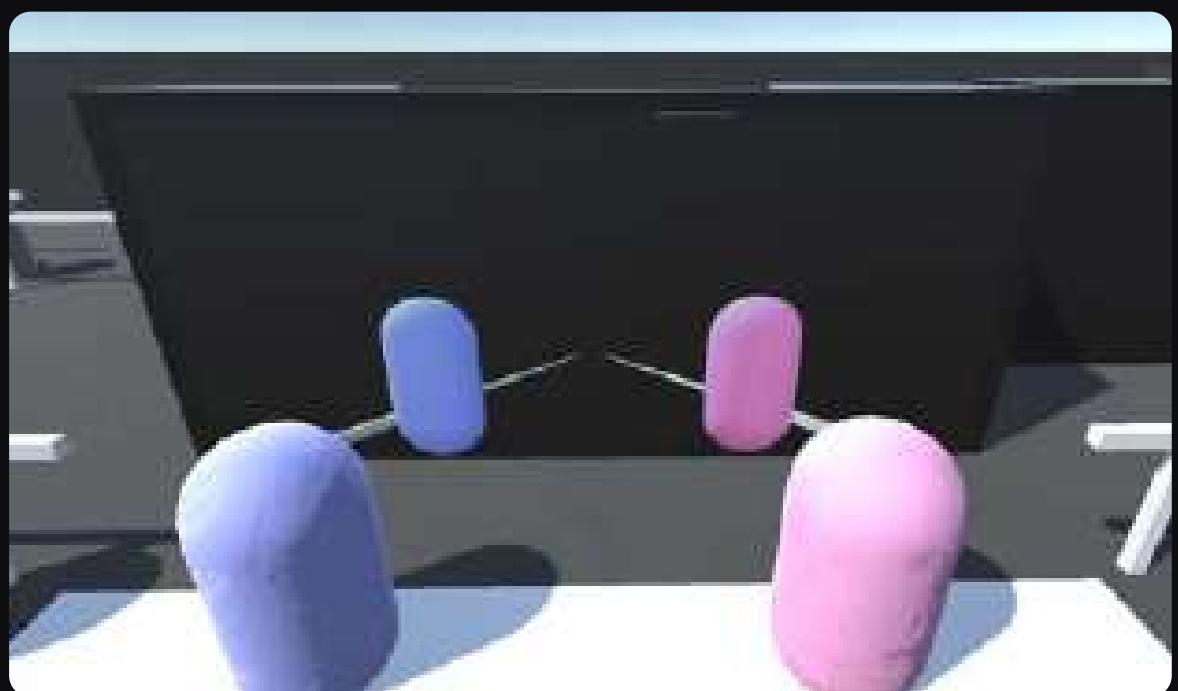
- One major concern was that the game became too repetitive over time, leading to boredom. Participants suggested that incorporating a system to vary the difficulty level could help maintain engagement for longer periods, or to add a goal with risk implemented such as having two lives (chances to miss the hole) before losing.
- A few individuals stated that if they saw the game, they would rather continue scrolling on their phones, which directly contradicted the game’s intended purpose of encouraging movement.
- Another significant issue was the lack of clear instructions. The prototype did not include any built-in guidance, meaning we had to manually explain the game to participants.
- Spectator enjoyment was notably low, as the game did not provide much entertainment value for those who were not actively participating. This limited its potential to attract more players or create a lively atmosphere within the queue.



Game View



Scene View



Screen View

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NOTION WEB

Link to notion page:

<https://truthful-kilogram-a3f.notion.site/Public-HCD-1b9bd6893c8a80c084efc285e462924c>

