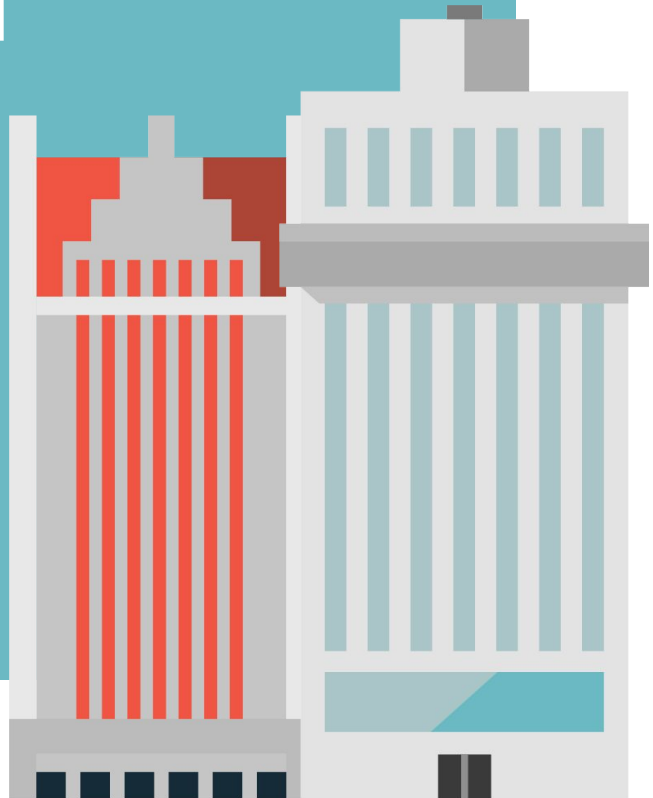
Augmenting Urban Experiences: Design Report



DECO3200 - Assessment 2

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PROBLEM STATEMENT

NOISE POLLUTION

Noise pollution in cities impacts the health and wellbeing of its residents, increasing stress, decreasing productivity and negatively affecting sleep *(Stansfeld & Matheson, 2003)*. By addressing this problem in areas of citizens' daily lives and creating a more pleasant experience, the quality of life can be improved for all.

To achieve the most valuable solution to this problem, concepts which improve noise pollution for city dwellers in a range of areas will be tested, including concepts targeted to residential areas, city centres and green spaces. Results from these tests will allow the most desirable and effective idea to be identified, which can then be improved through iterations.

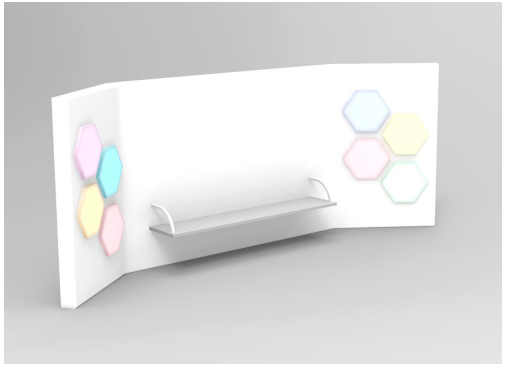
CONCEPTS OVERVIEW

PAINTING WITH NOISE

Painting with Noise is an LED light installation placed on walls surrounding construction sites in cities to improve the experience of walking past these areas of high noise pollution. The lights create artwork by converting the noise levels in the site into colour and intensity. Pedestrians can see where the sound is more concentrated and enjoy the display.

CITY SOUNDSCAPES

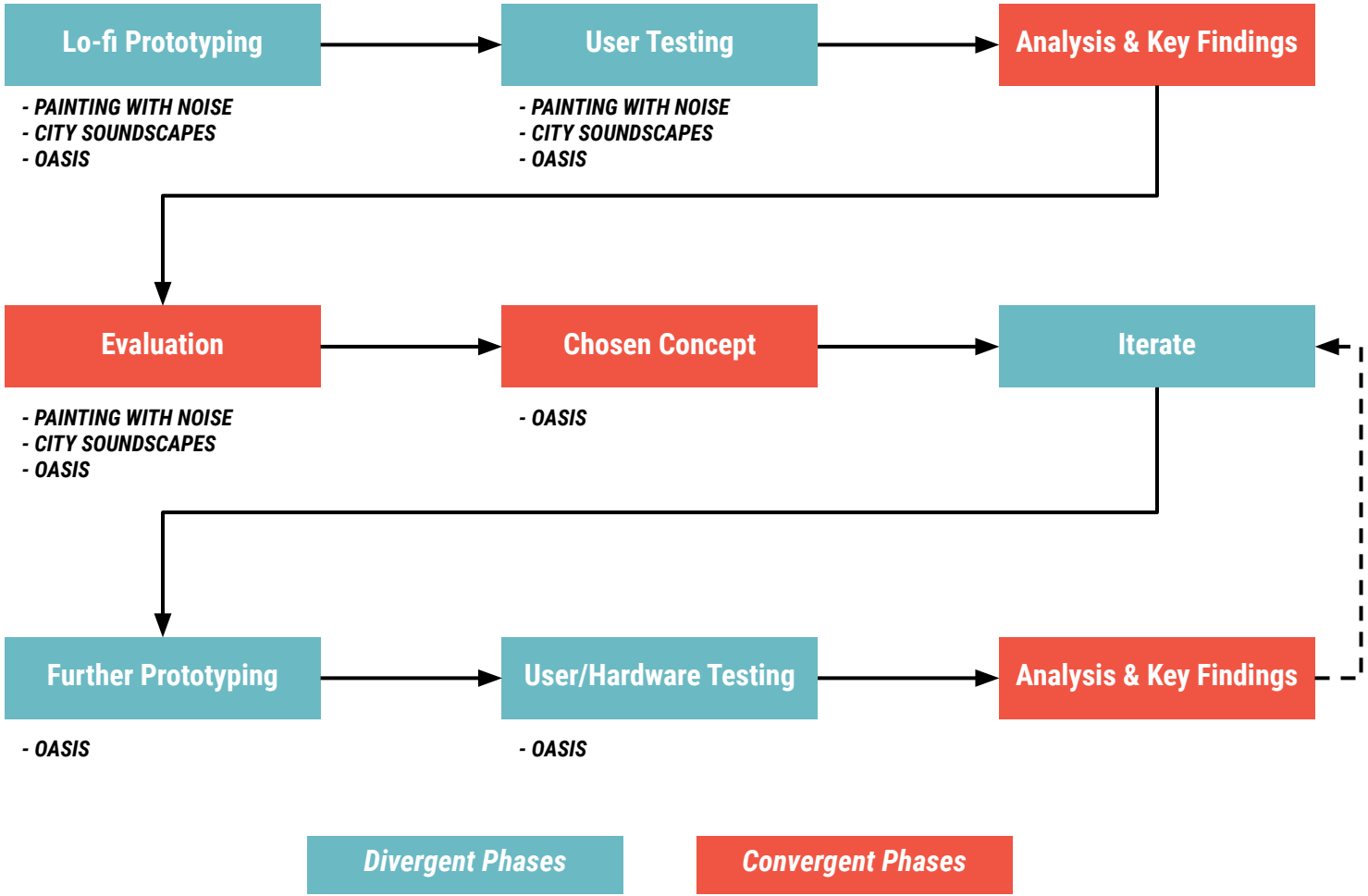
City Soundscapes involves data collection and mapping in cities which allows residents and city planners to make more informed decisions regarding noise pollution in different areas. The noise pollution data is collected using IOT sensors and displayed in an interactive heatmap highlighting where particularly high levels of noise exists and what is causing this.



OASIS

Oasis is a noise transformation wall, lighting and seating installation which creates a pocket of tranquility in a green space overwhelmed by noise pollution. The wall collects sound from the park, such as traffic noise, and transforms it into a more pleasant sound to play back to the user as they relax. Lights on the wall react to the transformed noise to complete the ambient atmosphere.

APPROACH OVERVIEW



ITERATIONS OVERVIEW

PAINTING WITH NOISE

Animated Gradient Prototype

Animated gradient projection with background construction noise.

User Testing

- *Contextual Walkthrough*
- *Observation*
- *Questionnaire*
- *Post Interaction Interview*

Data: Emotional Response

CITY SOUNDSCAPES

Concept Summary & UI Prototype

Concept summary and lo-fi user interface mockup.

User Testing

- *Focus Group Discussion*
- *Co-creation Workshop*

Data: User Feedback & Participatory Designs

OASIS

Transformed Noise Prototype

Road traffic audio clip edited into a transformed noise sample.

User Testing

- *Usability Testing*
- *Observation*
- *Post Interaction Interview*

Data: User Preferences & Emotional Response

Light Disc Prototype

Lofi physical prototype to show the shape and form of the light disc.

User Testing

- *Think Aloud Testing*
- *Observation*
- *Post Interaction Interview*

Data: User's Mental Models

FOCUS GROUP

Analysis & Evaluation

- *Affinity Diagramming*
- *Insight Statements*
- *How Might We?*
- *Decision Matrix*

OASIS

Transformed Noise Prototype

User Testing

- *A/B Testing*
- *Questionnaire*

Data: User Preferences & Emotional Response

Light Disc Prototype

Usability Testing

- *Role-playing*
- *Heuristic Evaluation*

Data: Interaction Models

TESTING METHODS OVERVIEW

PAINTING WITH NOISE

CONTEXTUAL WALKTHROUGHS

Allow us to understand the thoughts and actions of participants as they test a prototype in a relevant context.

PAINTING WITH NOISE - OASIS

OBSERVATIONS

Useful for noting participants behaviour and actions. How they interact with a prototype can reveal deeper insights.

PAINTING WITH NOISE - OASIS

USABILITY TESTING

Useful for testing specific features or functionality of a prototype with participants and gaining feedback.

OASIS

THINK ALOUDS

Think Alouds allow us to access participant's thought processes while they are interacting with a prototype.

PAINTING WITH NOISE - OASIS

QUESTIONNAIRES

Questionnaires give quick and immediate feedback on how the users feels or thinks about the prototypes.

PAINTING WITH NOISE - OASIS

POST INTERACTION INTERVIEW

A post interaction interview reveals deeper insights by probing the participant about their experience.

CITY SOUNDSCAPES

CO-CREATION WORKSHOP

Ensures that the needs of the users remain at the centre of the concept by engaging them in the design process.

PAINTING WITH NOISE - OASIS

FOCUS GROUP

Focus group discussion elicits understandings through asking questions and prompting conversations.

OASIS

ROLE PLAYING

Evaluate prototypes by taking on the role of the user and acting out tasks or activities to understand pain points.

OASIS

HEURISTIC EVALUATION

Quick and low cost method to identify usability problems of prototypes and rapidly iterate on them.

PROTOTYPE & TESTING OUTLINE

The prototype was a constructed walkway of projector screens showing an abstract animated gradient with construction noise background audio. A second version projects an image of construction hoarding as it is now so users can compare and an emotional baseline could be determined.

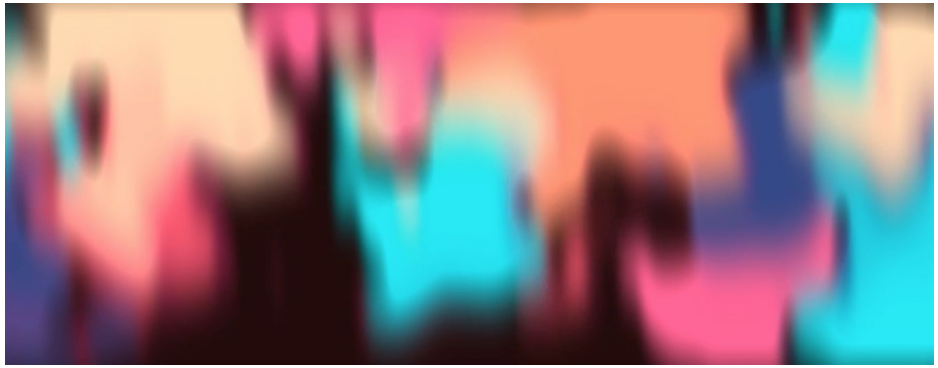
We were testing whether changing the visual elements of a users' surroundings within a construction environment improved their emotional state. Data collected in testing related to the participant's emotional response to each environment, including visuals and sound.

Participants

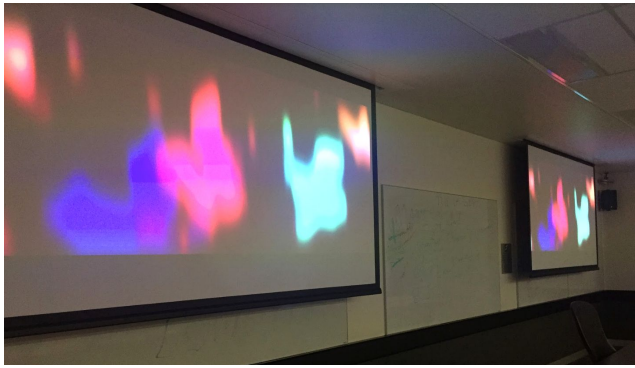
- 5 Participants
- Random Sampling

Criteria: Anyone who lives, works or studies in the city and has encountered construction sites before.

Methods
Contextual Walkthroughs, Observations, Questionnaires, Post-Interaction Interview



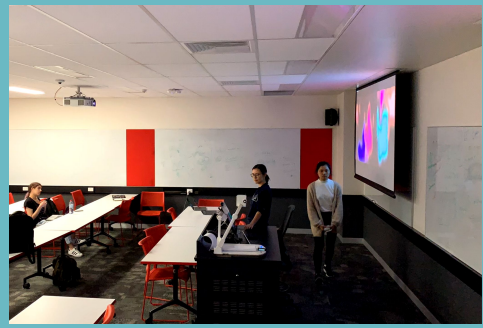
SCREEN CAPTURE OF ANIMATED VISUAL GRADIENT



USER TESTING SETUP

Contextual Walkthrough

As this concept is directly tied to the setting of construction sites we asked participants to imagine they were walking past a construction site on the street whilst completing the exercise. In a room an image of a traditional construction hoarding was displayed with construction noise playing in the background. The participant was asked walked to the other side of the room and back, past the walls. We encouraged them to be immersed in the experience, taking note of the environment and how they were feeling as this was integral to the user experience and would influence the feedback. This exercise was repeated with the Painting with Noise animated gradient displayed with the same background noise. The order was switched between participants to create a control.



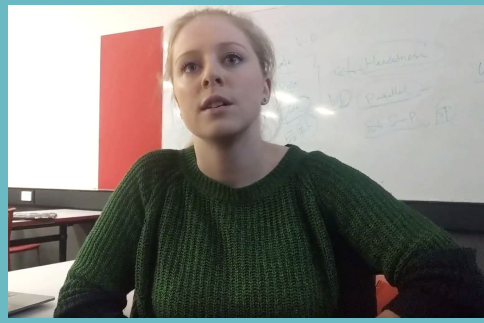
CONTEXTUAL WALKTHROUGH IN PROGRESS

Questionnaires

After each walkthrough participants completed a simple emotional questionnaire. This asked them to rate their mood, stress levels and aesthetics. We used this to gain insights into the emotional state of the users before and after using our prototype for Painting with Noise, showing whether the concept had a positive impact on them and improved their experience of the space.

Post-Interaction Interviews

Follow up questions were asked after the testing to see if users liked the concept and whether it was effective in improving their mood and experience when walking past construction sites. It enabled a more in depth understanding of the participants thoughts and reactions to their environment which couldn't be expressed in the questionnaire. It provided the opportunity to question participants about improvements to make and the desirability of the concept. Overall, the feedback revealed that the animated gradient was more pleasant than the current solution, however the construction noise was still very invasive and stressful.



POST INTERACTION INTERVIEW IN PROGRESS

Observations

Observations of participants' body language was conducted while they completed the contextual walkthrough. There was a range of engagement with the environment, with some viewing each of the different screens and comparing and others walking past without looking up. The animated visuals were more engaging than the traditional construction hoarding however, data gathered from this testing was not as useful as participants did not have a visibly emotional response to the experience. The information gained from the surveys and interviews were more revealing of the changes in their emotional states.

PROTOTYPE & TESTING OUTLINE

This lo-fi prototype is paper wireframe of the interface directly informed by participatory designs of potential users which incorporated the top features and functionalities that participants wanted.

