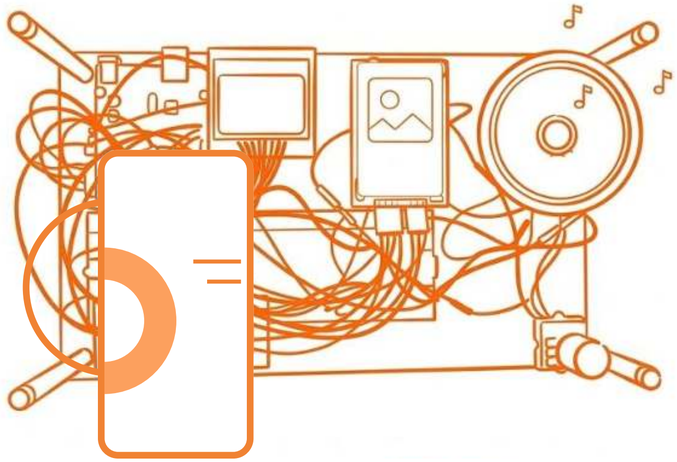
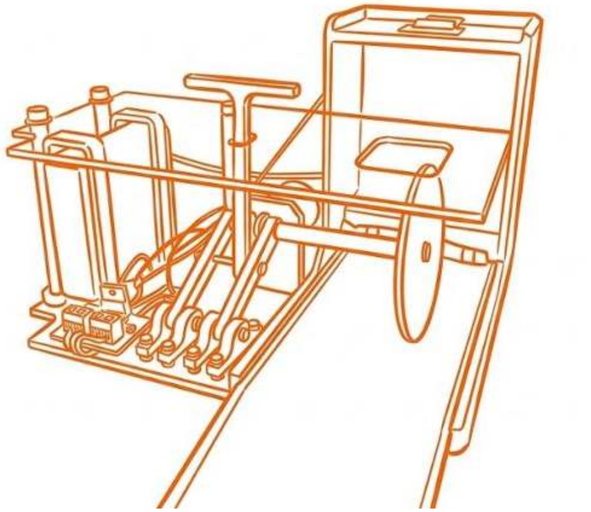
MUSIMORY

DM2601 MEDIA TECHNOLOGY
AND INTERACTION DESIGN

WORKBOOK

GROUP 5
OANH PHAN
JOLINE FRISK
MATTIA METRY
WENYU GAO



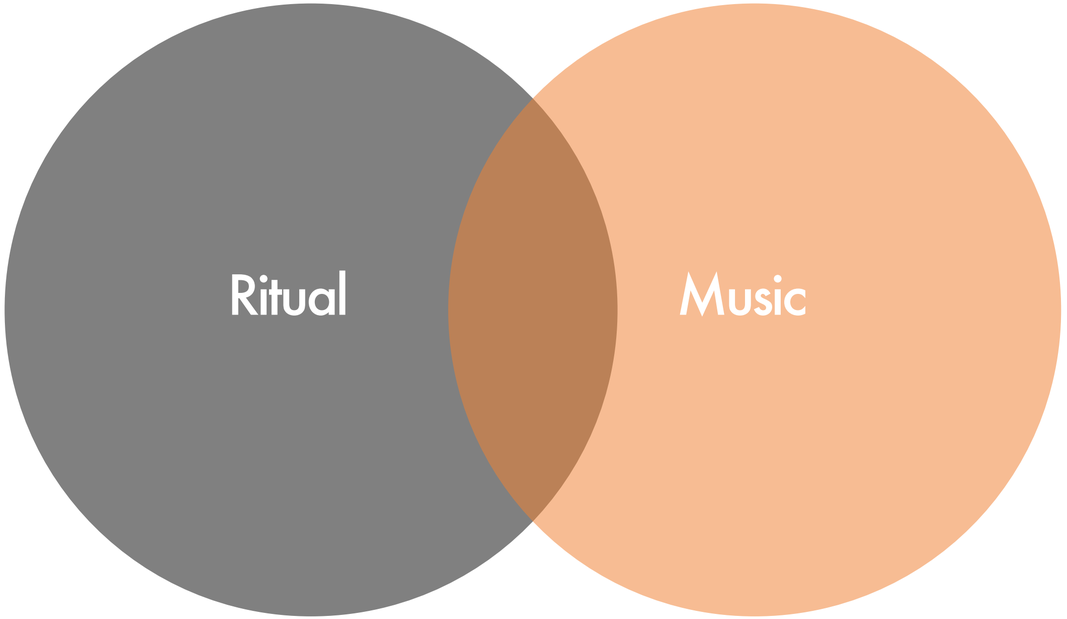


Interpretation of the design brief.

A ritual is some thing you do very intentionally. You specifically take time out of your daily life, maybe even use it to break out of your habits / auto-pilot life and connect with it on a much deeper and more meaningful way.

Music is a big part of people's life, dating back a history of thousands of years. Its been used in rituals celebrations and group gatherings to invoke emotions as well as community.

People of today listening, choosing, and discovering music actively or passively, whether it be through physical or digital mediums. And it does not have the same interactive experience as it has had.



DISCOVER

Section 1

DIVERGE
What is the nature of the problem

Brainstorming

Music	people listen to music in both mundane activities and rituals	physical (vinyl, CDs, tapes or digital records	physical (vinyl, CDs, or digital records
End of life	of human of pets of a service of a physical product of a game of clothes/ childhood toys	emotional attachment	creating a new ritual
Sports	for those getting into sports for those are already into sports	rituals for the fans rituals for the athletes before the match (superstitious) vs after the match (celebrating rituals)	
Environment	change break	starting a new ritual to break a previous bad habit	a tool to review your current environment to break habit or be better in something (be more productive)
Special occasion celebrations	birthday finishing master's degree anniversary	distance student that go on broad study family intimacy	physical → digital • Life presentation • important updates from diary • friend gathering & life updates •





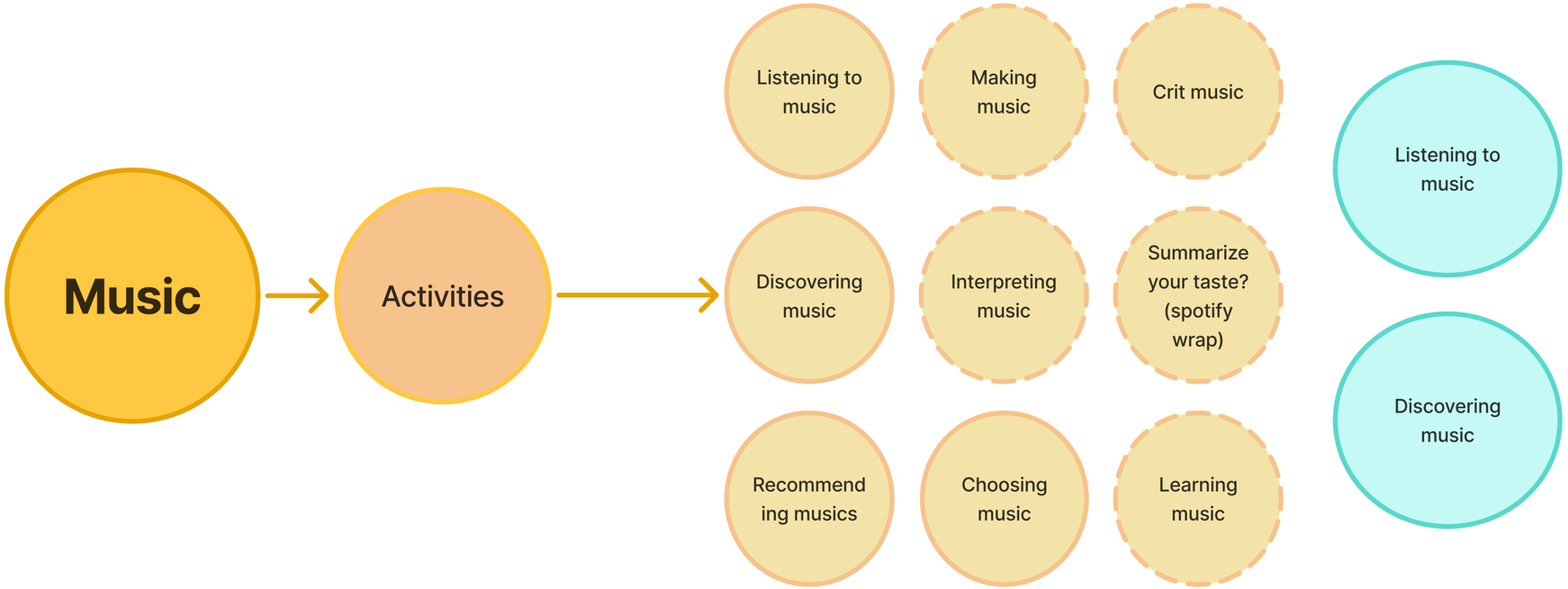
digital → physical
- game players can gather and meet physically
- a element that could ignite the physical meet-up