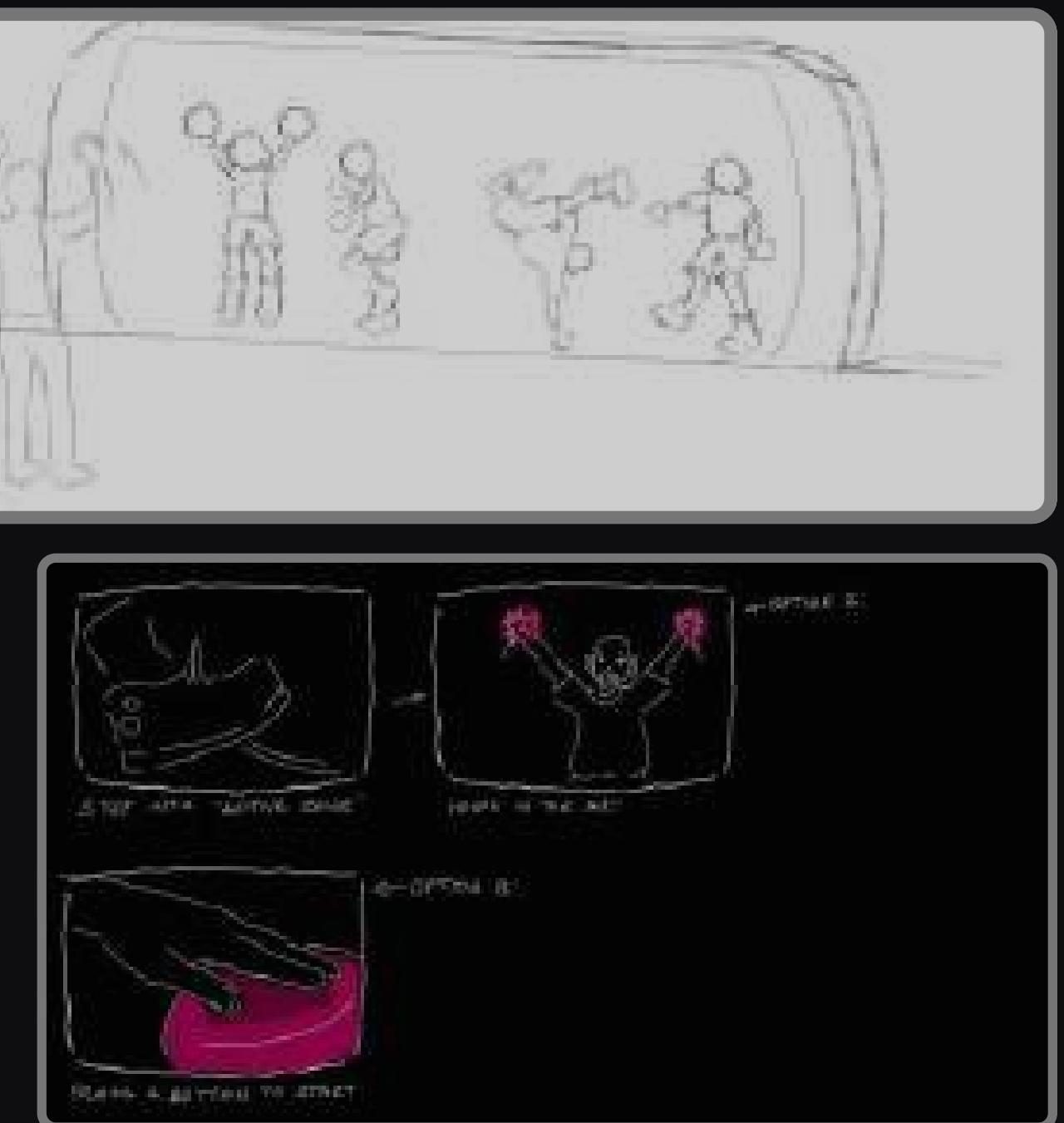