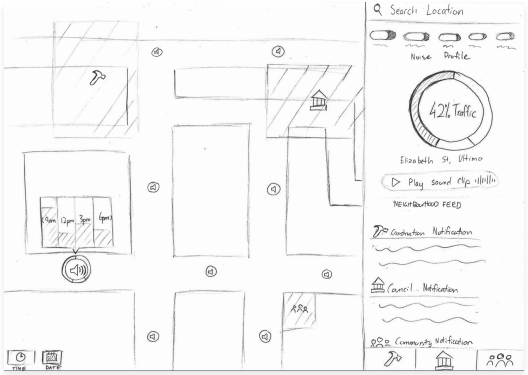
To ensure that City Soundscapes was actually of value to users we conducted a focus group and co-creation workshop. This stimulated discussion about the usefulness and desirability of the concept before collaboratively designing an interface.

Participants

- 6 Participants
- Targeted

Criteria: Those living in the city who had recently moved within the last six months.

Methods
Focus Group, Co-creation Workshop



PAPER UI WIREFRAME PROTOTYPE

PARTICIPANT IDEAS

PHOTO OF CO-CREATION WORKSHOP

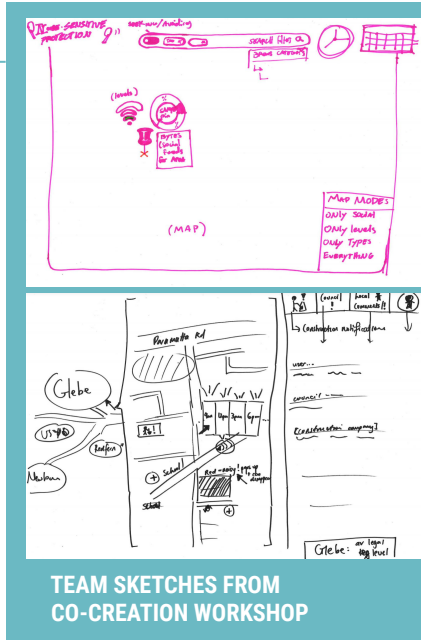
Focus Group Discussion

The focus group discussion brought forth participants' thoughts and feelings regarding City Soundscapes. This feedback covered not only what they liked and disliked about the concept but also who they thought potential users and their motivations might be. Overall, participants saw the value in this concept but didn't personally connect with it. They felt that it was very commercially focused, with the potential for it to be used to increase housing and rental prices in 'quiet' neighbourhoods and thereby only really being of use to the wealthy or elite.

Co-Creation Workshop

In the co-creation workshop they were tasked with a number of group and individual activities that would guide them in designing a final 'team sketch' which they had to pitch at the end. In the first brainstorming activity they focused on reframing the concept which resulted in shifting the concept to be more community driven so that it had value for everyone, including noise sensitive individuals. Crazy Eight's was the next activity which allowed participants to quickly generate ideas about the concept and interface. This led directly into the team sketch activity where teams now collaboratively brought together all their ideas to create a final sketch of what the interface would look like, incorporating their top features and ideas.

Overall participants designed interfaces which were community focused and included features such as construction and council notifications, as well as user-sourced noise comments or sound clips. The ability to filter noise levels and categories, as well as options for disabled individuals who are noise sensitive was also featured.



TEAM SKETCHES FROM CO-CREATION WORKSHOP

PROTOTYPE & TESTING OUTLINE

The prototype consisted of a soundproof wall with a seat and speaker on each side. On one side recorded traffic noise was played and on the other the transformed noise was played. Both sounds could be heard at once, but each was more clear on the side of the wall it was played on.

The purpose of the prototype was to test whether or not the noise transformation would actually be successful or desirable to users of urban greenspaces. With the data collected recording their preference of sound and emotional response and feedback on is qualitative elements.

Participants

- 5 Participants
- Random Sampling

Criteria: Anyone who lives or works in the city and has used a greenspace before.

Methods
Usability Testing, Post-Interaction Interview, Observations

USER TESTING SETUP

POST INTERACTION INTERVIEWS BEING CONDUCTED

Usability Testing

Participants stood in the middle of the room next to the wall and begun the test when the sounds were played. They were not told what each of the sounds were (i.e. traffic noise) or which side was the transformed noise as we did not want to bias them. They were asked to walk around the room listening to the sounds for a few minutes and then choose to sit on the side that they felt most comfortable with. Overall most participants sat on the side with the transformed noise however it was interesting that some sat on the side with the traffic noise, their choices were then discussed in the post-interaction interview.

Post-Interaction Interview

After each test participants were asked a few questions about where they sat and why based on the noise. They were asked to describe the sound and why they liked or disliked it. Overall, the transformed sound was preferred whether or not the participant realised the sound was transformed. Most participants noted how subtle the transformed noise was and found it more desirable than the traffic noise. Those who didn't choose the transformed noise explained that its ambience was quite dark which could be less enjoyable for extended periods of listening (ref appendix).

Observations

While the participants were doing testing, observations were done based on how they interacted with the space, where they chose to sit and how long it took each to decide. It was interesting to observe participants walking between each side comparing the sounds, often swapping between sides multiple times to be sure of which sound they preferred. Some participants took their time whilst others were immediately drawn to one side and sat down with confidence.

PROTOTYPE & TESTING OUTLINE

The prototype was a round tray to represent the physical form of light disc. It was attached to a wall using string to allow it to rotate freely to mimic the intended interaction model of being rotated, turned or spun.

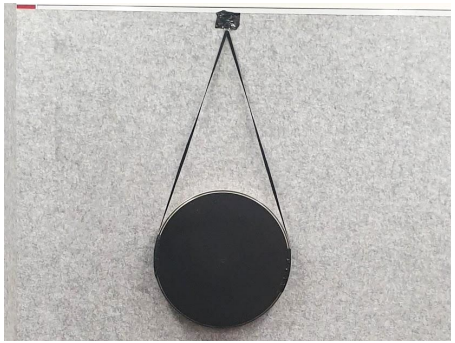
The purpose of the prototype was to test how users would interact with the light disc without instruction and whether the desired interaction is intuitive. We collected data on user's mental models regarding the perceived interactiving of the light disc and overall feedback about its function.

Participants

- 5 Participants
- Random Sampling

Criteria: Anyone who lives or works in the city and has used a greenspace before.

Methods
Think Alouds, Observations, Post-Interaction Interview



LIGHT DISC PROTOTYPE

THINK ALOUD TESTING BEING CONDUCTED

Think Aloud Testing

The same participants from Oasis noise transformation testing were used as they understood the concept and context better. Participants were shown the render of Oasis to explain what the light would ideally look like and how it would be mounted on the wall. They were then asked to demonstrate what they would do if they saw the light disc and think aloud. Most participants initially tapped or pushed the front of the disc, explaining that they thought it might be a button or touch sensitive. None of the participants thought to turn it as they believed it was fixed to the wall. Some said they were hesitant to even interact with the light without prompting. When informed they could move it, only some participants turned it as intended showing that the ideal interaction model was not intuitive.

Post-Interaction Interview

After the test, participants were asked to elaborate on why they performed certain actions and give some feedback as to what would encourage them to turn the light. All agreed that they struggled to recognise that they should spin the light disc and that signage, arrows or light indicators would make the interaction much clearer and encourage use. Participants were then told what the light's turning interaction could do regarding the sound manipulation. We received positive feedback for this functionality, with participants becoming excited to try the product. It was clear that both this feature and its combination with the physical interaction of the light disc were desirable to users.

Observations

While the participants vocalised their actions and thoughts, notes were taken on their behaviour, especially the subconscious movements they might not say out loud. When asked to interact with the light disc, most participants initially reached to touch the prototype but hesitated and withdrew their hands, showing that interacting with the disc did not feel natural in its current state. It requires clearer affordances to indicate that users are allowed to interact with the light disc.

FOCUS GROUP

A focus group discussion about all three concepts was also part of our user testing. We wanted to get feedback about each concept individually but also in comparison to one another.

This feedback was valuable in testing the desirability of each concept and how we could further iterate them to fulfill more user needs. The comparison of all three concepts also generated a thoughtful discussion, which directly influenced our evaluation of concepts framed around choosing which one to continue on with.

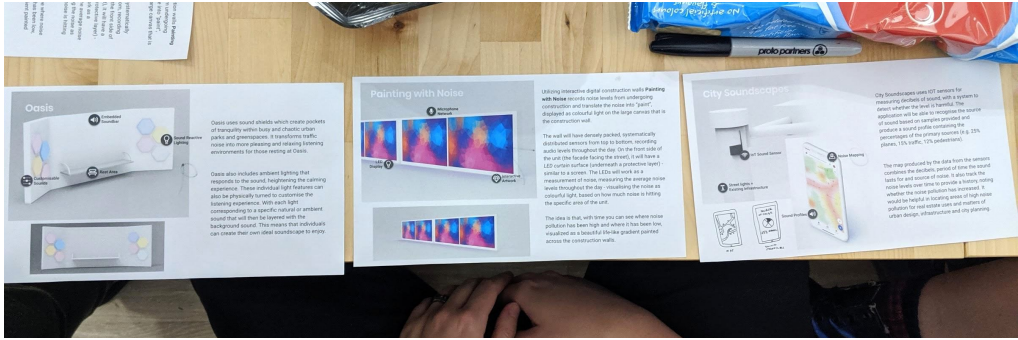
Participants

- 6 Participants
- Random Sampling

Criteria: Anyone who lives or works in the city and has experienced noise pollution.

Method
Focus Group

FOCUS GROUP IN SESSION



PARTICIPANT RESPONSE TO FOCUS GROUP ACTIVITY 2

Focus Group - Activity 1

Participants were given a summary and visualisation of a concept and then asked to rate its desirability on a scale of one to ten - with one being not desirable at all and ten being highly desirable. They were asked to consider not only how much they liked a concept but also how much they would actually want to engage with or use it when deciding on its rating. Once all participants had rated the concepts they shared their ratings and reasoning. This then lead into a facilitated group discussion focused on understanding what participants liked and disliked most about the concept and whether or not they would find it useful. The activity was then repeated for each concept, three times in total.

Focus Group - Activity 2

The next activity was for participants to rearrange all three concepts in order of desirability, relative to each other. Once they had ranked all the concepts, participants were called upon individually to discuss their decisions before engaging in a group discussion. Most participants were in consensus, with five out of six ranking Oasis as the most desirable concept overall.

PARTICIPANTS ENGAGING IN A GROUP DISCUSSION

SYNTHESIS & ANALYSIS METHODS OVERVIEW

AFFINITY DIAGRAMMING

Affinity diagramming is a useful method for synthesising large amounts of qualitative data through clustering of themes to reveal patterns and insights.

INSIGHT STATEMENTS

Insight statements are useful in summarising findings into key insights which are easily digestible. These can be revisited throughout the design process to evaluate iterations.

HOW MIGHT WE QUESTIONS

'How Might We?' questions based on key insights reframe problems as opportunities to facilitate ideation for further development of solutions.

DECISION MATRIX

A decision matrix is useful to evaluate our concepts through chosen criteria relevant to the problem area and user needs, and decide on the best solution.

PAINTING WITH NOISE (PwN) FINDINGS

INSIGHTS

PwN improves the experience of construction sites, but only marginally.

User testing revealed that whilst PwN did improve the pedestrian experience of construction sites and reduced stress levels. The results however were not significant enough for participants to perceive much added value.

How might we noticeably improve the experience to more positively impact users?

PwN is only engaging the first time users experience it.

User feedback showed that whilst users thought PwN was a novel idea its value decreased through repeated exposure thereby rendering it useless

How might we continuously engage users to provide lasting value?

PwN is not an effective solution as it doesn't address the noise factor.

User testing concluded that noise pollution was a larger problem for construction sites than visual aesthetics, and as PwN didn't address this, it wasn't as desirable to users.

How might we directly address the noise pollution created by construction sites?

PwN's gradient distracted from the noise but wasn't captivating.

From user testing it was evident that PwN's display was successful in distracting the participant from the noise pollution, however the visualisations weren't very engaging by themselves.

How might we create a more appealing visual display to engage users?

SOLUTIONS

Incorporate sound proofing elements in the design of the hoarding i.e embedding soundproofing panels in the wall, to reduce the amount of noise pollution. By minimising the noise in addition to providing an aesthetically pleasing experience it will have a greater positive impact.

Redesign the visualisation of the localised sound to be more engaging, potentially testing a less abstract design to see if it attracts the user's attention better. Also have multiple visualisations to cycle through so that users do not tire of it so quickly and it has repeat value.

CITY SOUNDSCAPES FINDINGS

INSIGHTS

City Soundscapes is not an inclusive product.

Through user testing it was revealed that the concept was only designed for specific users in mind, such as wealthy homebuyers or real estate agents. Participants identified that younger or lower socioeconomic individuals would not be as inclined to use the product.

How might we create a more inclusive and community driven concept?

City Soundscapes only has limited use cases.

User feedback showed that users would only need to use the product once i.e when moving house, but then would no longer be useful to them.

How might we make the product have greater functionality to increase usage?

City Soundscapes should offer greater user control and customisation.

Users indicated that they wanted more options to customise their user experience to suit their specific needs, thereby creating a more accessible product. For example, catering to those with a sensory processing disorder.

How might we empower users through customisation?

City Soundscapes has the potential to be used misused.

Users were concerned about how the product could potentially be used by the property market to increase housing and rental costs in 'quiet' neighbourhoods which would be deemed more desirable.

How might we ensure that the product protects the interests of the community?

SOLUTIONS

Shift the focus of the product to be more community focused by introducing a localised newsfeed displaying user comments and sound clips, construction warnings or council notifications. This change could be reflected by rebranding as **Neighbourhood Noise**.

Increase functionality and customisation by including noise level filters and sound profiles. This should also include options for disabled individuals who are noise sensitive to ensure that accessibility is considered. Greater user control and community focus would lead to increased usage.

OASIS FINDINGS

INSIGHTS

The transformed noise is more desirable than traffic noise.

User testing confirmed that the transformed sound was more calming and preferable to the traffic sounds. The noise created a more relaxing environment for users.

How might we learn from this and improve the results?

The ambience of the transformed noise directly affects the users emotional state.

Through user testing, some users revealed that they found the transformed noise to be too dark if they listened for an extended period. This indicated that the tone of the sound controls the users mood and needed to be adjusted accordingly.

How might we adjust the mood of the transformed noise to influence users?

The light disc's intended interaction model is not intuitive.

User testing showed that participants were hesitant to interact with the light disc without prompting. The intended interaction model of spinning or turning the light disc did not come naturally to users.

How might we make this interaction clear and encourage use?

The light disc's functionality is desirable.

Users said that they would be excited to interact with the light disc based on the visualisations and explanation provided about the sound manipulation during testing.

How might we utilise this feedback and make this a success?

SOLUTIONS

Create multiple samples of the transformed noise with varying moods. Then test them with users to gauge their emotional response and find the most suitable ambience. We will be evaluating its relaxing and calming qualities with consideration of the context of a green space.

Iterate the design of the light disc to make clearer the affordance of turning or spinning. Test the effectiveness of incorporating arrows, a call to action and or light indicators whilst balancing the overall aesthetic and minimalist design of the concept.

KEY FINDINGS & DECISION MATRIX

01 PwN improves the experience of construction sites, but only marginally as it does not directly address the noise pollution.

02 City Soundscapes needs to become community focused and increase its customizability to be desirable or viable.

03 Oasis' core functions are desirable but must be refined to be user friendly.

The aesthetic of transformed noise must be more emotionally conscious of users.
The light disc interaction needs to be more intuitive.

PAINTING WITH NOISE

DESIRABILITY — Low
Users didn't engage much with PwN.

VIABILITY — Low
PwN only distracts from problem of noise pollution.

FEASIBILITY — High
PwN requires minimal components and coding.

CITY SOUNDSCAPES

DESIRABILITY — Low
Users didn't engage much with City Soundscapes.

VIABILITY — Med
City Soundscapes helps manage exposure to noise pollution.

FEASIBILITY — Low
City Soundscapes requires a complex network of components and coding.

OASIS

BEST CONCEPT

DESIRABILITY — High
Users were very engaged with Oasis.

VIABILITY — Med
Oasis reduces noise pollution to an extent.

FEASIBILITY — Med
Oasis requires multiple components but isn't overly complex to build or code.

DECISION MATRIX CRITERIA

DESIRABILITY = DO THEY WANT THIS?

VIABILITY = SHOULD WE DO THIS?

FEASIBILITY = CAN WE DO THIS?