information security
who have access
only viewable to a few

"We first conducted a **brainstorming** session to generate a broad pool of ideas, from which we shortlisted the **top 5 most promising concepts**, and ultimately v**oted on music as our core direction."**



Deconstructing the Music-Listening Gesture Sequence



Active

musics through physical tools (CDs, Vinyl, Radio stations)

musics through platforms (sportify, apple music, ...)

musics through live performance

Passive

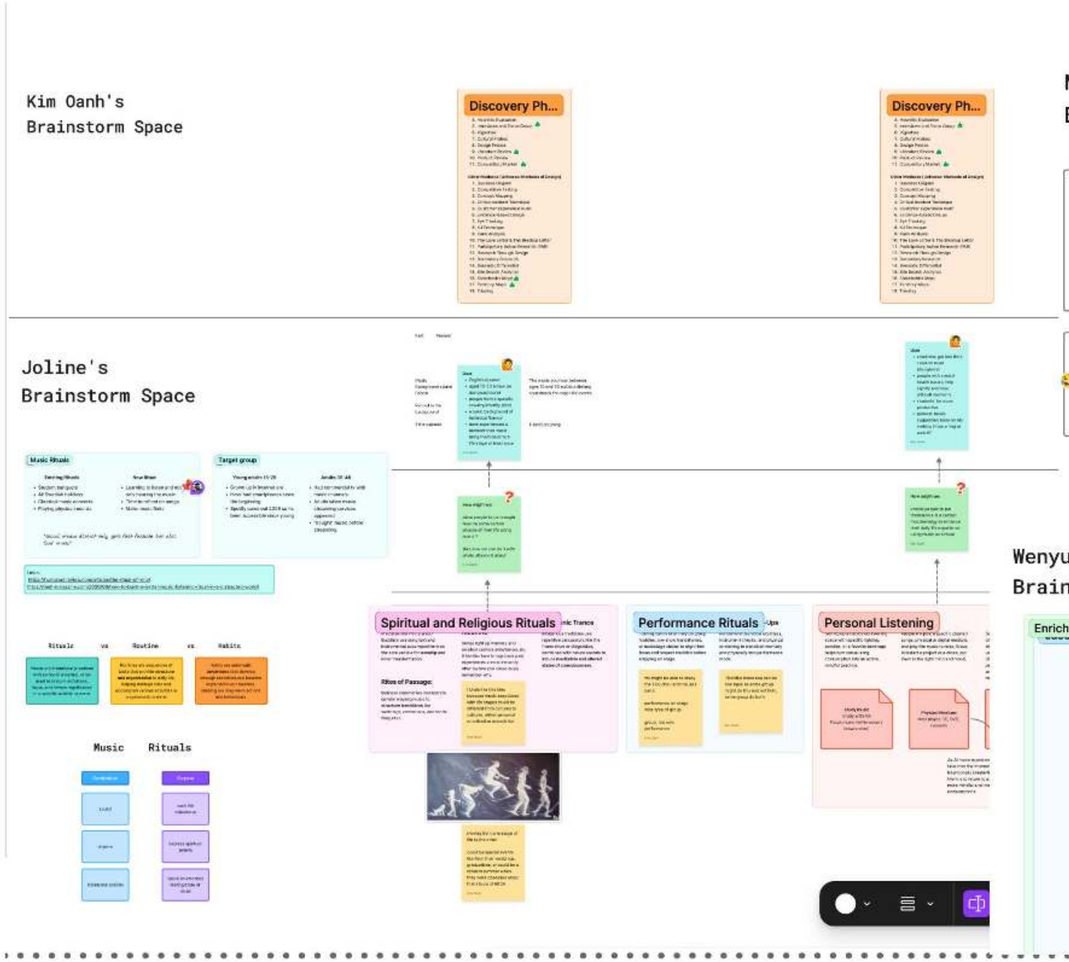
musics through short form content

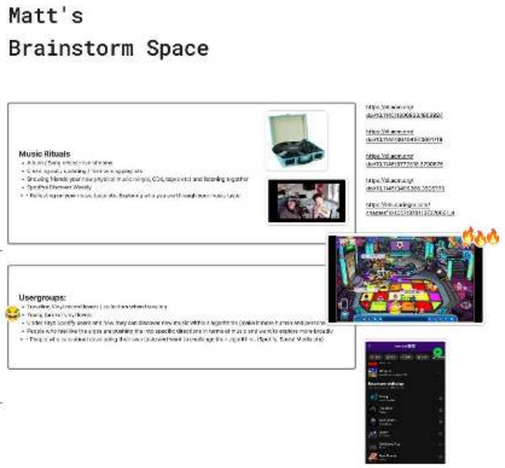
musics through other people's

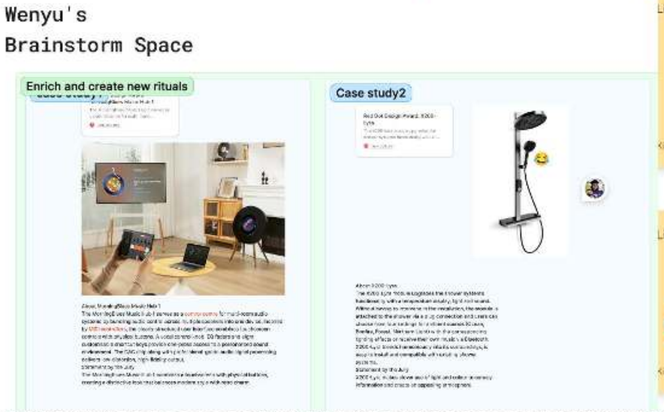
musics through places like station, malls, stores, restaurant, theme parks for specific commercial purposes

Individual Discovery & Voting

Each team member explored benchmark systems and inspiration cases to translate the abstract concept of "Ritual" into concrete interaction mechanisms.