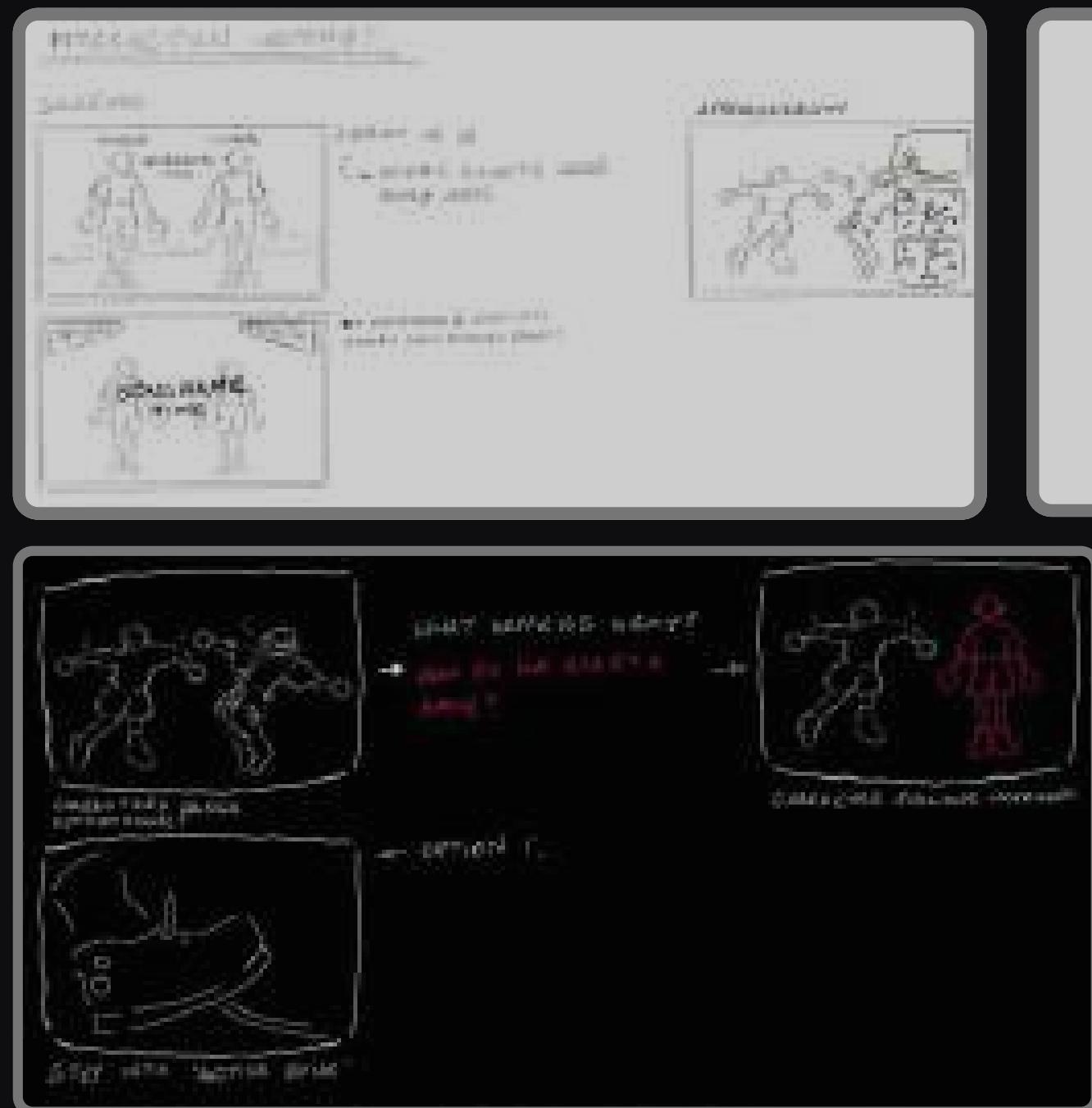
APPENDIX A: REFERENCES & SKETCHES