PROTOTYPE & TESTING OUTLINE

The prototype consisted of four new samples of Oasis' transformed noise, each with varying moods and sound elements.

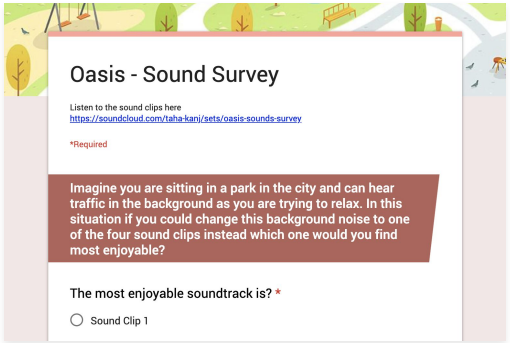
The aim was to determine the most ideal sound which would be relaxing and create a tranquil ambience for users in the green-space environment. The data collected during testing included sound preferences regarding the sound samples and feedback on its qualitative elements.

Participants

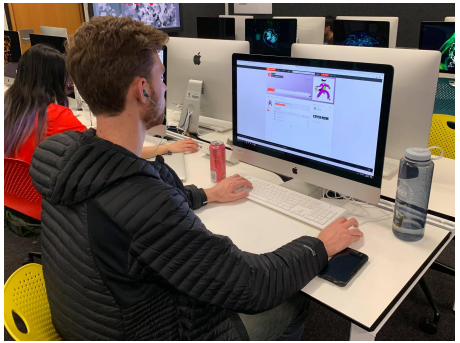
- 22 Participants
- Random Sampling

Criteria: Anyone who lives or works in the city and has used a green-space before.

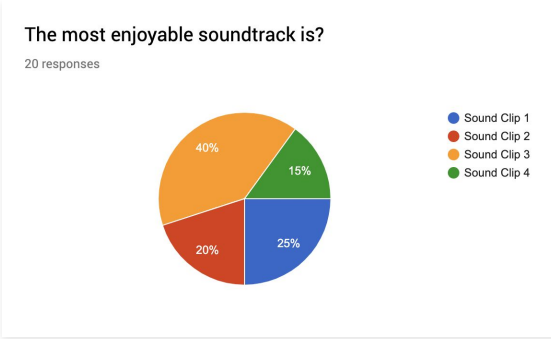
Method
A/B Testing, Questionnaire



OASIS SOUND SURVEY



PARTICIPANT LISTENING TO SOUND CLIPS



SAMPLE SURVEY RESPONSES

A/B Testing

A/B testing was used to determine which audio aesthetic was most desirable to users to aid in relaxation in the natural environment. Users were provided with four sound clips and asked to imagine they were in a park. They then chose the one they found most enjoyable to listen to within that environment.

Questionnaire

A short questionnaire was completed by users after listening to the tracks asking them to select their favourite and describe why they enjoyed it most. This test concluded that the third sound was preferred overall, as it was the most atmospheric and calming for users. Feedback also revealed that this track was uplifting and melodic due to the musical tones, aiding in distraction from unwanted outside noises.

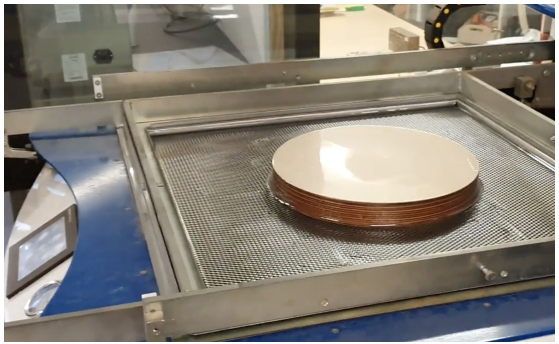
PROTOTYPE & TESTING OUTLINE

The prototype was a round light disc comprised of a wooden backing, programmed LED lights inside and frosted plastic covering.

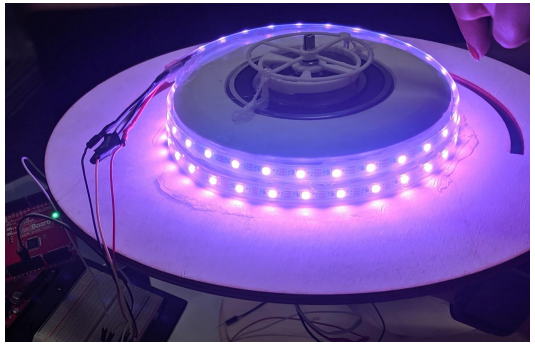
We used the prototype to test the look and functionality of the design, as well as the construction of the physical model components. Rapid iterations of physical prototyping was informed by role playing and heuristic evaluation continuing on from the user feedback from the initial prototype.

Participants
Design Experts

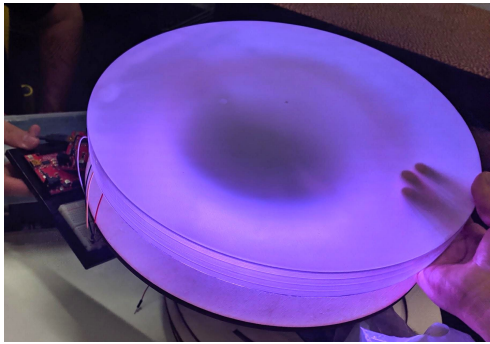
Methods
Physical prototyping, Role playing, Heuristic Evaluation



VACUUM FORMER PHYSICAL PROTOTYPING



LIGHT DISC LED LIGHT TEST



LIGHT DISC COVER TESTING DIFFUSION

Physical Prototyping

We used the vacuum former to test fabrication of the transparent cover for the Oasis light disk. We used a round serving tray and covered up the handles with tape, which did not work - the tray collapsed on itself and broke. We learned that the vacuum former is extremely exact, every single imperfection is visible in the plastic. We tried again using 5 laser cut cylinders of wood stacked on top and it achieved better results, but far from flush. We know that for our hi-fi mold, it needs to be perfectly sanded before running another vacuum session.

Role-playing

We role-played as potential users of the Oasis light discs by acting out spinning the prototype in order to quickly identify issues with its usability and function. This then informed rapid iteration, such as adding constraints to the design in the form of a laser cut groove in the backplate which would control the degree of rotation of the light discs and prevent overturning, thereby preventing user errors.

Heuristic Evaluation

Heuristic evaluation was done within our team to quickly identify aspects of the current design which could be more user friendly. There was a good consistency between the round light disc shape and design precedents, however it was not clear where to hold the light or that this interaction was possible. Users have good control over the system due to the sound customisation, however errors could occur due to a misunderstanding of the purpose of this interaction (i.e. if trying to affect volume or lights). Overall, clearer visual feedback is needed for to user communicate with the user and prevent error.

OASIS V2 FINDINGS

INSIGHTS

The transformed noise sample #3 most desirable

Testing concluded that the musical soundtrack #3 was most favourable as it created a peaceful and relaxing atmosphere.

How might we use utilise this result to produce the most desirable track for the masses?

The preferred qualities were calming, atmospheric and musical.

From user testing, these were the highest rated descriptions for users' favourite tracks. Most preferred a light track to match their mood in the green-space environment.

How might we apply this feedback to sound customisation?

The internal components of the light disc need to be redesigned to diffuse the light correctly.

From user testing it was clear that the central components - which contain electronics - create a shadow with the lights' current placement around the edge.

How might we adjust the light's components to maximise visual appeal?

The need to balance minimalist design with clear documentation for the light disc.

User feedback showed an appreciation for the design, but confusion regarding the lack of instruction about how to operate it. The design may be hindered by incorrect documentation added.

How might we include documentation which does not obstruct the clean aesthetics?

SOLUTIONS

Build upon the ambience in noise sample #3 and test it in the context of a park/green-space to ensure that it is still the most desirable and appropriate for the environment. Then develop the sound customisation of the light discs to heighten the calming, atmospheric or musical tones of the underlying track.

Test different subtleties of documentation from discreet light indicators to more obvious call to actions, such as signage or arrows to see which provides the most successful user engagement. Find the ideal balance in the design to engage users through both aesthetics and function, without restricting either.

OASIS

CHOSEN CONCEPT

WHAT DOES IT DO?

Oasis is a noise transformation wall, lighting and seating installation which creates a pocket of tranquility in a green space overwhelmed by noise pollution. The wall takes the noise pollution from the park, such as traffic noise, and transforms it into a more pleasant sound to playback to the user as they relax. Circular light discs on the wall react to the transformed noise to complete the ambient atmosphere and can be rotated by the user to customise their listening experience. There are six discs in total, three on each side of the seated area - each controlling one sound, specifically one note that together make up a chord.

HOW DOES IT SOLVE THE PROBLEM?

Oasis addresses the problem of noise pollution by providing city dwellers with a pleasant atmosphere to sit, study and relax. It creates an environment that decreases stress and allow green spaces to maintain some level of serenity. Using what is called noise transformation, Oasis records all sound on the exterior of the wall (such as traffic and other unwanted noise), this sound is then transformed by using various techniques such as pitch shifting, adding reverb and modifying EQ - the result is a calming unvarying ambience. This directly addresses the problem of noise pollution by augmenting the experience of irritating or unpleasant urban sounds into a soothing and enjoyable listening experience.

OASIS
VISUALISATIONS

OASIS

TARGET AUDIENCE

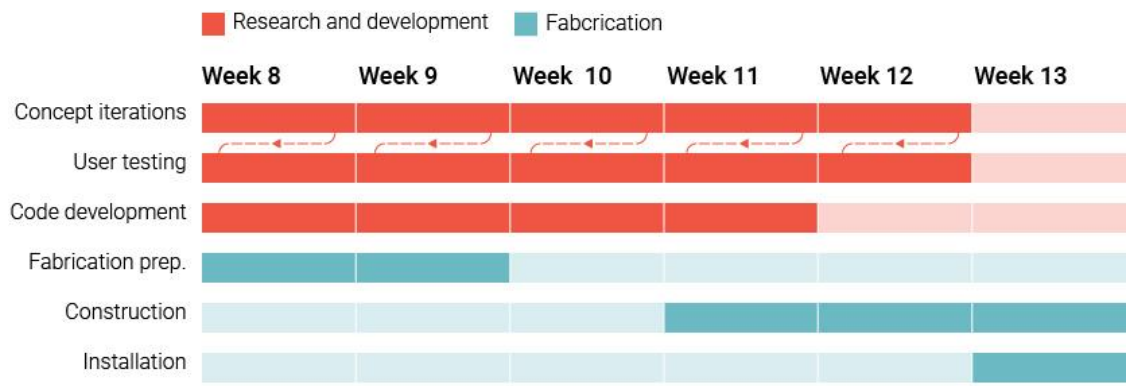
IDEAL USERS

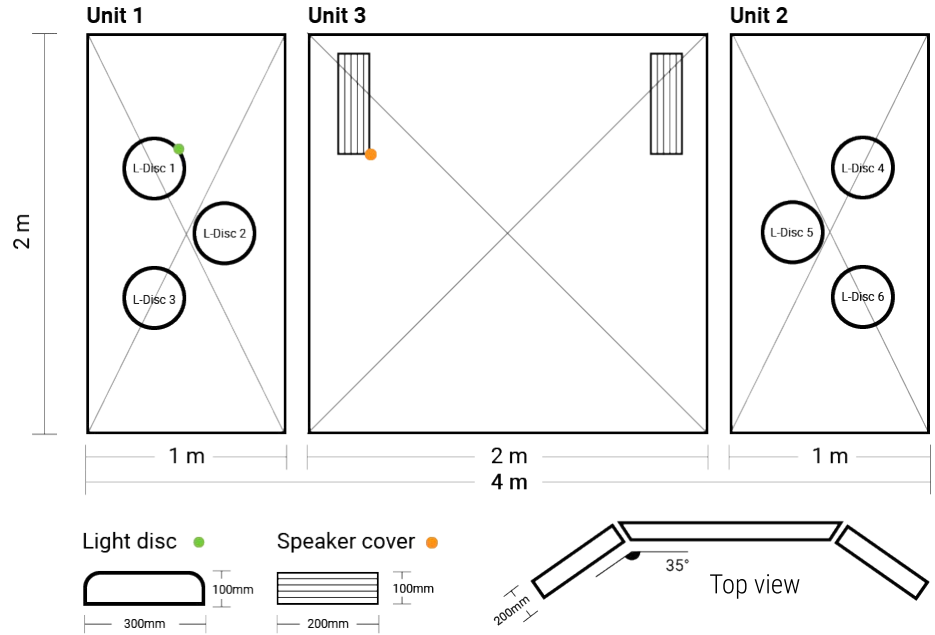
The target audience for Oasis is those who live, work or study close to the city centre and visit parks and other green-spaces to relax in their free time. It is aimed at those who rely on the parks to unwind but are disadvantaged as urban green-spaces are invaded with noise pollution. For example this may include working professionals who visit a park on their lunch break, students who study there, or residents who have no backyard in their home.

HUMAN FACTORS

It's suitable for most users, however is not targeted to the hearing impaired as the concept is addressing noise pollution, but the space is still visually appealing. The height of the lights and the fixed seat may also disadvantage those in wheelchairs. The seat and sound customisation is only accommodating to one or two users at a time. Also if children are present, they may be drawn to the light display, disrupting the peaceful area.

OASIS
IMPLEMENTATION PLAN





Oasis will be built as three separate units.

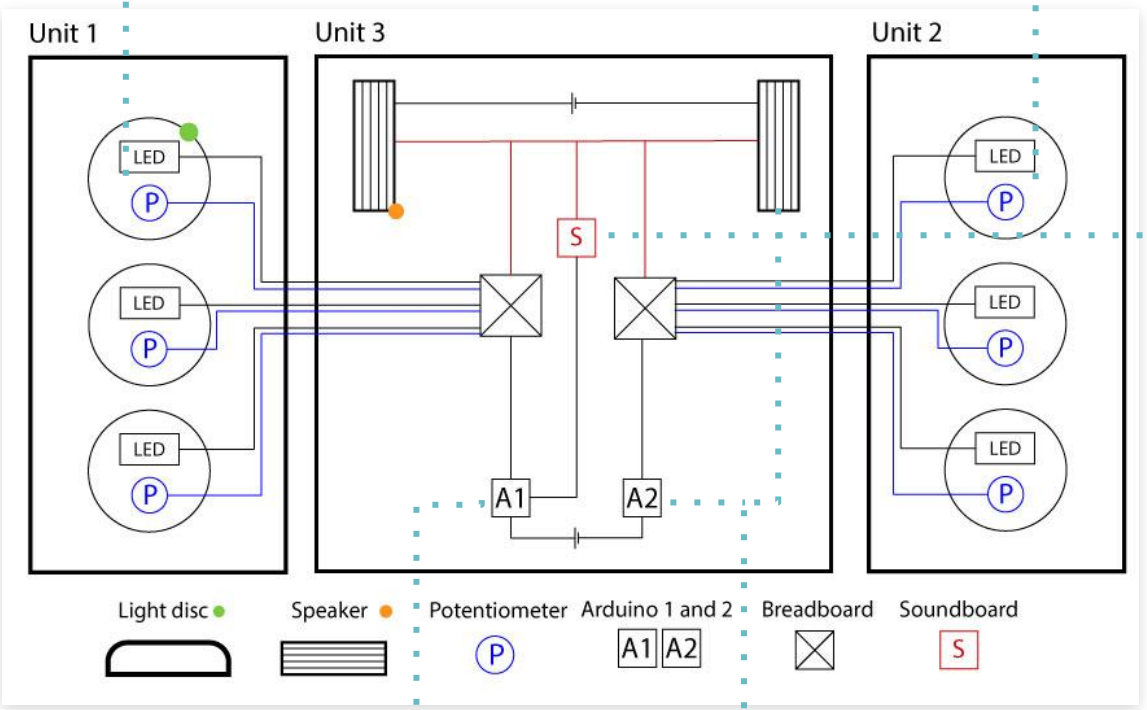
Unit 1 & 2 will house all the components for three discs each as well as one Arduino.

Unit 3 will house audio components; 2 speakers located on each side running through an audio shield and into the Unit 1 Arduino.

OASIS

TECHNICAL IMPLEMENTATION PLAN

Unit 1 and 2 include one LED strip and potentiometer per disc. Both units lead to breadboards, within Unit 3 .



In the center is the master soundboard connected to the unit 1 Arduino. This soundboard is not connected to a potentiometer as users cannot change the volume of the master sound.