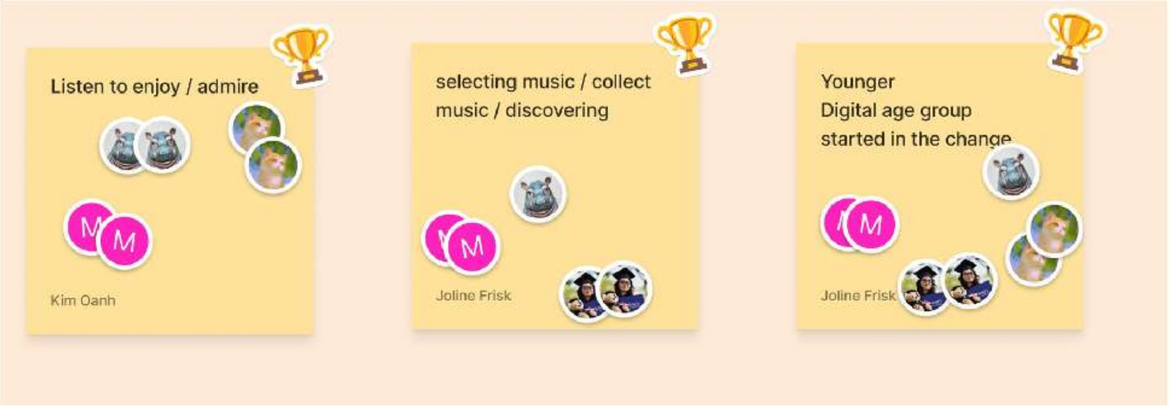
2 SEP

Target users and Context

Music as a Ritual

When looking at music as a ritual, we want to focus on a younger music-listening audience, mainly digital natives. They have grown up with streaming platforms and instant access to almost any song, so they have not really experienced the older rituals of buying, ripping, collecting, and sharing music.

We want to support people who want to be more intentional about how they select, collect, and discover music.



Our Main Target Audience

- Young adults aged 18–24
- Primarily Gen Z
- Grew up in a predominantly digital environment
- Have a strong interest in music and want to engage with it more deeply
- Are interested in transitioning towards a more human, personal, and tactile music experience

Plan for Data Collection

Discovery Phase Methods

1. Contextual Inquiry
2. Task Analysis
3. Ethnography
4. Heuristic Evaluation
5. Interviews and Focus Group 👍
6. Vignettes
7. Cultural Probes
8. Design Probes
9. Literature Review
10. Product Review
11. Competitor / Market 👍

Other Methods (Universal Methods of Design)

1. Business Origami
2. Competitive Testing
3. Concept Mapping
4. Critical Incident Technique
5. Customer Experience Audit
6. Evidence-based Design
7. Eye Tracking
8. KJ Technique
9. Kano Analysis
10. The Love Letter & The Breakup Letter 👍👍
11. Participatory Action Research (PAR)
12. Research Through Design 👍
13. Secondary Research
14. Semantic Differential
15. Site Search Analytics
16. Stakeholder Maps
17. Territory Maps
18. Triading

"We discussed a wide range of research methodologies and initially considered Research through Design (RtD) as a comprehensive and in-depth approach. However, based on feedback received during a tutorial, we learned that RtD is typically used for design research and usually requires a long timeframe to complete, making it less suitable for our course constraints. Therefore, we decided to adopt user interviews, Competitive Market Analysis and Literature Review to gather data, as our primary goal is to capture users' authentic lived experiences."

01. Interviews and Focus Group

Either individual or as a Focus group.
We intend to ask more follow-up question after the love/breakup letters.

After coding, if we find appropriate (shared/ highly contrast opinion), we will go it in individual or group.

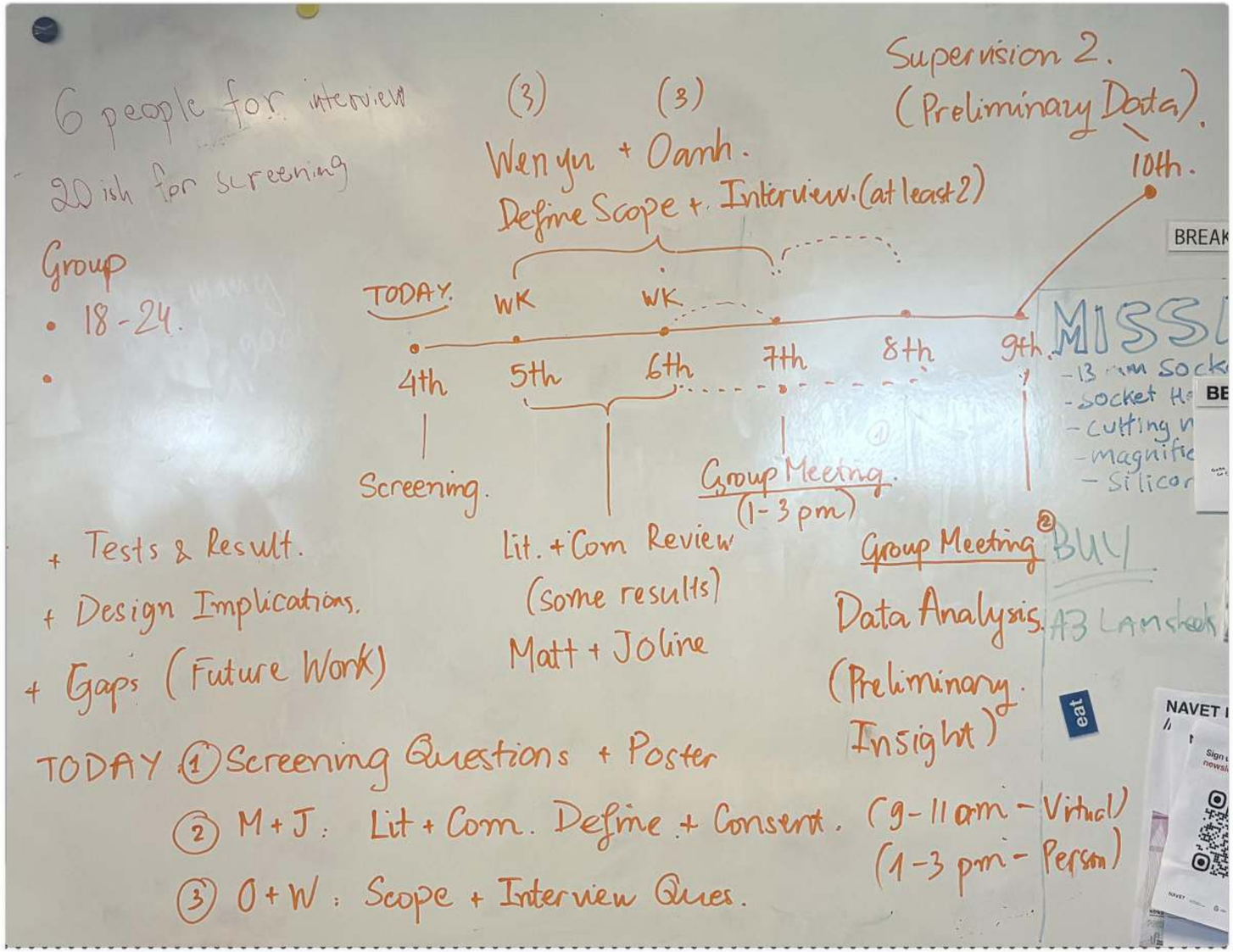
02. Competitor / Market

Find out what closed-library music player solutions are out there. What works and what does not

03. Literature review

Academic research

Discovery Planning





Wenyu: Interview 3 participants

Kim Oanh

Matt: Literature Review

Kim Oanh

Joline: Competitive Market Analysis

Kim Oanh

Oanh: Interview 2 participants

Kim Oanh

2 SEP

Semi-structured 1:1 interviews

MEMBER OANH WENYU

Goals

Primary:

Identify the **challenges** about their current music ritual

Kim Oanh

Secondary:

Understand the current methods of music **listening** of young adults

Kim Oanh

Secondary:

Understand the current ways of **discovering** new music and new artists

Kim Oanh

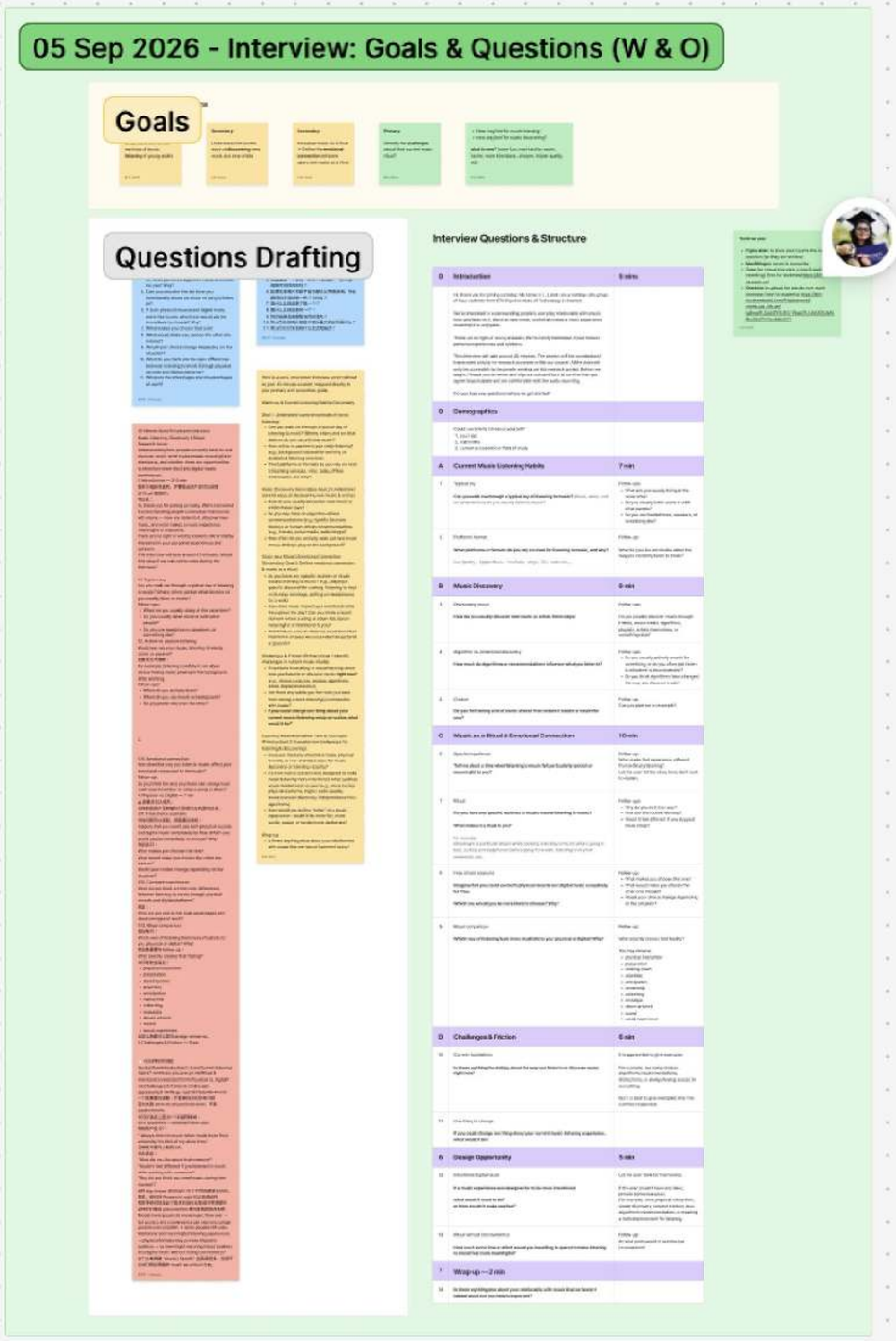
Secondary:

Introduce music as a ritual → Define the **emotional connection** between users and music as a ritual

Kim Oanh

We aligned on the main purpose of the interviews and drafted key questions.

To select suitable participants, we used a screening questionnaire, after which Wenyu and Oanh will conduct 5 interviews in total.



Interview Questions & Structure

0	Introduction
	Hi, thank you for joining us today. My name is [...], and I am a member of a group of four students from KTH Royal Institute of Technology in Sweden. We're interested in understanding people's everyday relationship with music: how you listen to it, discover new music, and what makes a music experience meaningful or enjoyable. There are no right or wrong answers. We're mainly interested in your honest personal experiences and opinions. This interview will take around 45 minutes. The session will be recorded and transcribed strictly for research purposes within our course. All the data will only be accessible to the people working on this research project. Before we begin, I'll need you to review and sign our consent form to confirm that you agree to participate and are comfortable with the audio recording. Do you have any questions before we get started?

0	Demographics
	Could you briefly introduce yourself? 1. your age 2. nationality 3. current occupation or field of study

A	Current Music Listening Habits	7 min
1	Typical day **Can you walk me through a typical day of listening to music?** *Where, when, and on what devices do you usually listen to music?*	Follow-ups: • What are you usually doing at the same time? • Do you usually listen alone or with other people? • Do you use headphones, speakers, or something else?
2	Platform / format **What platforms or formats do you rely on most for listening to music, and why?** like Spotify、Apple Music、YouTube、vinyl、CD、radio etc.。	Follow-up: What do you like and dislike about the way you currently listen to music?