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SUPPLEMENTARY SKETCHES

STAKEHOLDER: SKETCHES

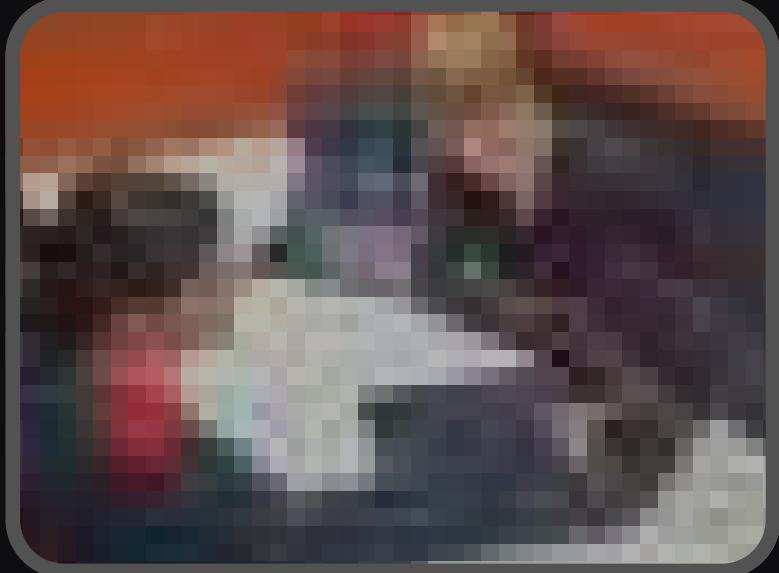
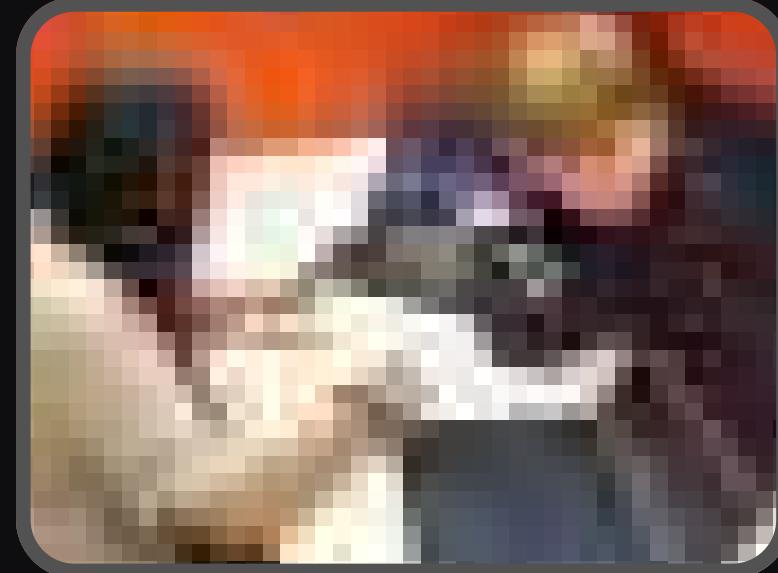