Unit 3 powers the LED strips through the 2 Arduino boards as well as collects inputs from the potentiometer. The potentiometer changes the volume of sounds per disc.

Each Arduino and the speaker will either have their own power supply or an external power supply that will power the whole circuit.

TEAM ROLES & RESPONSIBILITIES

Jodie Clothier
User Experience Lead

Conducting user testing.
Guiding design iterations.
Assisting in fabrication.
Product video.
Documentation.

Mikkel Astrom
Physical Fabrication Lead

Construction of the wall.
Assist in implementation of electronic components.
Build light discs.
Oversee budget.

Miriam Green
Creative Direction Lead

Artistic fabrication.
Construction of prototype components.
Product aesthetics.
Documentation.

Taha Kanj
Technical Implementation Lead

Development of code.
Implementation of electronic components.
Assist in building light discs.
Assist in construction of wall.

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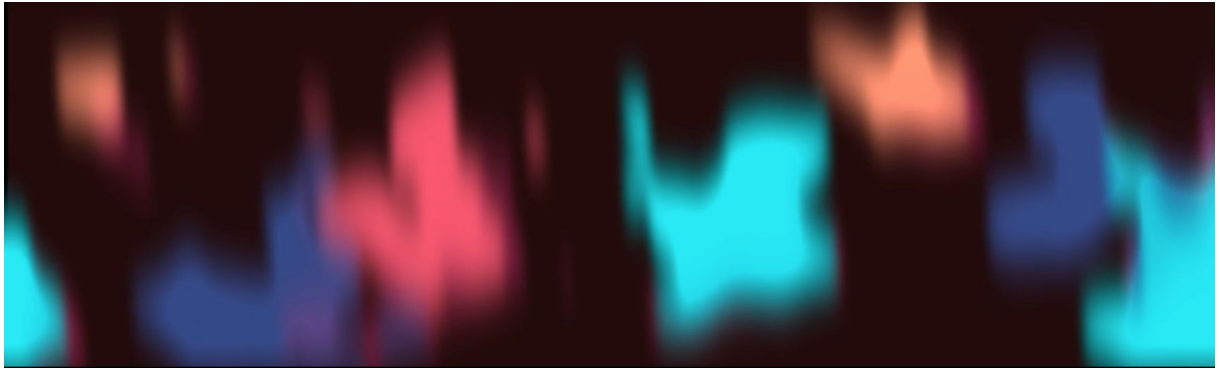
Construction Hoarding Image. Retrieved from https://leebrosfencing.com.au/products/hoarding/builders/#gallery-3

Appendix

Appendix 1 - Painting with Noise user testing visualisations

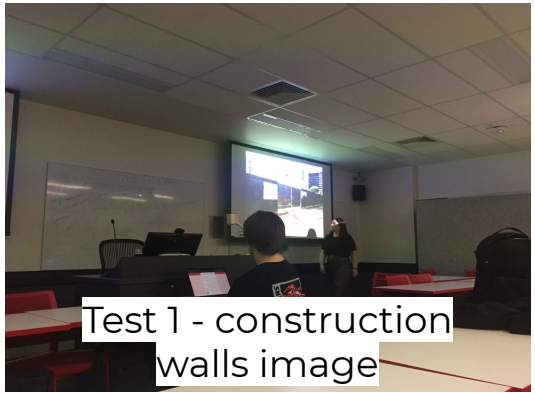
Abstract lighting video screen captures



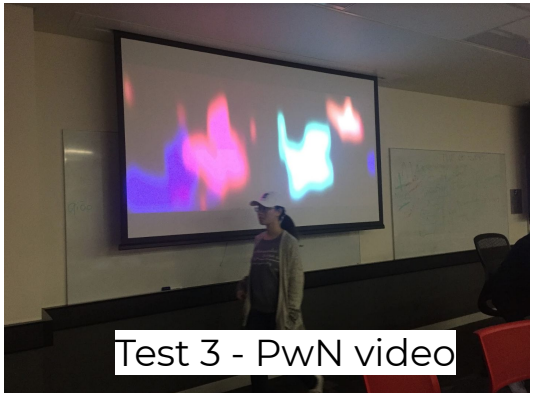
Construction hoarding image

source: Construction Hoarding Image. Retrieved from https://leebrosfencing.com.au/products/hoarding/builders/#gallery-3

Appendix 1 - Painting with Noise user testing pictures

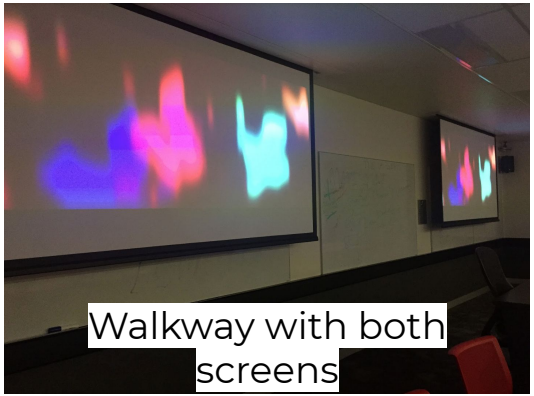


Test 1 - construction walls image



Test 3 - PwN video

Test 1 - PwN video



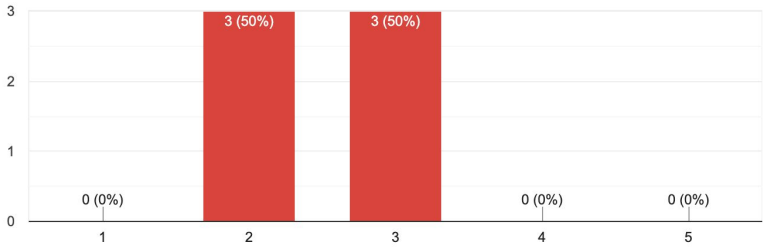
Walkway with both screens

Appendix 1 - Painting with Noise survey results compared

Construction Hoarding

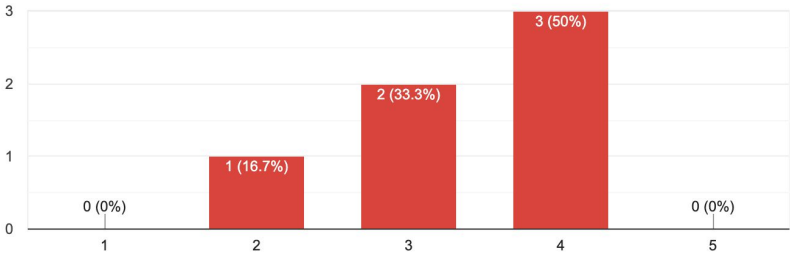
How would you rate your mood?

6 responses



How stressed do you feel?

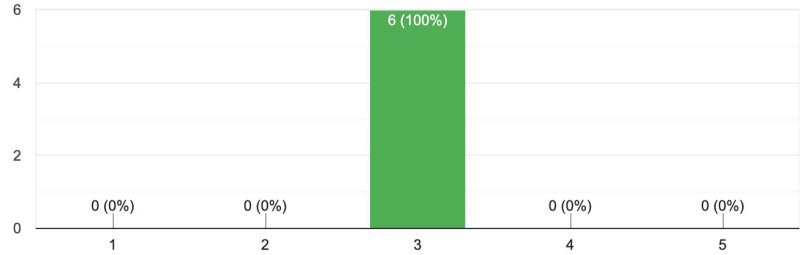
6 responses



Painting with noise

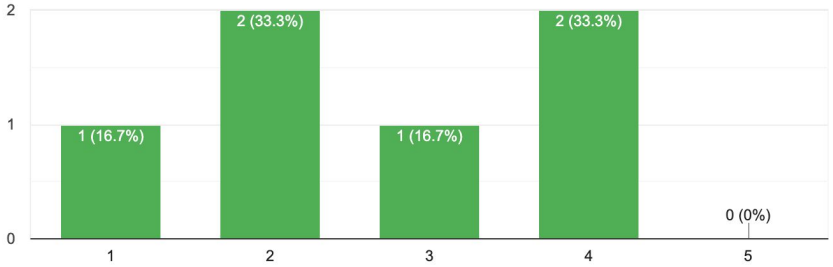
How would you rate your mood?

6 responses



How stressed do you feel?

6 responses

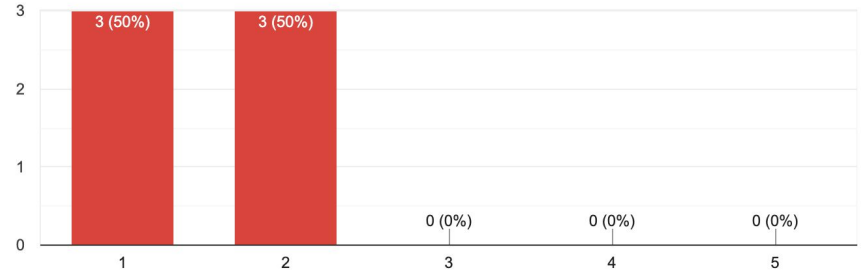


Appendix 1 - Painting with Noise survey results compared

Construction Hoarding

How would you rate the aesthetics of your environment?

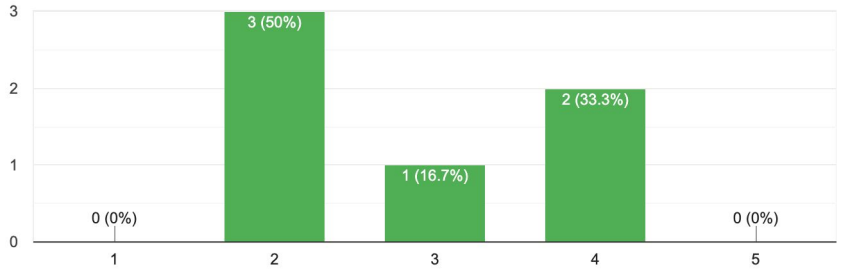
6 responses



Painting with noise

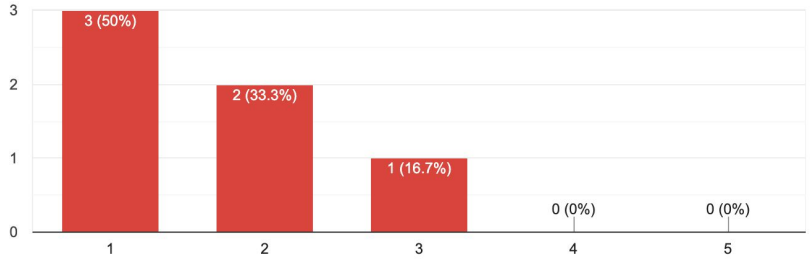
How would you rate the aesthetics of your environment?

6 responses



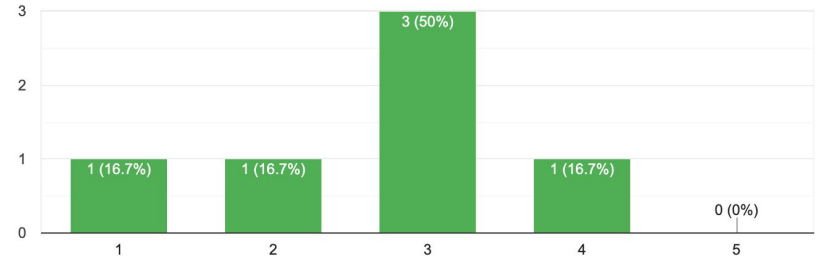
How enjoyable was your overall experience?

6 responses



How enjoyable was your overall experience?

6 responses



Appendix 2 - City Soundscapes focus group + co-creation agenda

Focus Group/Co-creation Workshop Agenda

1. **Introduction: Welcome everyone and thank them for their time.**
    a. This focus group and co-creation workshop is part of our final interactive product design studio where we design and build a product that augments urban experiences in public spaces. Think smart cities if that helps. My team's chosen problem area within this scope is noise pollution.
        i. *This is an important issue as it negatively affects productivity and personal health, causing distraction from work, disrupted sleep and is detrimental to health and wellbeing. By augmenting the urban experience of noise pollution and giving people more agency regarding environmental noise we can create a more positive atmosphere for individuals, improving their wellbeing, and benefitting society as a whole.*

2. **Setting Context:**
    a. The first half of tonight will consist of a focus group discussion to gain feedback about a number of concepts.
    b. In the second half we will move into the co-creation workshop where we will collaboratively explore and design one of these concepts together.

3. **Focus Group: Part A**
    a. I will hand each of you a slip of paper which will show the name, description and visualisation of a concept.
    b. Take a couple of minutes to look it over and read it through, I'll then briefly go over the concept and answer any questions.
    c. After that I will get you to turn the piece of paper over to the blank side.
    d. Now rate the desirability of the concept between 1 and 10 and write it down - with 1 being not desirable at all and 10 being highly desirable.
        i. *When I say desirability I want you to think about how much you **want** the concept. So think about not only how much you like the concept but also how much you would want to engage with or use it.*
    e. Okay so put your hand up if you gave a rating of *1… 2… 3… continue to count up to ten…*
    f. Choose 2-3 participants to discuss their ratings
    g. Facilitate group discussion

    REPEAT FOR EACH CONCEPT

Appendix 2 - City Soundscapes focus group + co-creation agenda

4. **Focus Group: Part B**
    a. Now that you have all three concepts I want you to rearrange them in order of *desirability*.
    b. Order them in front of yourself from left to right so that the most desirable concept is on the left and the least desirable concept is on the right.
    c. Go around the table and get some participants to discuss their arrangements. *(Take photos of arrangements)*

    QUICK BREAK - COLLECT ALL SLIPS OF PAPER

5. **Co-creation Workshop: Overview/Teams**
    a. We will now begin our co-creation workshop which will consist of four activities, some completed as individual and some in teams.
    b. I have already organised teams to mix those who are most familiar with design and technology evenly throughout the teams: So Team A is Jess, Jessie and Lucy and Team B is Harriet, Rachel and Gabby.
    c. Please move so that you are sitting with your team.
    d. A quick overview of this workshop.
        i. I'll introduce the concept we'll be designing an interface for, then in teams you'll start brainstorming some ideas about who would use the concept and what their needs are.
        ii. Then you'll individually do some rough scribbles and sketches, after that you'll come back together as a team to create a master sketch of the interface.
        iii. And finally each team will then stand up and do a two minute mini pitch of their final interface followed by questions and feedback from the other team.
    e. Don't worry I will be running through each step as we go along.

6. **Co-creation Workshop: Issuing the Brief**
    a. The concept we will be designing together is concept two, City Soundscapes.
    b. We will be designing what the web interface would look like and its functionality. So basically what you would see if you opened it up on your computer or laptop.
    c. Reintroduce City Soundscapes paper slips, rehash it's purpose and who the intended users are.
    d. Ask if anyone has any further questions.

Appendix 2 - City Soundscapes focus group + co-creation agenda

7. **Co-creation Workshop: Discovery/Brainstorming (Teams) - 10 minutes**
    a. Now in teams I want you explore this concept by asking yourselves and each other questions about who would use this concept and what their needs are.
    b. Start brainstorming your ideas and thoughts on post it notes, you'll 10 minutes.
    c. Here are some questions to get you started:
        i. Who would this concept be useful for?
        ii. How should this concept be used?
        iii. How could this concept be used?
        iv. What does this concept need to do to be useful/successful/enjoyable/fun/engaging?

8. **Co-Creation Workshop: Crazy Eights (Individual) - 8 minutes**
    a. Now that we're all warmed up we'll be moving into an individual exercise called 'Crazy Eights' which will help us quickly generate ideas.
    b. Each person will take a piece of paper and fold it into eight boxes.
    c. I'll then set a timer for eight minutes and you will have 60 seconds per box to scribble out an idea or sketch. It can be a button, a feature, a scenario or setting, a tagline…wherever your mind goes.
        i. Your ideas will be bad, obvious, simple, messy and confusing. That's the point.