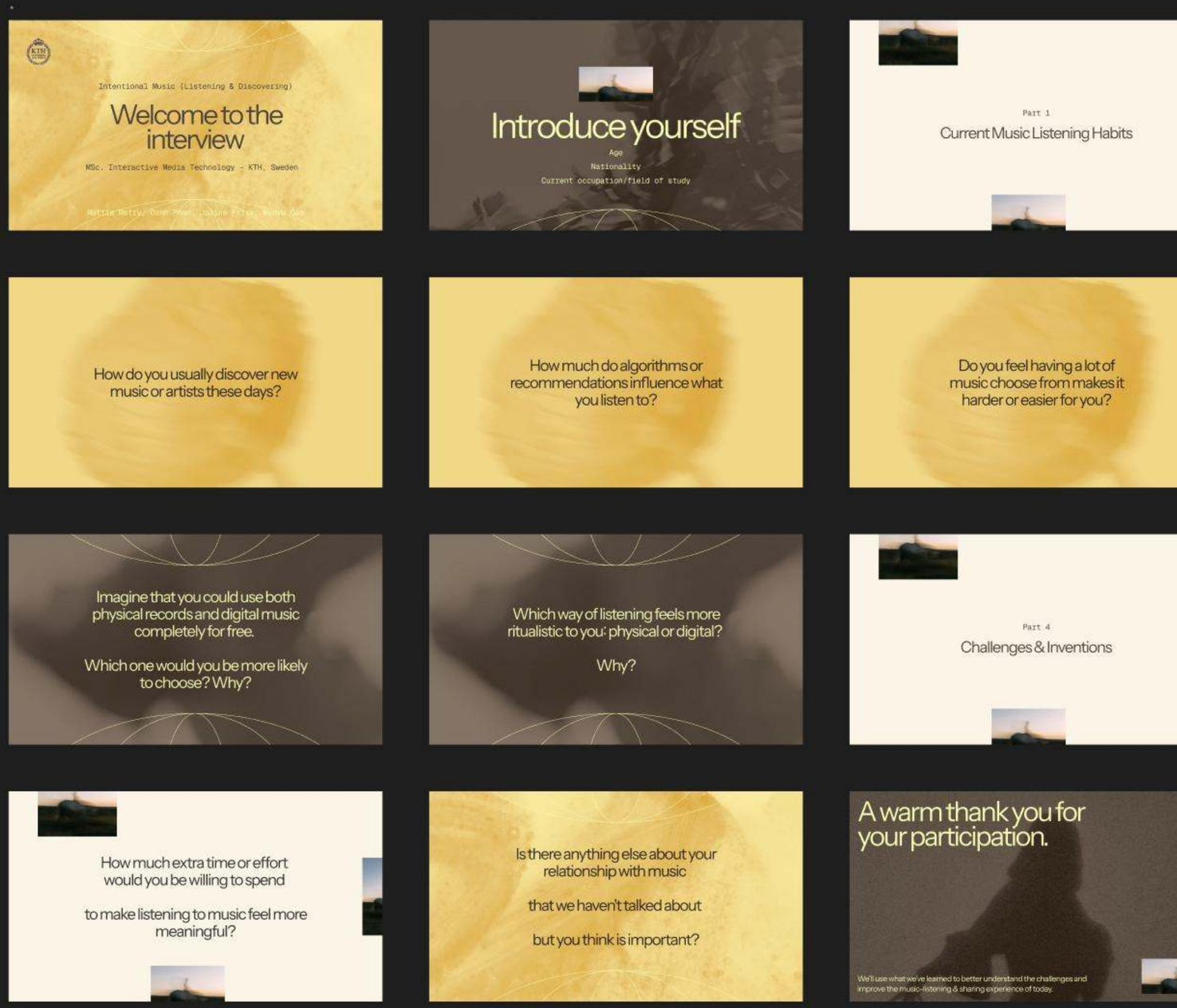
B	Music Discovery	6 min
3	Discovering music **How do you usually discover new music or artists these days?**	Follow-ups: Do you usually discover music through friends, social media, algorithms, playlists, artists themselves, or something else?
4	Algorithm vs. intentional discovery **How much do algorithms or recommendations influence what you listen to?**	Follow-ups: • Do you usually actively search for something, or do you often just listen to whatever is recommended? • Do you think algorithms have changed the way you discover music?
5	Choice **Do you feel having a lot of music choose from makes it harder or easier for you?**	Follow-up: Can you give me an example?

C	Music as a Ritual & Emotional Connection	10 min
6	Special experience **Tell me about a time when listening to music felt particularly special or meaningful to you?**	Follow-up: What made that experience different from ordinary listening? Let the user to explain.
7	Ritual **Do you have any specific routines or rituals around listening to music?** **What makes it a ritual to you?** for example: listening to a particular album while cooking, listening to music before going to bed, putting on headphones before going for a walk, listening to vinyl on weekends, etc.	Follow-ups: • Why do y • How did • Would it these ste
8	Free choice scenario **Imagine that you could use both physical records and digital music completely for free.** **Which one would you be more likely to choose? Why?**	Follow-up: • What ma • What wo other one • Would yo on the sit
9	Ritual comparison **Which way of listening feels more ritualistic to you: physical or digital? Why?**	Follow-up: What exactl You may rec • physical i • preparati • slowing c • attention • anticipati • ownershi • collecting

D	Challenges & Friction	6 min
10	Current frustrations **Is there anything frustrating about the way you listen to or discover music right now?**	It is appropriate to give examples: For example, too many choices, algorithmic recommendations, distractions, or always having access to everything. But it is best to give examples after the user has responded
11	One thing to change **If you could change one thing about your current music-listening experience, what would it be?**	

6	Design Opportunity	5 min
12	Intentional digital music **If a music experience was designed for to be more intentional** **what would it need to do?** **or how should it make you feel?**	Let the user think for themselves. If the user doesn't have any ideas, provide some examples: For example, more physical interaction, slower discovery, curated choices, less algorithmic recommendation, or creating a dedicated moment for listening.
13	Ritual without inconvenience **How much extra time or effort would you be willing to spend to make listening to music feel more meaningful?**	Follow-up: At what point would it become too inconvenient?

Interview slides



We designed dedicated slides for the interview questions to provide a clear structure for both the interviewer and interviewee. These slides create a natural rhythm and intentional pauses throughout the conversation, giving participants time to prepare for each phase of the interview.

Interview Raw Data 1

MEMBER WENYU

I interviewed three participants with diverse backgrounds in music: one was a passionate music lover who listens daily and streams full albums from start to finish, while another had a background in choir singing and played musical instruments.

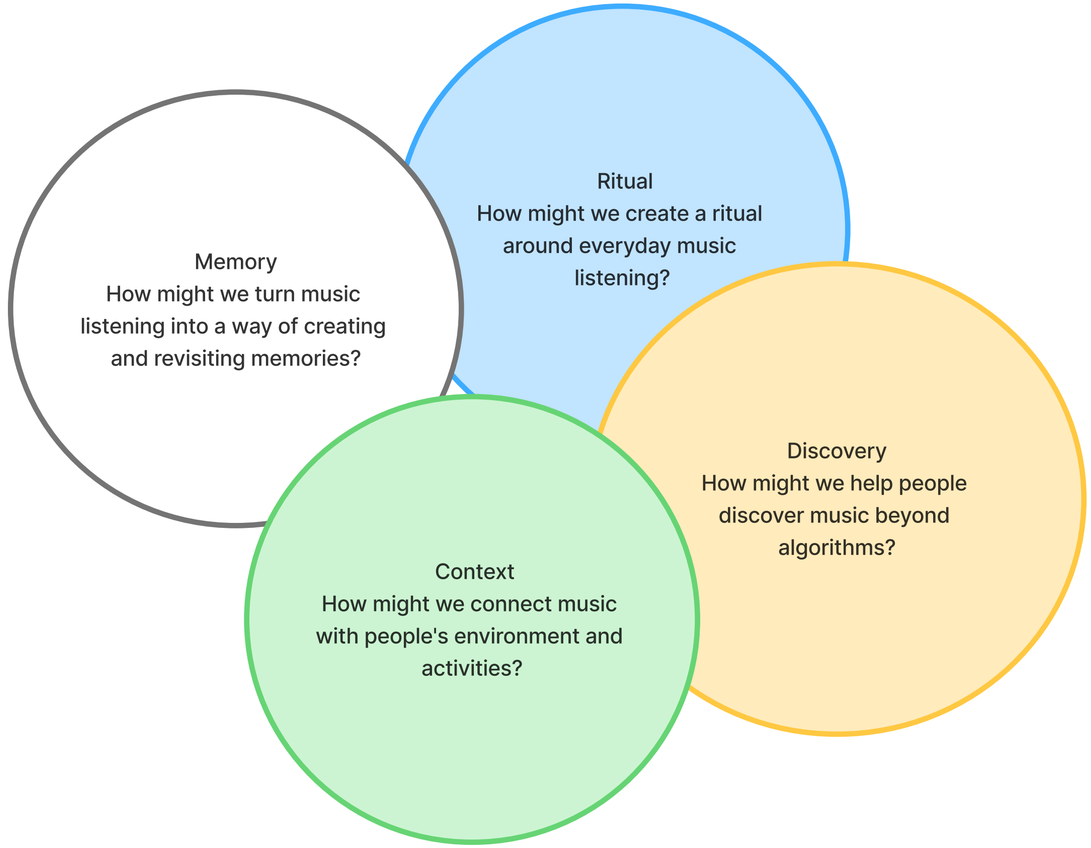
I conducted these as semi-structured interviews, adjusting my questions in real time based on their responses. To get deeper insights, I sometimes allowed participants to freely expand on their thoughts. However, if the discussion drifted off-topic or became less relevant, I stepped in to bring them back on track. Overall, I feel I collected rich raw data, and talking directly with these users gave me much more confidence in our project's direction." (Wenyu)