STAKEHOLDER: SKETCHES

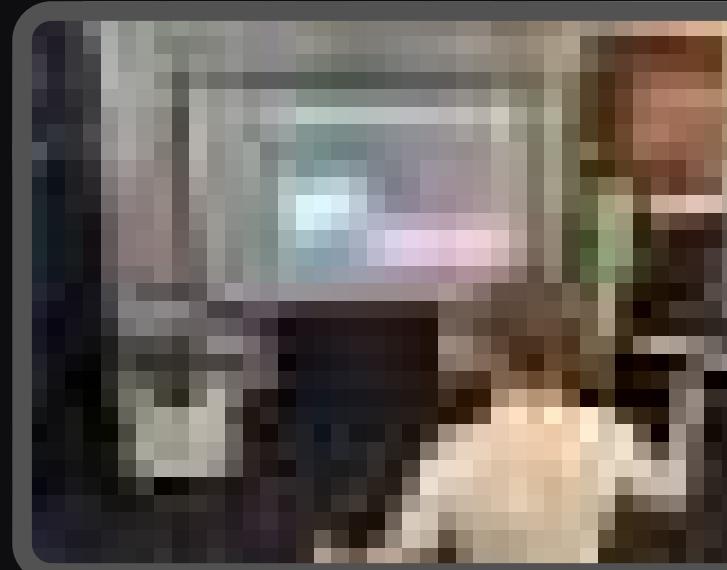


APPENDIX B: RESEARCH EVIDENCE

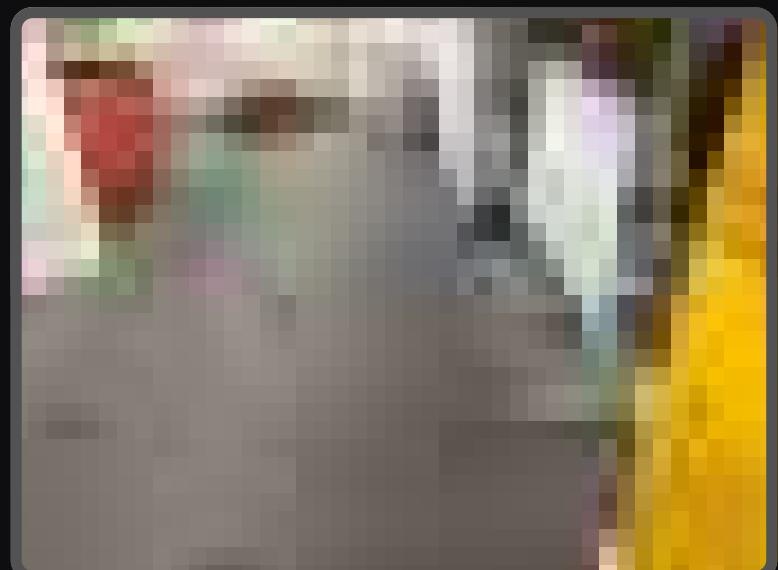
[1] PREMO: ANALYSIS



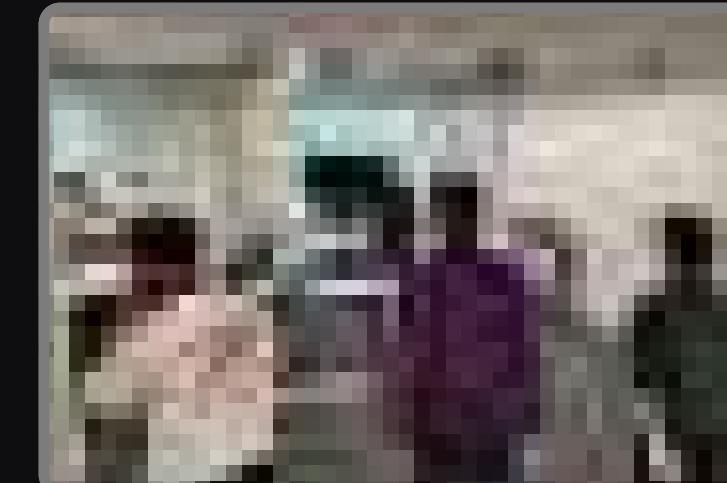
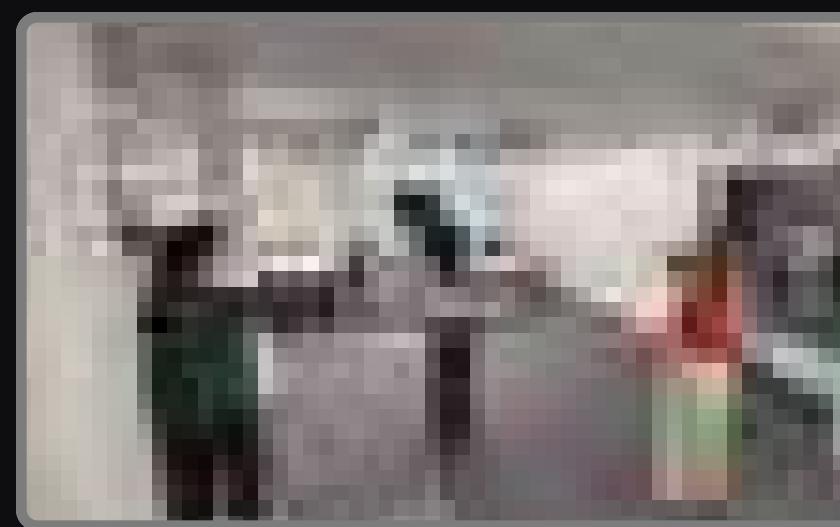
[2] CODE: TESTING



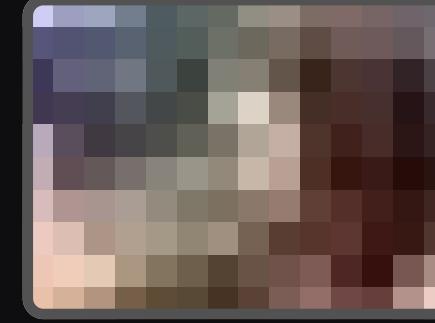
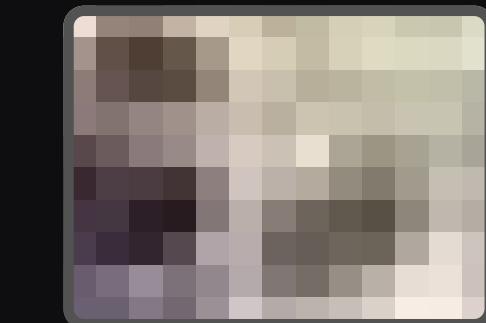
[3] SCREEN: SIZING