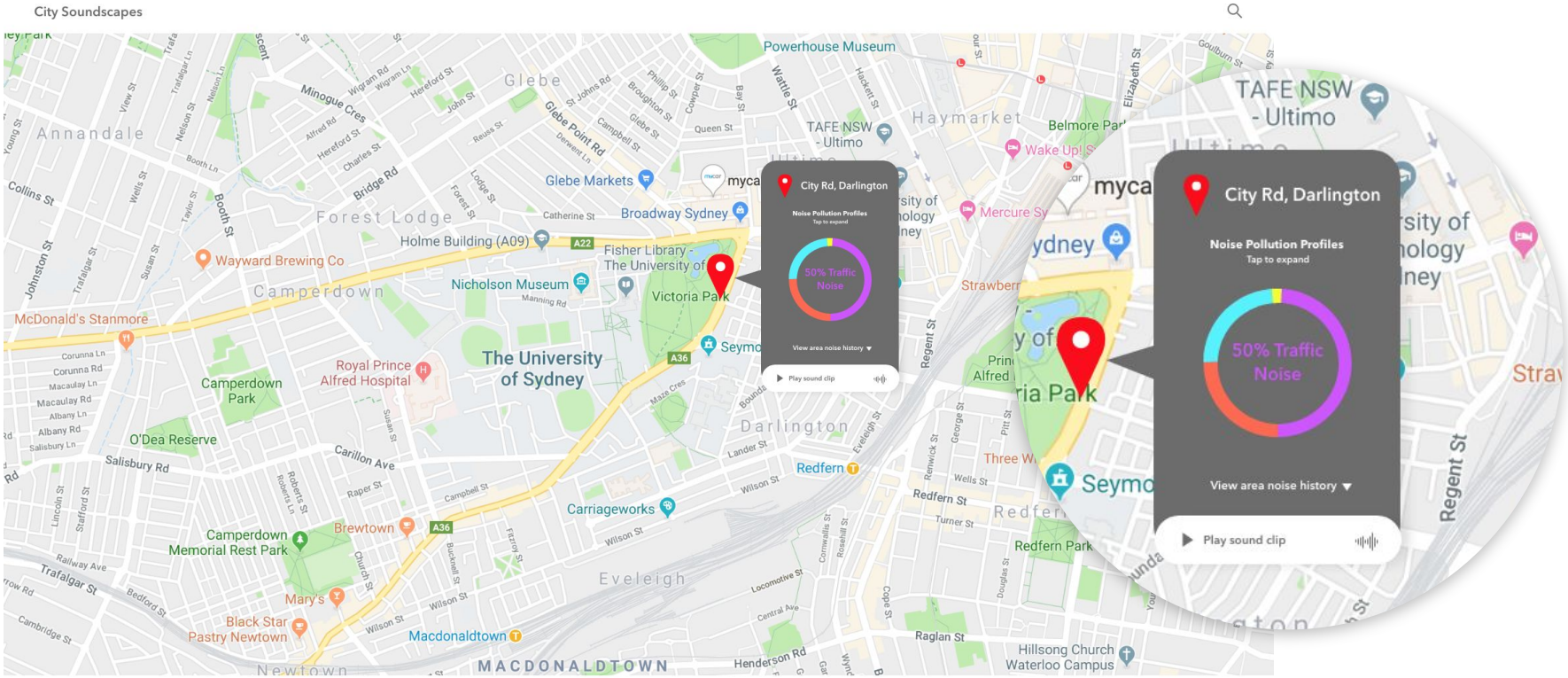
9. **Co-creation Workshop: Team Sketches - 15 minutes**
    a. Now come together in your teams and compare your Crazy Eights drawings.
    b. In your teams discuss and explore the ideas from the drawings, and come to an agreement on the top features or ideas they want to include in one consolidated master sketch. You'll have 5 minutes for this part.
    c. As a team sketch a single layout that incorporates the top ideas. Remember this is going to be a web layout so use your paper in landscape and pretend it is a computer screen.You have 10 minutes to draw this up.

10. **Co-creation Workshop: Mini Pitches/Critiques (Teams)**
    a. Team A stands up and has a two minute pitch of their interface.
    b. Team B asks questions and gives feedback

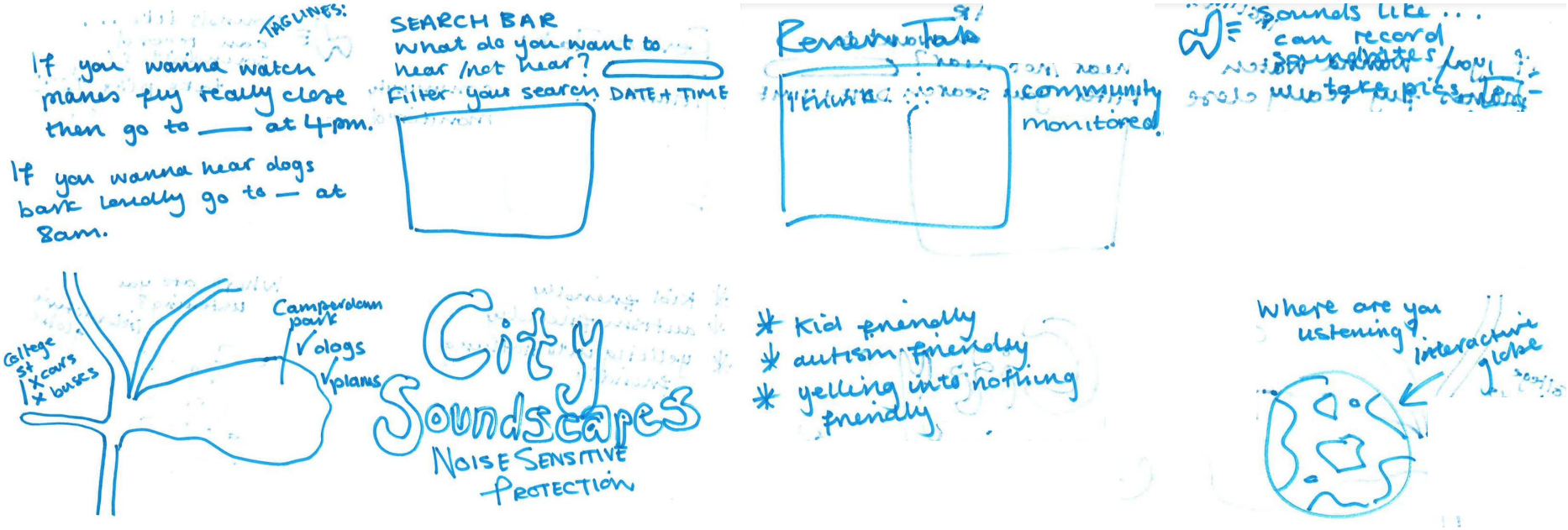
    NOW REVERSE ROLES

11. **Debrief/Wrap Up**
    a. The entire group discusses what common themes emerged:
        i. Which features or ideas stood out?
        ii. Which are most intriguing and exciting?
        iii. What seems most challenging and difficult to achieve?
        iv. Where do we see areas that are clear no-go's?
        v. What must-have's are we seeing?
        vi. What was a challenge?
        vii. What conflicts emerged?

Appendix 2 - City Soundscapes initial interface mockup



Appendix 2 - City Soundscapes co-creation workshop crazy eights



Appendix 2 - City Soundscapes co-creation workshop crazy eights

Email / sms notification

Ability to hold corporation / council accountable through recordings used as evidence

Help people with autism to avoid overstimulation

New Baby / Dog alert in neighbourhood

If neighbours have parties lets / Are ok with parties

Party streets

11 college st is having a party til 12:00am.

Complain through this interface if necessary

Profile

Ratings

Know how busy an event is thanks to noise pollution

Appendix 2 - City Soundscapes co-creation workshop crazy eights

a way to have it so that not everyone can

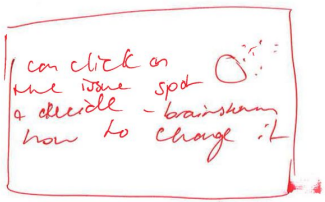
notification box of something happening in the area → enough time to have a say about it

sound bites —

can click on an area & hear what the noise is like / time of day.

routes to take to avoid noise → like as a function on google maps for people with disability.

community way to engage



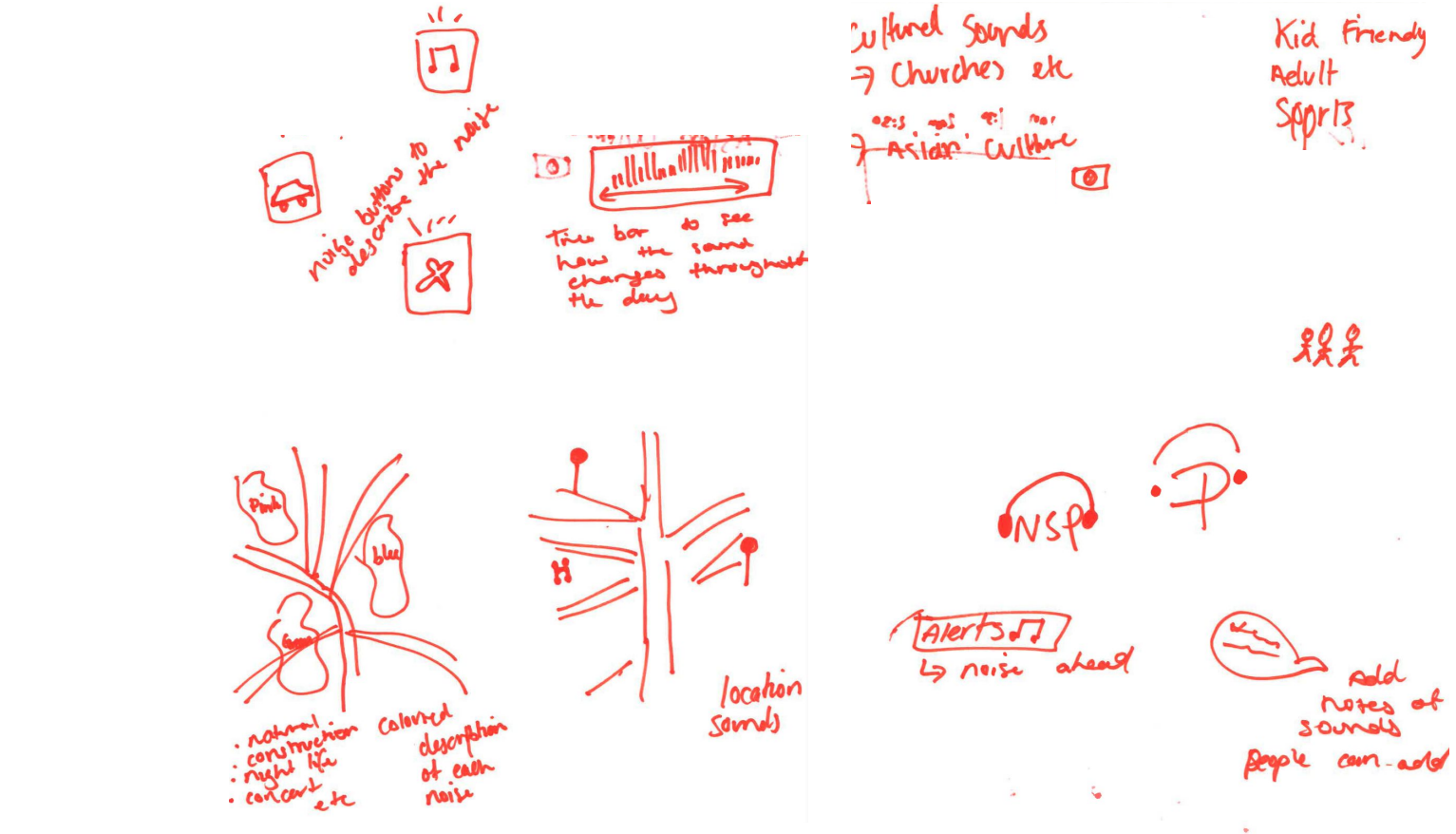
construction-o-meter

every area has a way to know times of construction.

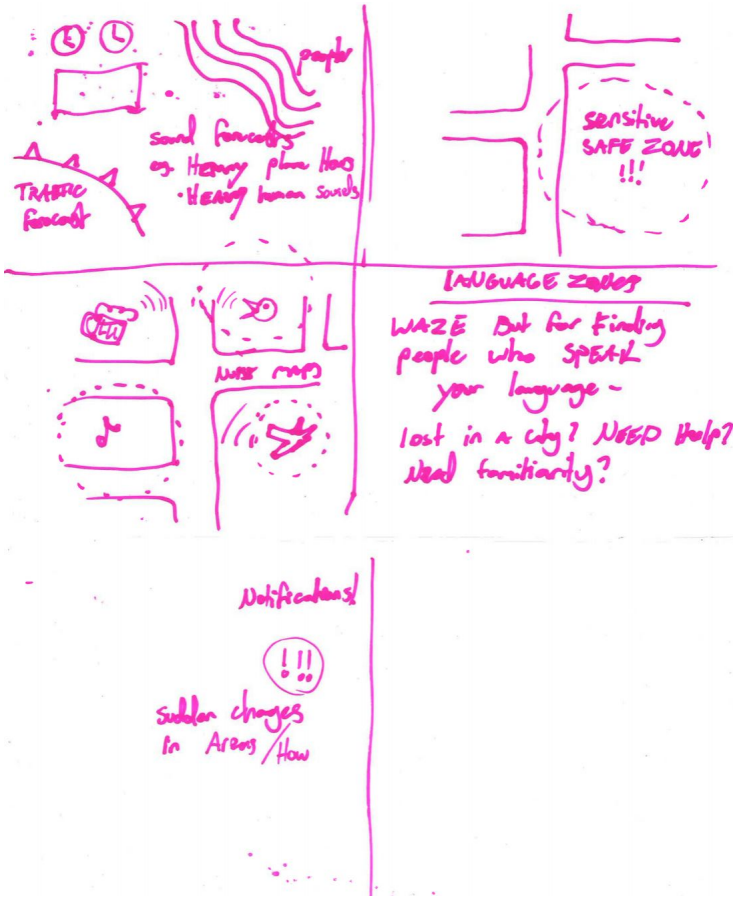
holding council accountable → the community knows what is acceptable

a way to notify people in the area of something with noise i.e. party.