Interview Insights 1

MEMBER WENYU

"I carefully reviewed the interview transcripts, highlighted key user insights, and eventually synthesized them into four 'How Might We' (HMW) statements." (Wenyu)





15 SEP

Interview Raw Data 2

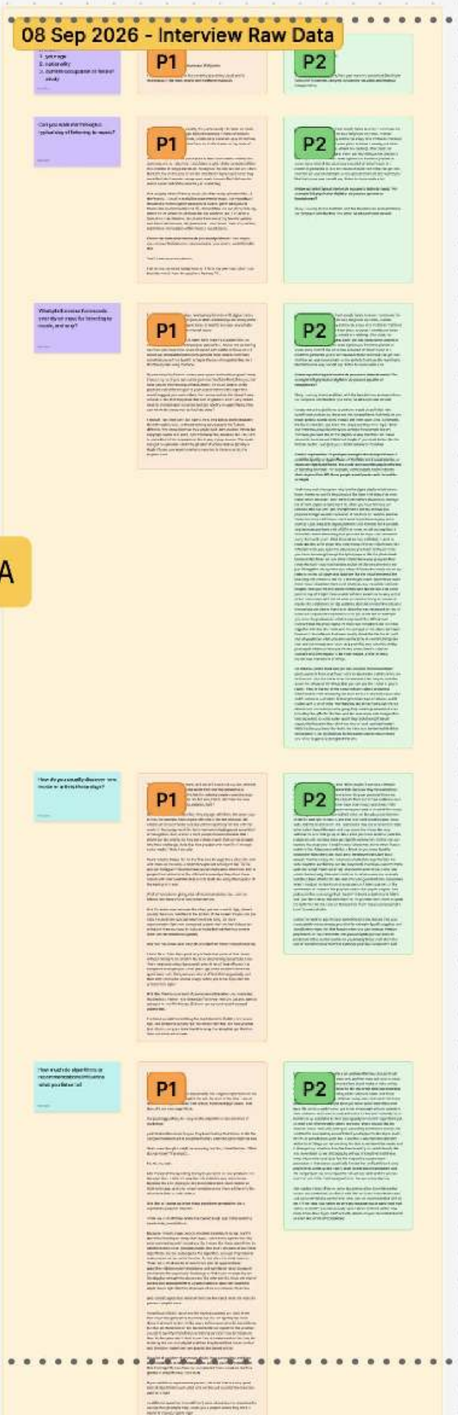
MEMBER OANH

I interviewed two of the five participants, recorded their responses using Zoom transcription, and manually reviewed the transcripts to verify their accuracy. After organizing the text by participant and interview question, I began highlighting relevant excerpts and assigning codes to capture meaningful concepts and patterns.

RAW INTERVIEW DATA

This was my first experience with manual coding. Although I had previously synthesized interview data using the thematic grouping tools in Dovetail and Maze, I wanted to explore the process more deeply and understand how insights emerge from the data itself.

I found that these tools can be efficient for business-oriented research, where speed and actionable outcomes are often priorities. However, I wondered whether this efficiency might limit the exploration of diverse perspectives, nuanced interpretations, and emerging sub-themes during the discovery phase.