[4] QUEUING : INTERACTION



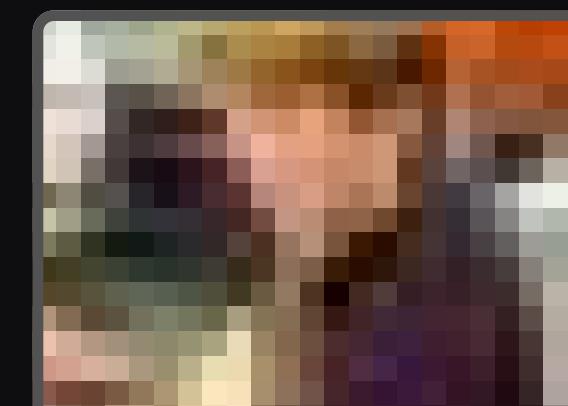
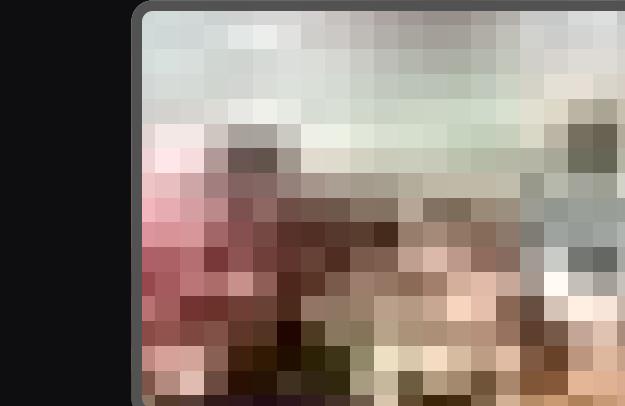
[5] VALIDATION: VISUALS



Notable Quotes:

- "It just made sense...It is self-
- "It feels like a game I've played before, but way
- "Even if you've never done it before, you'd figure it out ... I knew where to look straight
- "I don't usually play games, but I still got what I had to do pretty
- "I feel like if I was dancing, the UI wouldn't get in the way"

[6] VALIDATION: PREMO



With friends

Excited (5)
Curious(5)
Amazed (3)
proud(1)
Shy(2)

Without friends

Excited (3)
Curious (4)
Amazed(1)
Shy(2)
offput(1)
bored(1)

APPENDIX C: TRANSCRIPT

STAKEHOLDER ROLE-PLAY

Ikem: "Rhythm Rush is a dance battle game for up to six players."

Noah: "Six is great - I could play with all my friends."

Ikem: "Would six be too many people?"

Will: "I like having a lot of people involved."

Tim: "If there are too few people, then others might be left out."

Joe: "I think six is a good number. As a family man, I'd be fine with my kids doing it because I'd be there. I'd want to dance with my kids and have fun, like holding hands or whatever."

Ikem: "Would you want the dances to be shown on screen?"

Will: "I'd prefer if we could choose from different dances."

Will: "I want a difficult dance."

Ikem: "Is there any way we could make it more fun for you and your friends?"

Noah: "I'm fine with it - but that's because I'm very drunk."

Ikem: "What about spacing and safety in the dance zone?"

Tim: "There needs to be a way to space people out so no one's bumping into each other. There should be an indicator for entering the dance zone. Otherwise, I'd have to stop people from entering. Maybe a gate system - I'd be worried someone could get injured."

Ikem: "What happens if someone wants to stop mid-game?"

Noah: "What if I want to leave the game halfway through? I'm not super into dancing."

Ikem: "Would this slow down the queue?"

Joe: "Would it slow down the queue significantly? What if my kids just want to keep dancing?"

Will: "I'd hog it - I love dancing. But I'd move along if the queue was moving."

Tim: "If the queue is moving quickly, people might get less time to dance, and that could cause conflict."

Joe: "If people could move along with the queue, that would be best."

Tim: "You'd also need a system for how long people are spending on it - otherwise someone might hog it."

Ikem: "Would you personally approach it?"

Noah: "I'd approach it if my friends did -herd mentality."

Will: "I'd approach it."

Joe: "I'd approach it because of my kids."

Tim: "There could be conflict if there are separate queues."

Ikem: "Who do you think would actually engage with the game?"

Joe: "Teenagers might feel too uncomfortable. Kids under 12 and adults would engage more."

Ikem: "What kind of music would you want?"

Will: "Something with a strong beat."

Joe: "Family-friendly music."

Will: "Something inspired by Just Dance."

Tim: "Nothing that would make people get too boisterous."

Ikem: "Would you want music from the concert line-up or something else?"

Noah: "I'd rather not have music from the concert -it would ruin the live experience."

Ikem: "What kind of visuals would make it appealing?"