Appendix 2 - City Soundscapes co-creation workshop crazy eights

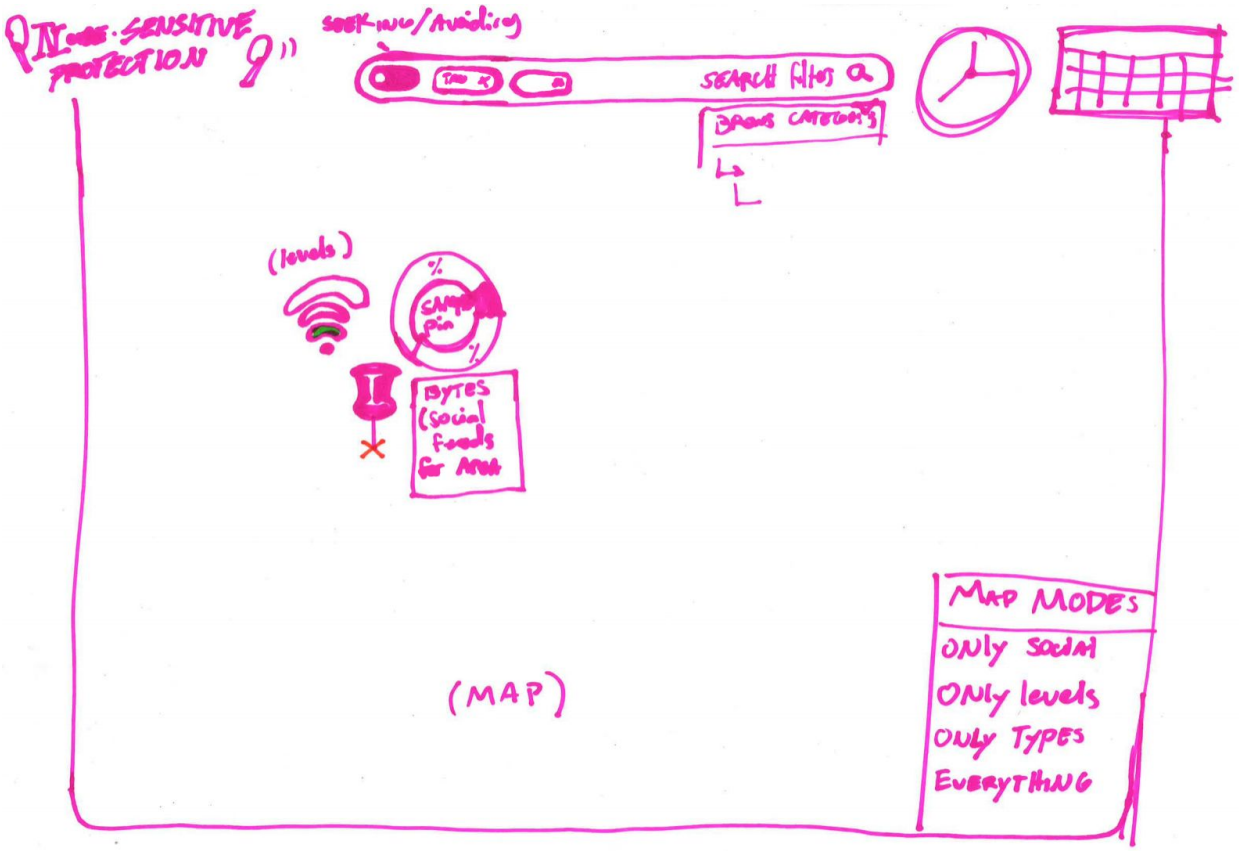


Appendix 2 - City Soundscapes co-creation workshop crazy eights



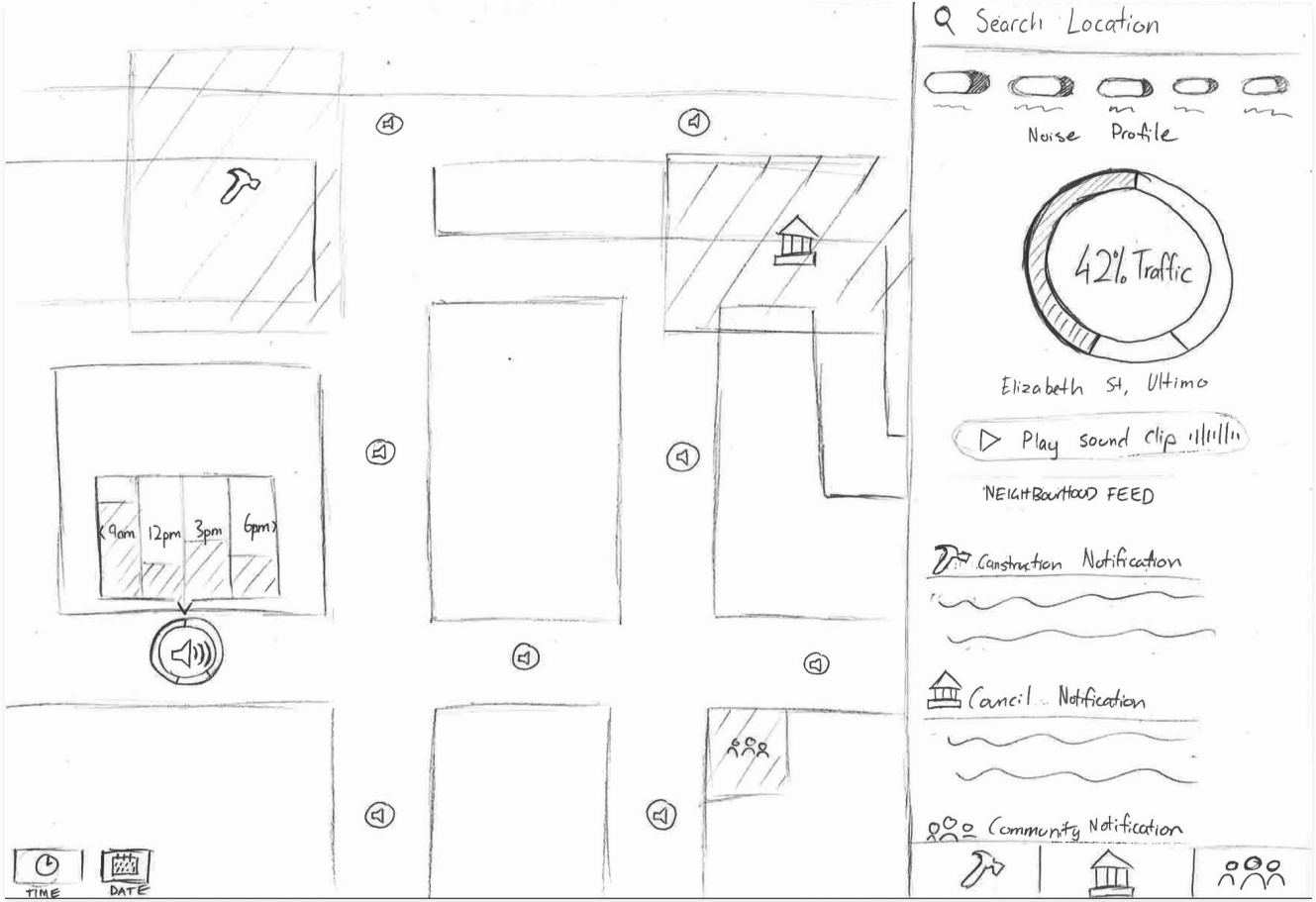
Appendix 2 - City Soundscapes co-creation workshop team post it note ideas

Appendix 2 - City Soundscapes co-creation workshop interface #1 sketch

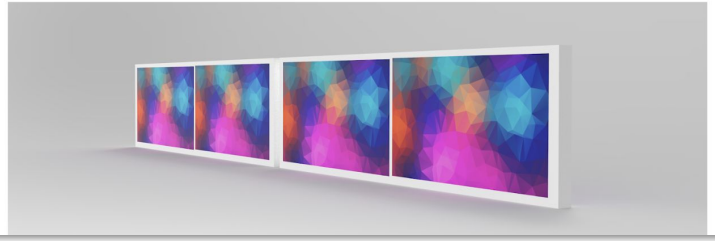


Appendix 2 - City Soundscapes co-creation workshop interface #2 sketch

Appendix 2 - City Soundscapes Lo-fi Prototype



Appendix 3 - Focus Group (Painting with Noise)



Utilizing interactive digital construction walls **Painting with Noise** records noise levels from undergoing construction and translate the noise into “paint”, displayed as colourful light on the large canvas that is the construction wall.

The wall will have densely packed, systematically distributed sensors from top to bottom, recording audio levels throughout the day. On the front side of the unit (the facade facing the street), it will have a *LED curtain* surface (underneath a protective layer) - similar to a screen. The LEDs will work as a measurement of noise, measuring the average noise levels throughout the day - visualising the noise as colourful light, based on how much noise is hitting the specific area of the unit.

The idea is that, with time you can see where noise pollution has been high and where it has been low, visualized as a beautiful life-like gradient painted across the construction walls.

Concept Overview (given to participants)

Desirability Rating (1-10)

P1 - 7

P2 - 6

P3 - 9

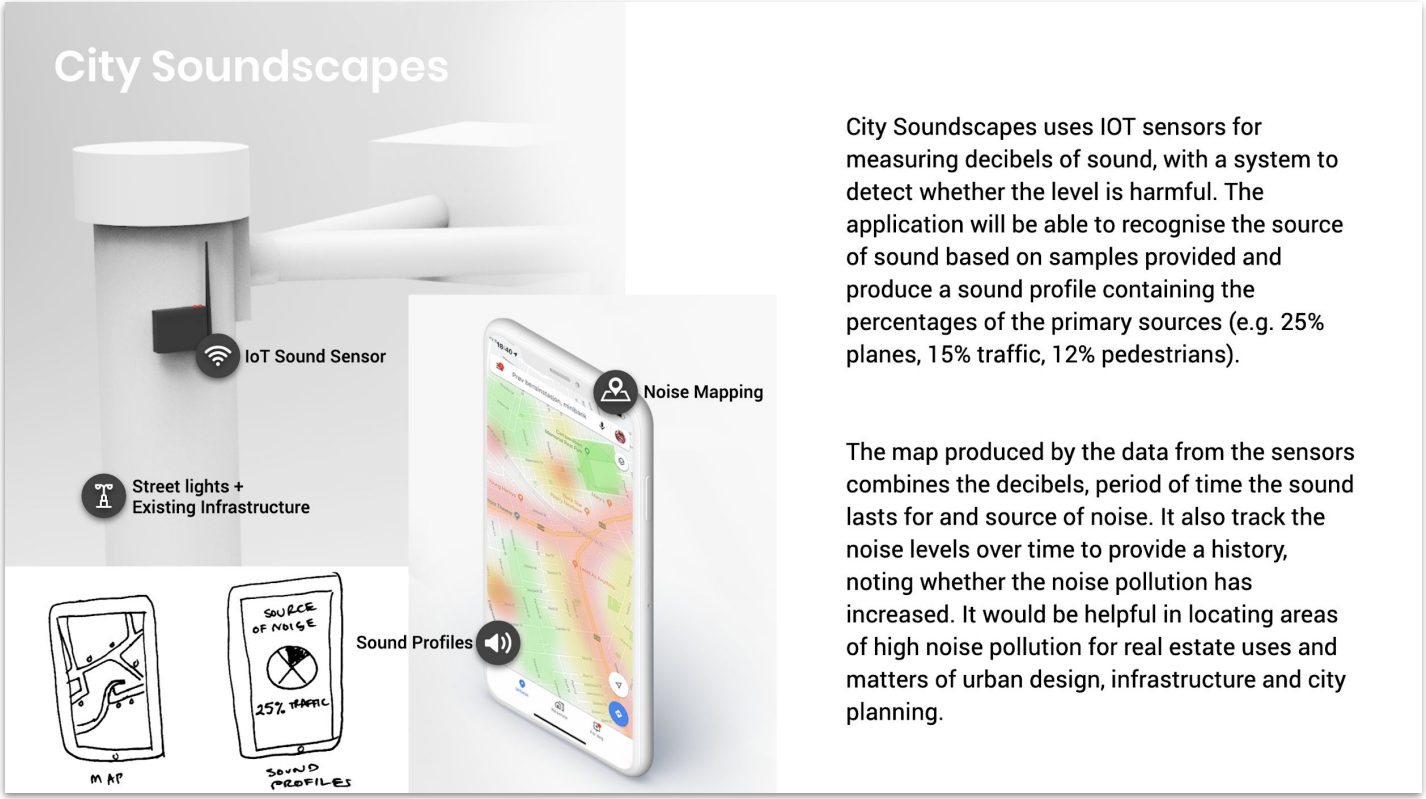
P4 - 7

P5 - 7

P6 - 6

Overall - 42/60

Appendix 3 - Focus Group (City Soundscapes)



Concept Overview (given to participants)

Desirability Rating (1-10)

P1 - 6

P2 - 8

P3 - 6

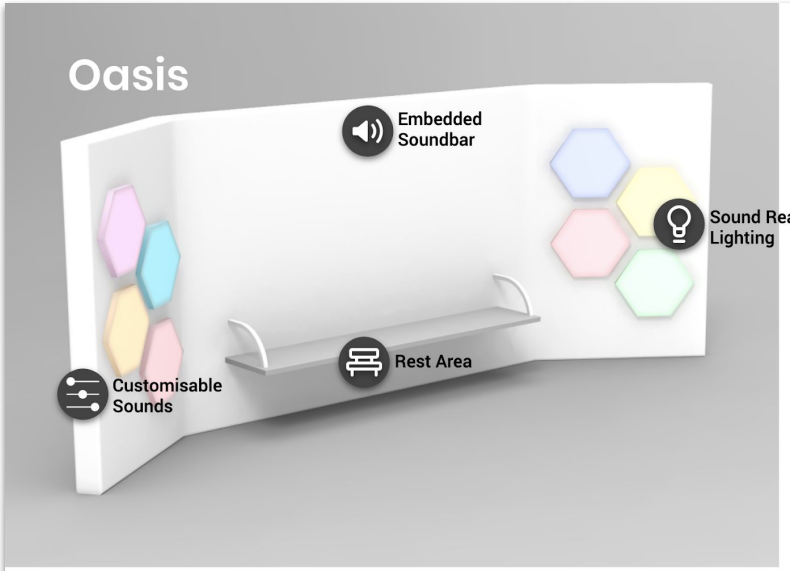
P4 - 7

P5 - 6

P6 - 6

Overall - 39/60

Appendix 3 - Focus Group (City Soundscapes)



Oasis uses sound shields which create pockets of tranquility within busy and chaotic urban parks and greenspaces. It transforms traffic noise into more pleasing and relaxing listening environments for those resting at Oasis.

Oasis also includes ambient lighting that responds to the sound, heightening the calming experience. These individual light features can also be physically turned to customise the listening experience. With each light corresponding to a specific natural or ambient sound that will then be layered with the background sound. This means that individuals can create their own ideal soundscape to enjoy.

Concept Overview (given to participants)

Desirability Rating (1-10)

P1 - 4

P2 - 8

P3 - 9

P4 - 9

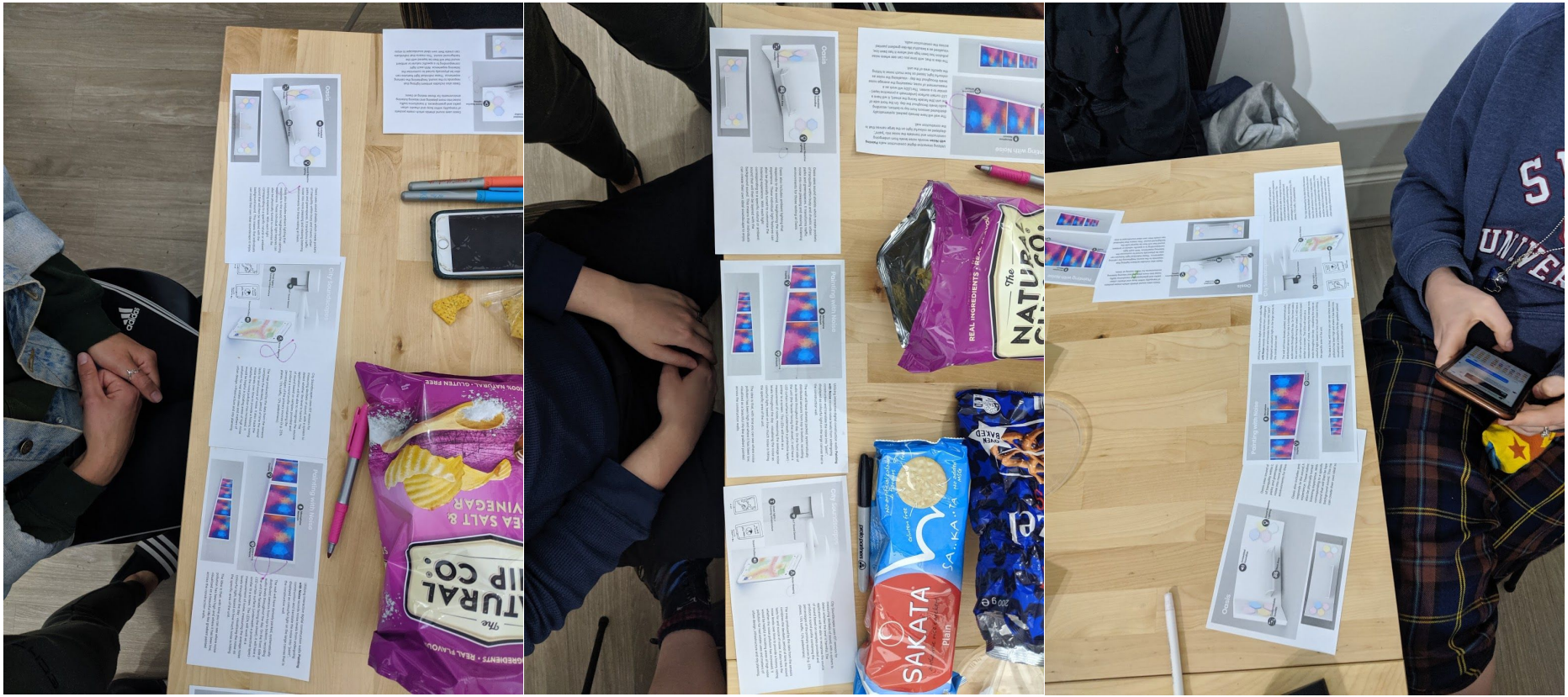
P5 - 8

P6 - 8

Overall - 46/60

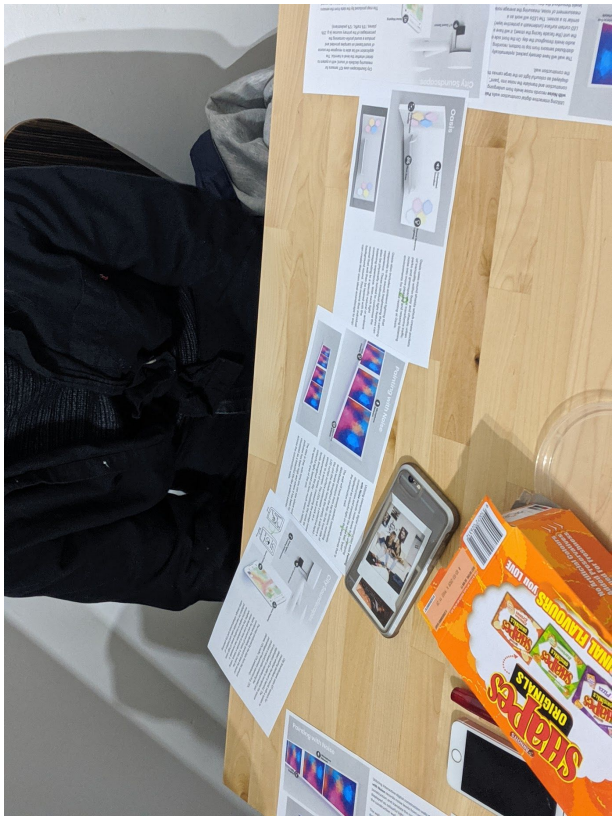
Appendix 3 - Focus Group (Ranking All Concepts)