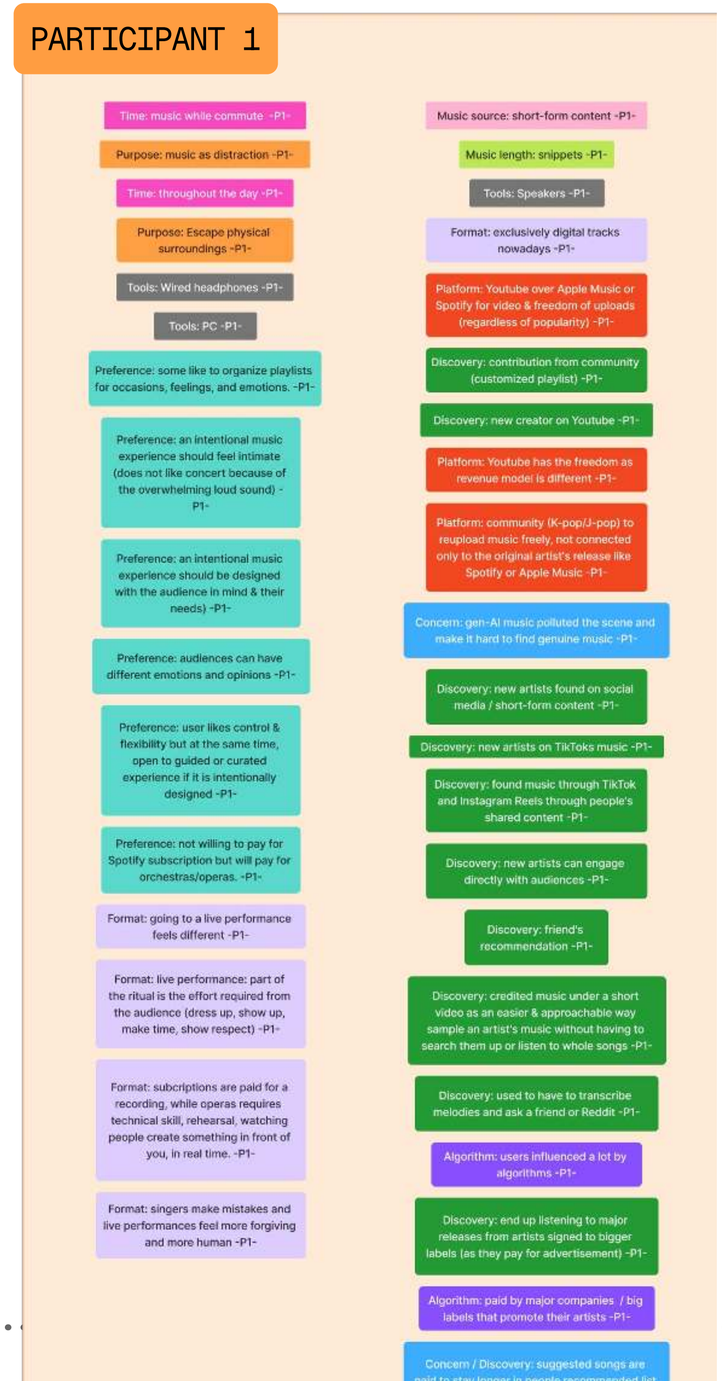
Codes

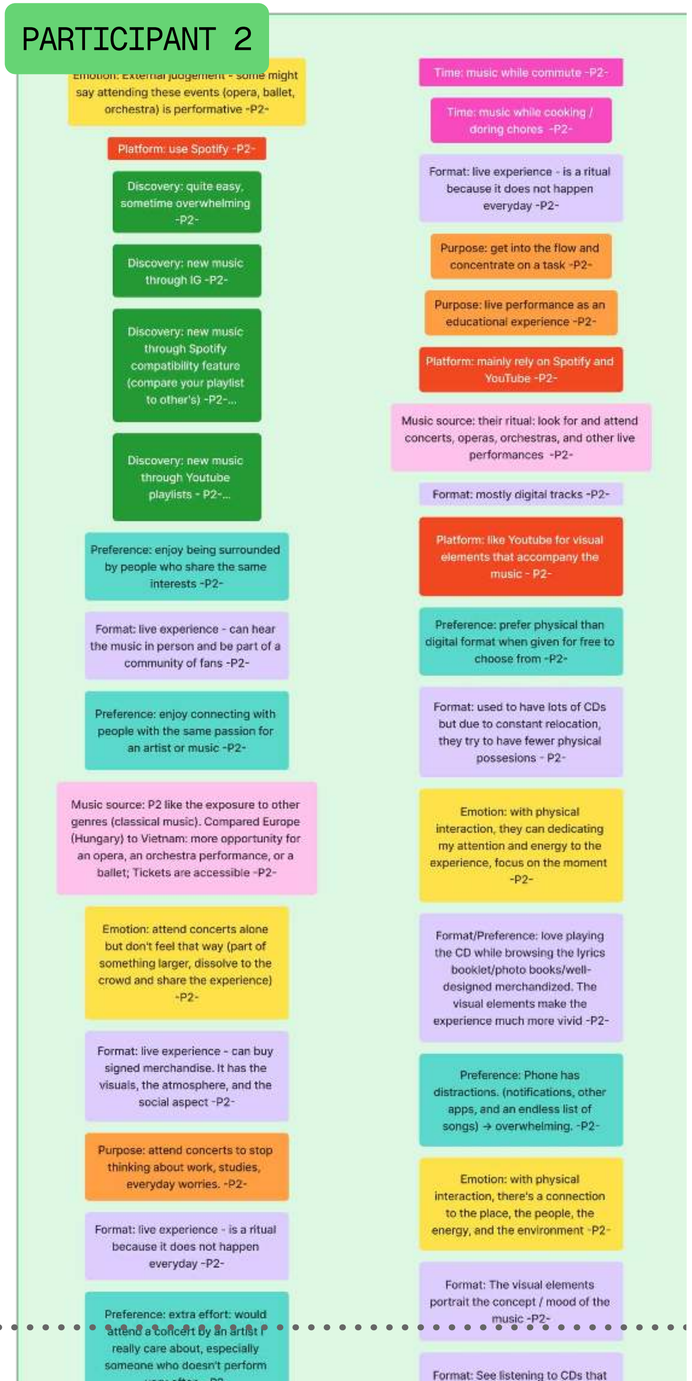
MEMBER OANH

By working through the process manually, I aimed to develop a more grounded understanding of qualitative data analysis, from identifying meaningful excerpts to interpreting and connecting patterns across participants.

Beyond learning the mechanics of coding, I wanted to reflect on how the process shapes the insights we uncover, and how a more deliberate approach could reveal deeper or less obvious dimensions of user experiences.

10 SEP













Code Organization

MEMBER OANH

I organized the codes into 10 main groups, each containing sub-groups to capture more specific concepts and nuances within the data.

1. Setup
2. Format & Platform
3. Emotion
4. Experience
5. Purpose
6. Discovery
7. Algorithm
8. Choice
9. Ritual
10. Social Connection

PARTICIPANT 1

PARTICIPANT 2

10 SEP

Interview Insights 2

MEMBER OANH

FORMAT & PLATFORM

Choosing digital does not mean rejecting physical experiences.

Digital music is valued for its convenience and control, while physical and live formats are valued for the deeper sense of presence, connection, and meaning they can create.

EMOTION

Music becomes personally meaningful when people **connect it to their own experiences**, creating emotional value that can persist over time.

RITUAL

Ritual emerges when listening involves **deliberate actions, preparation, time, and attention.**

When an experience requires effort, the **friction** can encourage deeper engagement and make the experience feel more special.

ALGORITHM & CHOICES

Recommendation systems significantly **influence what music becomes visible** and what users end up listening to.

However, having **more choices does not always create more value**; listeners often benefit from reducing or structuring their choices to make listening easier.

Competitive Analysis

MEMBER JOLINE

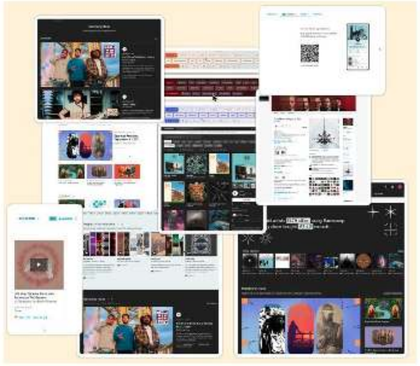
There where two parts to the competitive analysis one for the layout and structuring of streaming and music stores that exist today
The other part was looking at feedback for these platforms and physical listening devices.

Questions used for the first part of the analysis:

- How is music presented for discovery?
- What drives the recommendations?
- What drives the recommendations?
- How much control does the user have?
- What can you do after discovering something?
- What seems distinctive about this platform's approach to discovery?
- What seems weak or missing?

From these questions the structures of Spotify and YouTube music were close in the sense that they relied heavily on algorithms and passive discovery

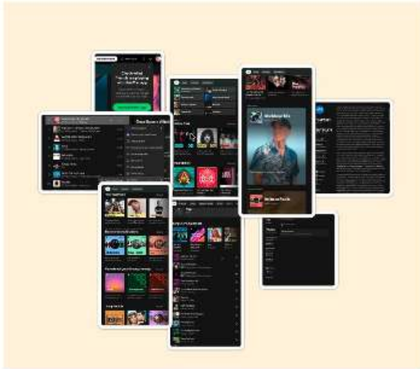
Soundcloud is a mix of algorithms and community and lastly Bandcamp that you actively need to find music as it is no recommendation system based on the things you like, however, Bandcamp is more of a marketplace platform than a streaming service



Bandcamp



Soundcloud



Spotify



Youtube Music

Competitive Analysis

Physical Devices

MEMBER JOLINE

The physical players we focused on where the portable ones in the aspect of being the other option to phones, and, it showed positive experiences as well as some issues with using these devices.

The main takeaway is that the user liked having a separated device for music so that they could listen to music without being distracted.

However, there were also complains about the usability and overall performance. And also that some users experiences technical issues with the devices.

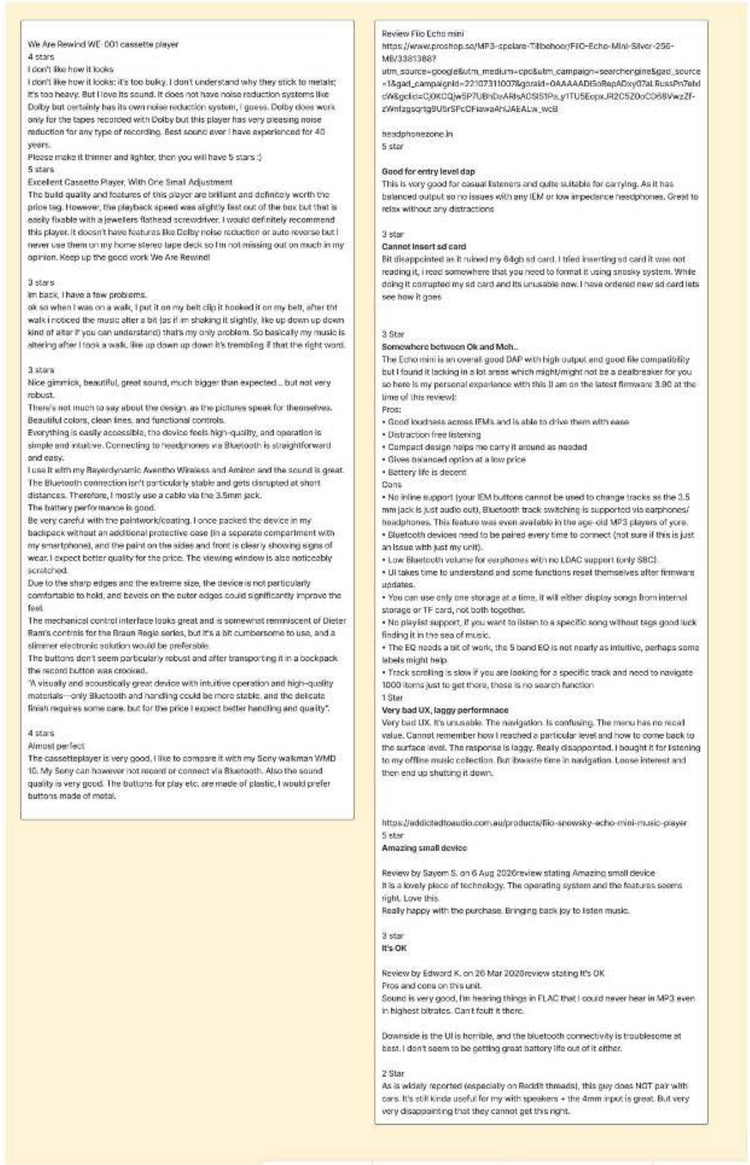
Overall, shows that there is an appreciation of having a separate device for music, but that the reliability is important for it to be a alternative for a phone