Tim: "I want cool visuals."

Ikem: "If you're shy, what would help you feel more comfortable?"

Joe: "I'd want a guide - I don't want to do improv dancing."

Noah: "Hints would help. Just Dance is good. At the start, have someone you can mirror."

Tim: "Or include freestyle sections."

Noah: "Yeah, or a tutorial you can mirror. Then it goes into freestyle."

Tim: "And maybe you could skip the tutorial just for yourself."

PARTICIPANTS

Joe (Stakeholder 4)

Noah (Stakeholder 2)

Will (Stakeholder 3)

Tim (Stakeholder 6)

Facilitator: Ikem

APPENDIX D: PROGRAM & MEETINGS

BODY.PY



A screenshot of a code editor window titled "body.py". The code is written in Python and contains several sections of comments and code. The code includes imports like 'os', 'sys', 'argparse', 'time', 'random', and 'math'. It also uses external modules such as 'pandas' and 'openpyxl'. The code appears to be a script for generating or processing data, with loops and conditionals throughout.

MAIN.PY

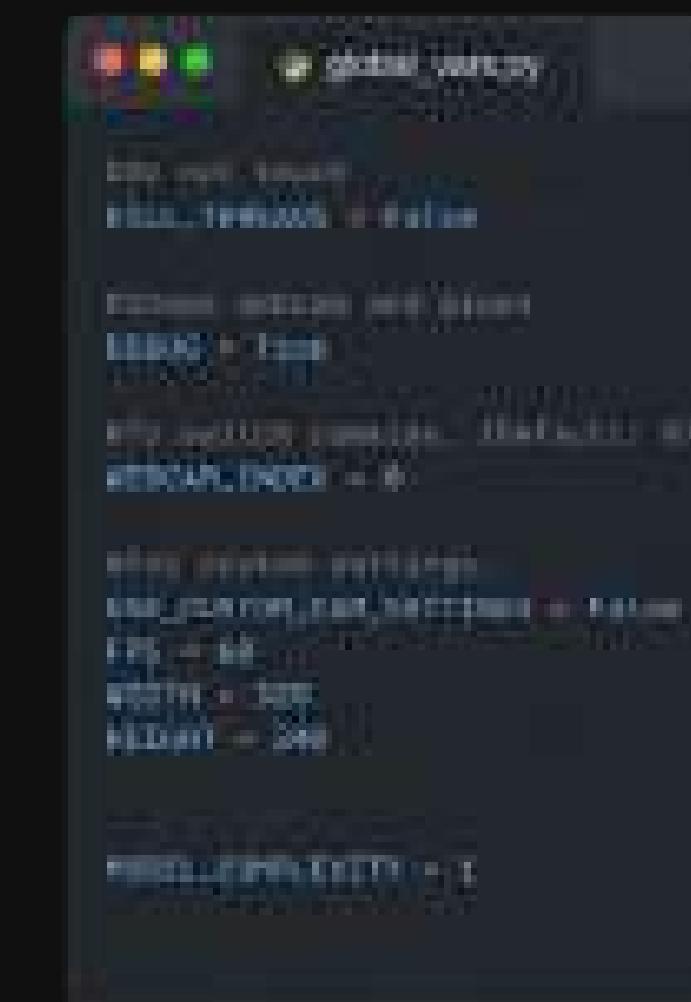


A screenshot of a code editor window titled "main.py". The code is in Python and includes imports for 'os', 'sys', 'argparse', 'time', 'random', 'math', 'pandas', and 'openpyxl'. The script defines a function named 'main' which takes command-line arguments. Inside the main function, there's a loop that processes data from 'input.xlsx' and writes it to 'output.xlsx'. The code uses various Python libraries for file operations and data manipulation.

MEETING MINUTES

https://imperiallondon-my.sharepoint.com/:w/g/personal/ie124_ic_ac_uk/EdRI7JRt3-xGi4cJvqk5HJ0BnhRxN_k5tdcnafIREkTq1w?e=ZHyrI4

GLOBAL_VARS.PY



A screenshot of a code editor window titled "global_vars.py". The code defines a single variable 'GLOBAL_VARS' which is a dictionary. This dictionary contains several key-value pairs, including 'id' (set to 1), 'name' (set to 'Global Variables'), 'parent' (set to None), and 'children' (an empty list). The code is used to manage global variables in the application.