Rearrange them in order of desirability. (Left - Most Desirable, Right - Least Desirable)



Appendix 3 - Focus Group (Ranking All Concepts)

Rearrange them in order of desirability. (Left - Most Desirable, Right - Least Desirable)



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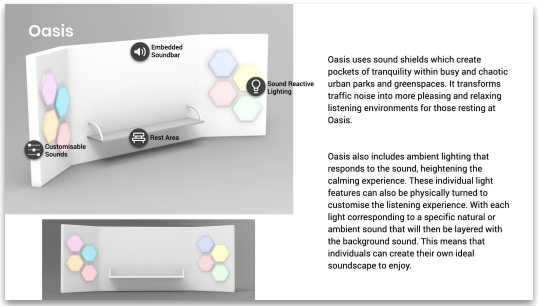

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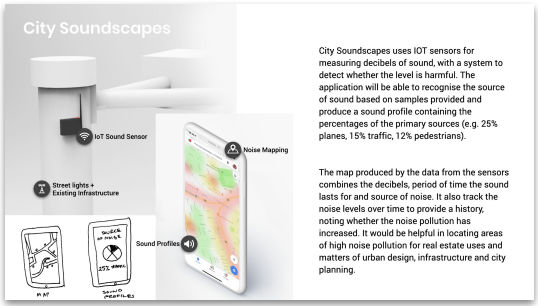

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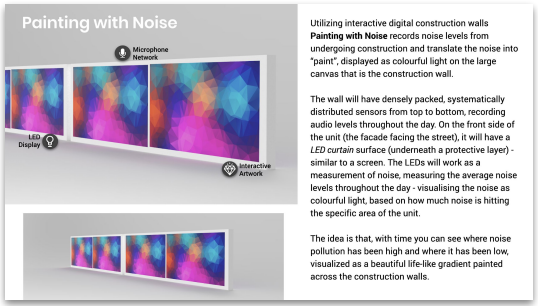

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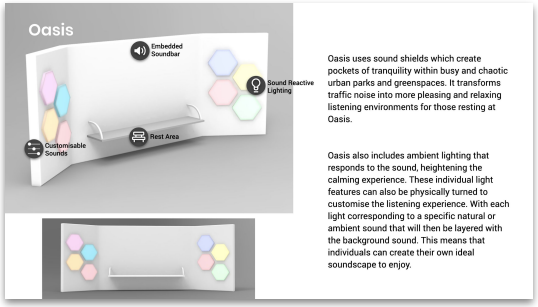

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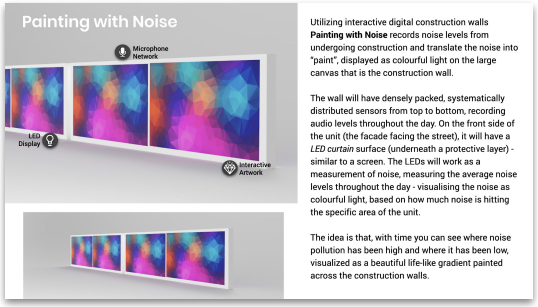

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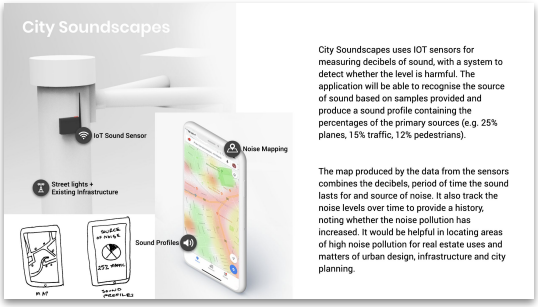

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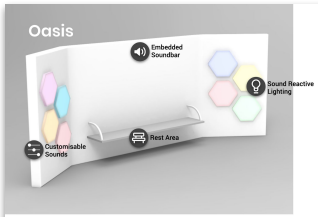

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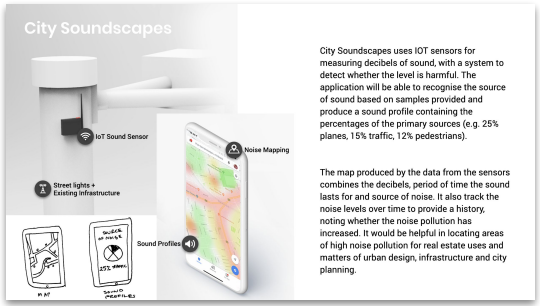

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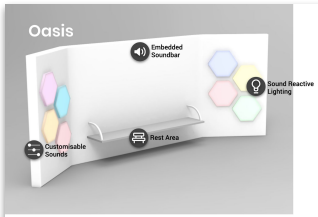

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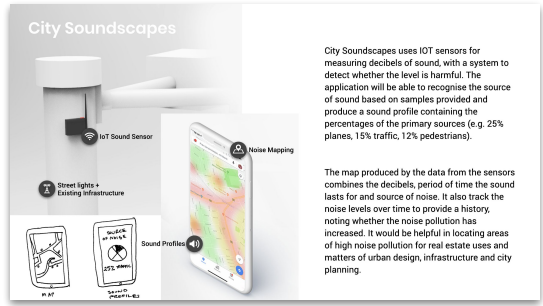

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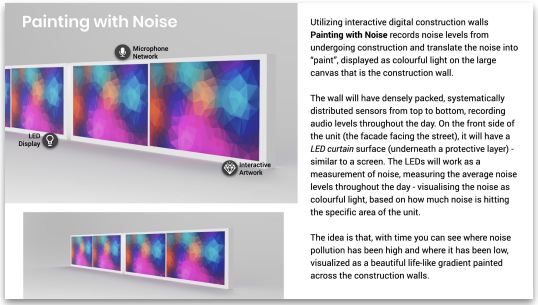

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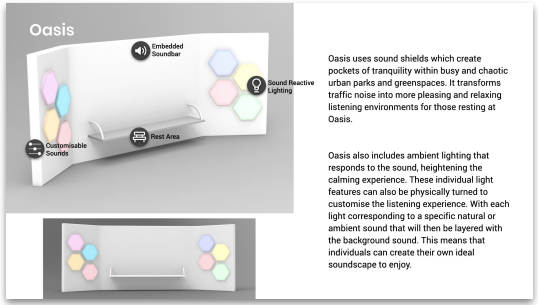

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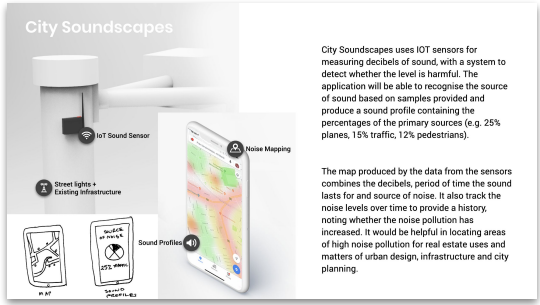

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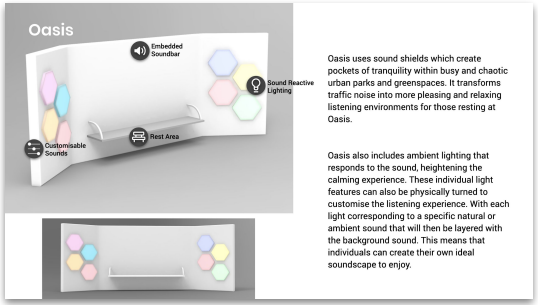

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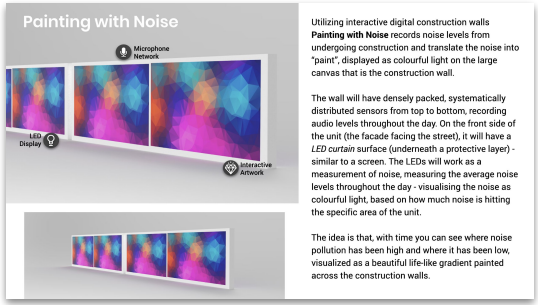

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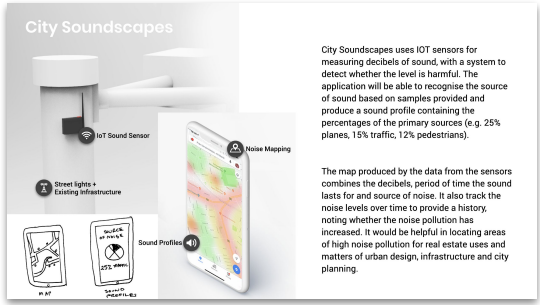

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Appendix 4 - Oasis testing pictures

Test 3 - light disc interaction

Appendix 4 - Oasis observation notes

Test 1

Oasis
Test 1
Noise wall - 5 min
Took a long time listening to both sides
Sit on traffic side of the wall - It sounded like the sound was neutralised there
Didn't realise it was traffic noise

Light
Disc - punch it/play darts, might swing it
Wouldn't think of twisting it – sit disc off the wall to suggest interaction

Test 2

Test 2
Noise wall
Listened on both sides of the wall multiple times - approx 1-2 min
Sat on transformed noise side

More drawn to other side originally, until heard music
Chose oasis side because he noticed music undertones - but took a while to notice
Preferred the oasis musical noise

Light
Don't know if would interact if it was lit up
Might not interact without a sign
Would be intrigued
Spin or press it

Sign says 'spin' would
if hard material then spin rather than press

Test 3

Test 3
Noise wall
Walked around and listened to sounds - stayed on each side of the wall for a few seconds
Sat on traffic side

Originally liked oasis side better, but didn't want to spend a long time there

Oasis had a moody and dark sound
Lighter, natural sound
Ambience is too moody - a bit too ominous

Light
Hit it/tap it - looks like a drum
If could spin - would spin it regularly, but it's not obvious
Would be good to have a sign to move it

Appendix 4 - Oasis observation notes

Test 4

Test 4

Noise wall

‘Is it meant to be an ocean?’
Sat on oasis side
Felt more comfortable
Less drawn to noise of traffic side
Doesn’t like traffic
Wouldn’t pick either
Slightly more peaceful on oasis side

Light

Poke it
‘I wouldn’t touch it if it was a light disc’
Looks like a target - throw something at it
Like a steering wheel
Put arrows or lights to guide you to spin it

Test 5

Test 5

Noise wall

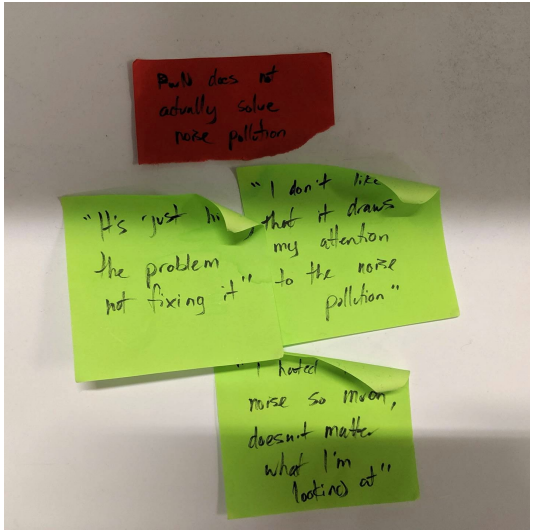
Quickly chose the oasis side
More high pitched noise - more meditative sound
Traffic noise is aggressive
Oasis is too calming - might fall asleep

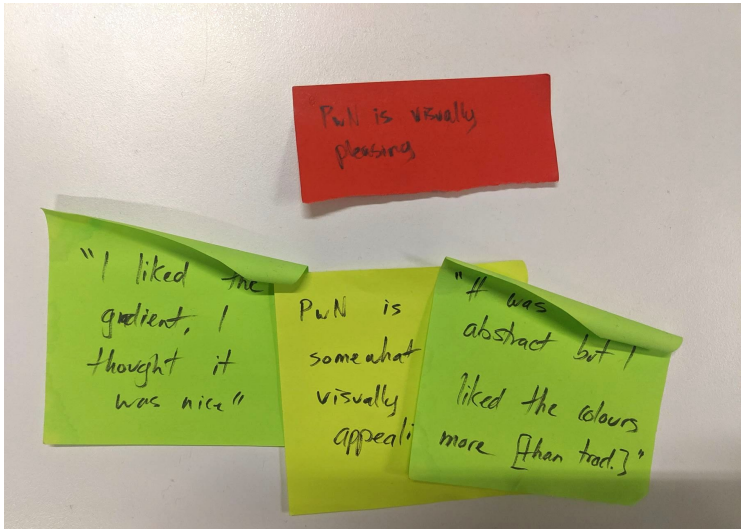
Light

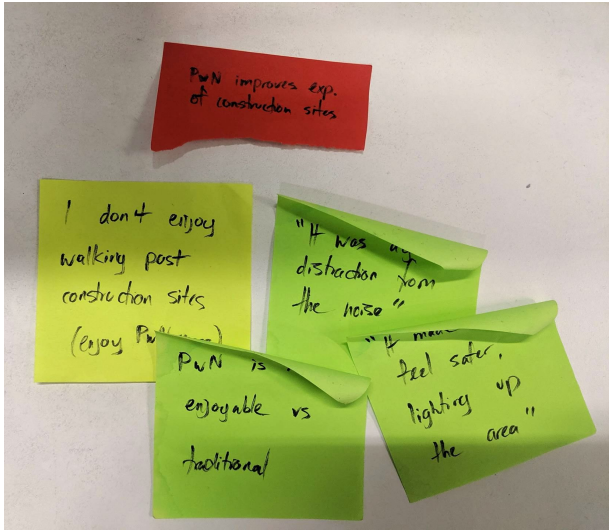
Looks like a drum
Press it - change colour mood
Slide up - change brightness of light
Spinning is like volume dial

Make it clear to spin it - add an arrow on side/top

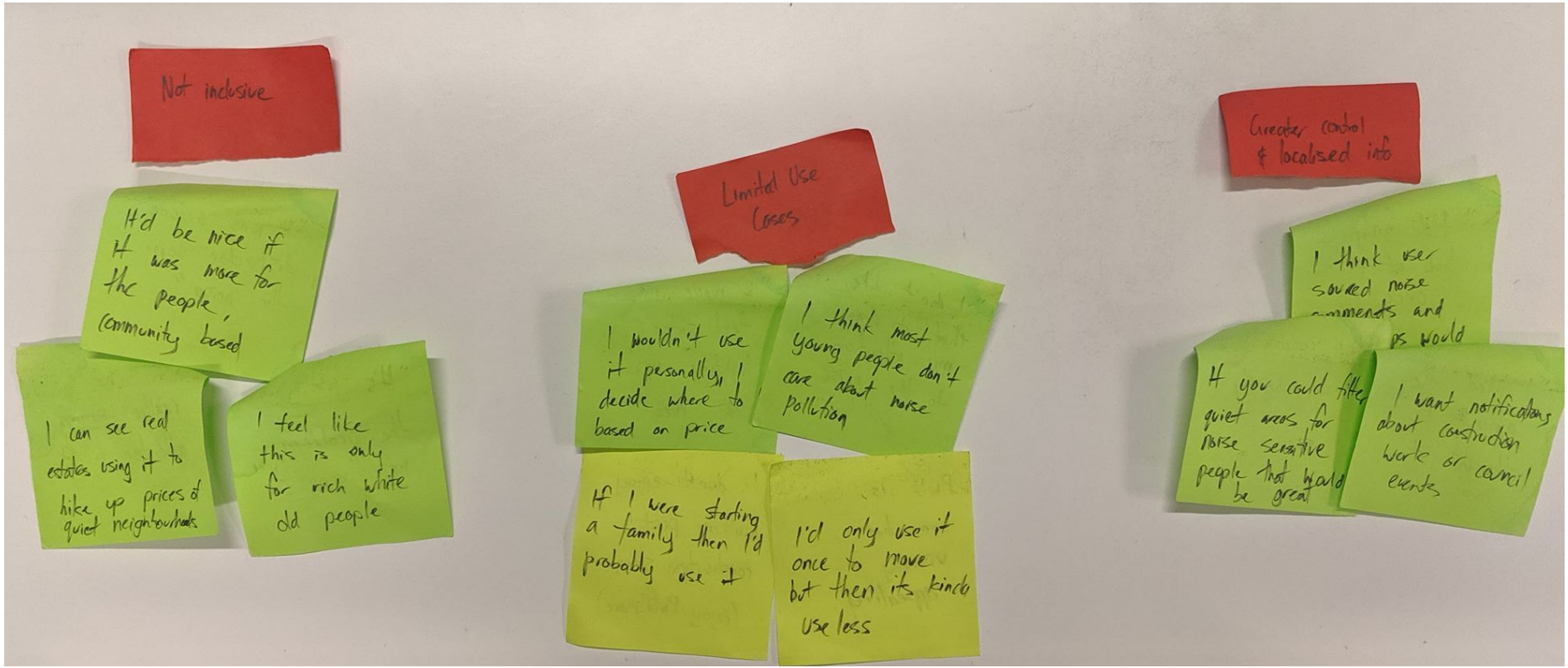
Appendix 5.1 - Painting with Noise affinity diagramming



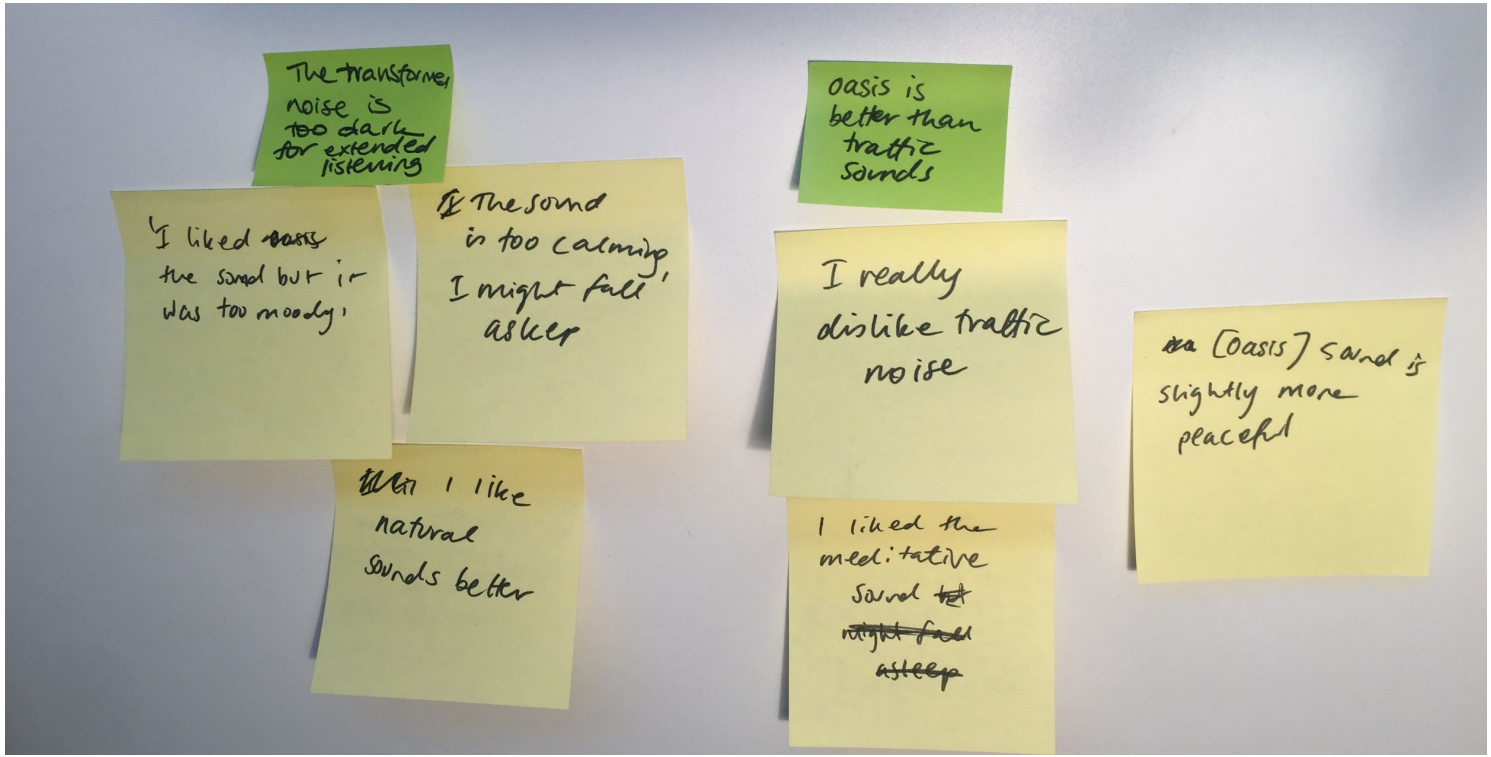




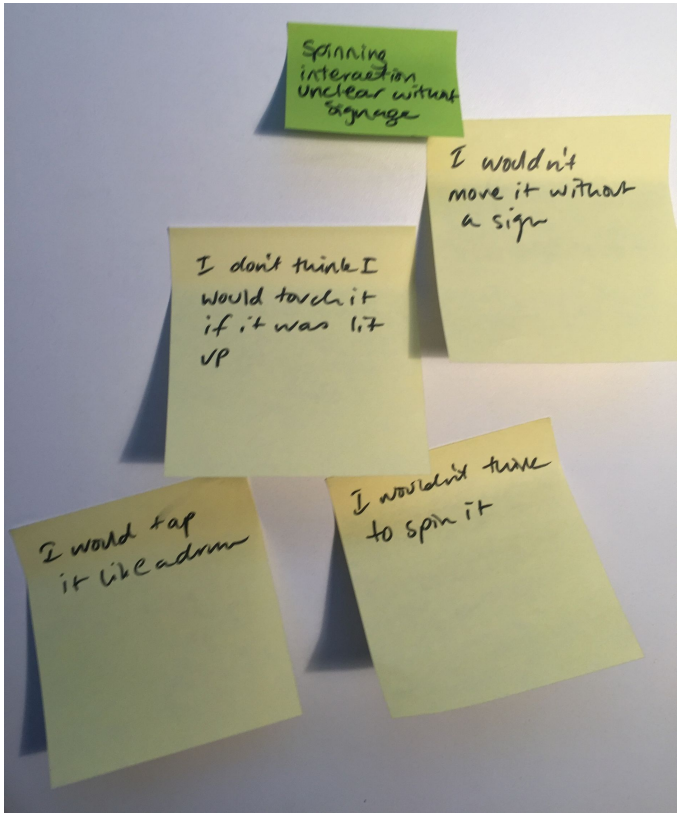
Appendix 5.2 - City Soundscapes affinity diagramming

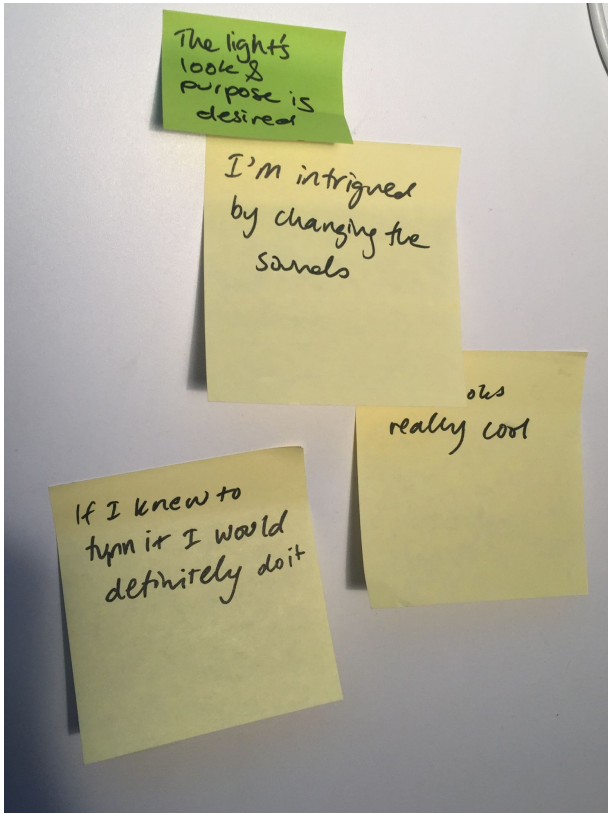


Appendix 5.3 - Oasis (noise transformation) affinity diagramming



Appendix 5.3 - Oasis (light disc) affinity diagramming



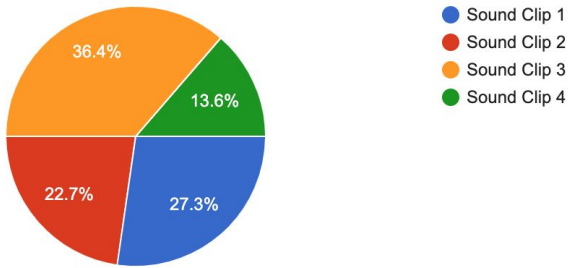


Appendix 6 - Oasis V2 survey results graphs

Preferred soundtrack (track no.3)

The most enjoyable soundtrack is?

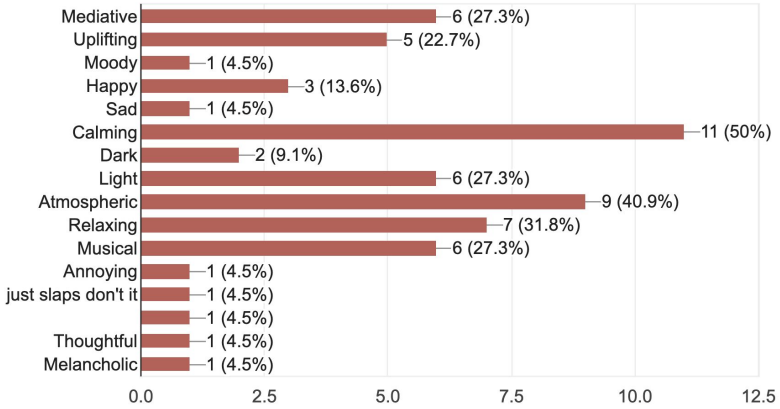
22 responses



Preferred qualities of sound

Please choose three words which best describe this track.

22 responses



Appendix 6 - Oasis V2 survey responses raw data

The most enjoyable soundtrack is?	Please explain why you enjoyed this track most?	Please choose three words which best describe this track.
Sound Clip 3	It feels the most calming and uplifting. I like how emotional it is and would want to listen to this one most.	Calming, Light, Musical
Sound Clip 4	Soundclip 1 is too dark and ominous although I like the ambience of it. SC2 is too horror film-esque although again ambience is good. While SC 3 and 4 are ambient they're bridging further into music which I think would bother me if I was in a park because it's too opinionated mood wise, like I don't want to listen to light guitar strumming or a quiet movie soundtrack overlayed with white noise. I pick SC4 though as it doesn't make me feel gross and unsafe even though it's a bit annoying. I'd want it to have longer and less musically structured chords	Uplifting, Sad, Dark, Atmospheric, Musical, Annoying
Sound Clip 3	I enjoy listening to music - not really a fan of artificial bird sounds & wind chimes. As the sound had more of a rhythm it was easier to focus on to drown out the traffic noise.	Calming, Light, Musical
Sound Clip 3	Sounds nice but they all sound the same on my phone	Happy, Light
Sound Clip 1	Track 1 remind me of a windy day with little distraction that urge you to slow down. It's quite peaceful	Mediative, Calming, Atmospheric
Sound Clip 3	The third sound clip was more calming.	Mediative, Calming, Musical
Sound Clip 2	I found the "chimming" sound relaxing, and unsure if there were bird noises but I found whatever that was most relaxing as well.	Mediative, Atmospheric, Relaxing

Appendix 6 - Oasis V2 survey responses raw data

Sound Clip 3	Didn’t like static noise in any of them but melody was nicest in track 3.	Musical
Sound Clip 3	I enjoyed this track the most as it was more music focused, I prefer to listen to an actual melody when I am trying to pass time or just in general, which is a proven psycological concept (babies react to melodies over white noise). The other tracks when listen in my current context (in a room at uni) did not seem approriate and so became intrusive rather than relaxing.	Uplifting, Relaxing, Musical
Sound Clip 1	bangers	just slaps don't it
Sound Clip 4	had bird chirping	indifferent, was the best out of the clips provided, but all of them were bad
Sound Clip 2	It sounded more soothing but also playful and cheerful	Uplifting, Happy, Light
Sound Clip 1	sounds like what you would hear before slender man jumps you outside of stocky. The reason why i enjoyed in is because it sounds like it was made in a matter of seconds	Atmospheric
Sound Clip 1	Reminds me of Dark Souls	Dark, Atmospheric
Sound Clip 3	Made me feel like I was in a video game. Felt least intrusive/most chill and natural.	Mediative, Calming, Thoughtful
Sound Clip 1	It felt the most soothing and calming which is what I would want in this kind of space. Most meditative and just enough sound to compensate for the background noise	Mediative, Calming, Relaxing
Sound Clip 3	The melodic tune playing over the ambient sound is incredibly soothing and peaceful to listen to.	Uplifting, Calming, Atmospheric

Appendix 6 - Oasis V2 survey responses raw data

Sound Clip 4	Was torn between 3 and 4, but picked 4 because it made me feel calmer over a longer period of time	Uplifting, Calming, Atmospheric, Relaxing
Sound Clip 2	A quieter sound with more southing tones	Mediative, Calming, Light
Sound Clip 2	I really like the bird sounds because they are natural sounding. The others sounded a bit eerie to me.	Calming, Light, Relaxing
Sound Clip 2	I enjoyed the birds and the distant bell sound	Happy, Atmospheric, Relaxing
Sound Clip 1	I've always been drawn to more darker, ambient tones so this track in particular stood out to me the most. I don't find it outright sad, rather a brief reflection following an important time in your life.	Moody, Calming, Atmospheric, Relaxing, Melancholic

Appendix 6 - Oasis V2 Heuristic Evaluation

Heuristic Evaluation - Light Disc

Visibility of system status	When users interact with the light disc, the user is given audible feedback, there is no visual feedback given to the user. However, as this interaction directly affects audio, this amount of feedback is appropriate and given in real time as they interact.
Match between system and the real world	Oasis comes complete with a bench, providing a trivial, real world object, invites users to sit within the Oasis environment. In terms of the light disc interaction, users initially had trouble knowing how to interact with the disc or even knowing if they could interact with the disc. Perhaps a visual or tactile cue could improve the feasibility of the disc interaction
User control and freedom	The interaction of each light disc is circular in motion, users can turn the disc either clockwise or anti-clockwise with a stopping mechanism that is physically integrated into the disc itself, specially the back plate which has a laser cut canal with a screw in it. This physically stop the disc from rotating more than 180 degrees.
Consistency and standards	Each interaction for the 6 discs is identical except for the output of each interaction, that is the specific sounds pertaining to the specific discs.
Error prevention	Possible errors that could occur is overturning the disc when trying to decrease or increase volume. This is avoided by including a stoppage mechanism that allows users to know when they have reach maximum/minimum volume.
Recognition rather than recall	As each interaction is identical, once the users understand the rotation interaction for one disc, they can apply that knowledge to the remaining five.
Flexibility and efficiency of use	Novice users will interact with each disc to see what sound elements the prefer and want to apply. Returning users can go right ahead and change rotate the discs to the elements they already know they prefer, allowing them to begin their experience in less time
Aesthetic and minimalist design	Oasis does not come with any dialogue; users learn to use Oasis by exploring the interactions.
Help users recognize, diagnose, and recover from errors	Currently there is no way to display or project errors. As the main feedback given to the user is audio, perhaps an audio error tone can be played to tell they user that an error has occurred.
Help and documentation	Currently there is no help or documentation.