we are rewind cassette player



Fiio Echo mini



We Are Rewind WE-001 cassette player
4 stars
I don't like how it looks
I don't like how it looks: it's too bulky. I don't understand why they stick to metallic. It's too heavy. But I love its sound. It does not have noise reduction systems like Dolby but certainly has its own noise reduction system, I guess. Dolby does work only for the tapes recorded with Dolby but this player has very pleasing noise reduction for any type of recording. Best sound ever I have experienced for 40 years.
Please make it thinner and lighter, then you will have 5 stars :)
5 stars
Excellent Cassette Player, With One Small Adjustment
The build quality and features of this player are brilliant and definitely worth the price tag. However, the playback speed was slightly fast out of the box but that is easily fixable with a jewelers flathead screwdriver. I would definitely recommend this player. It doesn't have features like Dolby noise reduction or auto reverse but I never use them on my home stereo tape deck so I'm not missing out on much in my opinion. Keep up the good work We Are Rewind!

3 stars
Im back, I have a few problems.
ok so when I was on a walk, I put it on my belt clip it hooked it on my belt, after thit walk I noticed the music alter a bit (as if im shaking it slightly, like up down up down kind of alter if you can understand) thats my only problem. So basically my music is altering after I took a walk, like up down up down it's trembling if that the right word.

3 stars
Nice gimmick, beautiful, great sound, much bigger than expected... but not very robust.
There's not much to say about the design, as the pictures speak for themselves. Beautiful colors, clean lines, and functional controls.
Everything is easily accessible, the device feels high-quality, and operation is simple and intuitive. Connecting to headphones via Bluetooth is straightforward and easy.
I use it with my Bayerdynamic Aventho Wireless and Amiron and the sound is great. The Bluetooth connection isn't particularly stable and gets disrupted at short distances. Therefore, I mostly use a cable via the 3.5mm jack.
The battery performance is good.
Be very careful with the paintwork/coating. I once packed the device in my backpack without an additional protective case (in a separate compartment with my smartphone), and the paint on the sides and front is clearly showing signs of wear. I expect better quality for the price. The viewing window is also noticeably scratched.
Due to the sharp edges and the extreme size, the device is not particularly comfortable to hold, and bevels on the outer edges could significantly improve the feel.
The mechanical control interface looks great and is somewhat reminiscent of Dieter Rams's controls for the Braun Regie series, but it's a bit cumbersome to use, and a slimmer electronic solution would be preferable.
The buttons don't seem particularly robust and after transporting it in a backpack the record button was cracked.
"A visually and acoustically great device with intuitive operation and high-quality materials—only Bluetooth and handling could be more stable, and the delicate finish requires some care, but for the price I expect better handling and quality".

4 stars
Almost perfect
The cassetteplayer is very good. I like to compare it with my Sony walkman WMD 10. My Sony can however not record or connect via Bluetooth. Also the sound quality is very good. The buttons for play etc. are made of plastic, I would prefer buttons made of metal.

Review Fiio Echo mini
https://www.proshop.se/MP3-spelare-Tillbehoer/FIIO-Echo-Mini-Silver-256-MB/3381388?utm_source=google&utm_medium=cpc&utm_campaign=searchengine&gad_source=1&gad_campaignid=22107311007&gbraid=0AAAADE5oRapADxy07aLRussPn7ahlcW&gclid=Cj0KCQjw9P7UBhDeARIsAOSSTPa_y1TU5EopxJR2OSZ0oCD68VwzZf-zWntzgsqrlg9UbrSPcDFIaxwaAhJAEALw_wcB

headphonezone.in
5 star

Good for entry level dap
This is very good for casual listeners and quite suitable for carrying. As it has balanced output so no issues with any IEM or low impedence headphones. Great to relax without any distractions

3 star
Cannot insert sd card
Bit disappointed as it ruined my 64gb sd card. I tried inserting sd card it was not reading it, I read somewhere that you need to format it using snosky system. While doing it corrupted my sd card and its unusable now. I have ordered new sd card lets see how it goes

3 Star
Somewhere between Ok and Meh..
The Echo mini is an overall good DAP with high output and good file compatibility but I found it lacking in a lot areas which might/might not be a dealbreaker for you so here is my personal experience with this (I am on the latest firmware 3.90 at the time of this review):
Pros:
• Good loudness across IEMs and is able to drive them with ease
• Distraction free listening
• Compact design helps me carry it around as needed
• Gives balanced option at a low price
• Battery life is decent
Cons
• No inline support (your IEM buttons cannot be used to change tracks as the 3.5 mm jack is just audio out), Bluetooth track switching is supported via earphones/ headphones. This feature was even available in the age-old MP3 players of yore.
• Bluetooth devices need to be paired every time to connect (not sure if this is just an issue with just my unit).
• Low Bluetooth volume for earphones with no LDAC support (only SBC).
• UI takes time to understand and some functions reset themselves after firmware updates.
• You can use only one storage at a time, it will either display songs from internal storage or TF card, not both together.
• No playlist support, if you want to listen to a specific song without tags good luck finding it in the sea of music.
• The EQ needs a bit of work, the 5 band EQ is not nearly as intuitive, perhaps some labels might help.
• Track scrolling is slow if you are looking for a specific track and need to navigate 1000 items just to get there, these is no search function
1 Star
Very bad UX, laggy performnace
Very bad UX. It's unusable. The navigation. Is confusing. The menu has no recal value. Cannot remember how I reached a particular level and how to come back to the surface level. The response is laggy. Really disappointed. I bought it for listening to my offline music collection. But itwaste time in navigation. Loose interest and then end up shutting it down.

https://addictedtoaudio.com.au/products/fiio-snowsky-echo-mini-music-player
5 star
Amazing small device

Review by Sayem S. on 6 Aug 2026review stating Amazing small device
It is a lovely piece of technology. The operating system and the features seems right. Love this.
Really happy with the purchase. Bringing back joy to listen music.

3 star
It's OK

Review by Edward K. on 26 Mar 2026review stating It's OK
Pros and cons on this unit.
Sound is very good, I'm hearing things in FLAC that I could never hear in MP3 even in highest bitrates. Can't fault it there.

Downside is the UI is horrible, and the bluetooth connectivity is troublesome at best. I don't seem to be getting great battery life out of it either.

2 Star
As is widely reported (especially on Reddit threads), this guy does NOT pair with cars. It's still kinda useful for my with speakers + the 4mm input is great. But very very disappointing that they cannot get this right.

Competitive Analysis

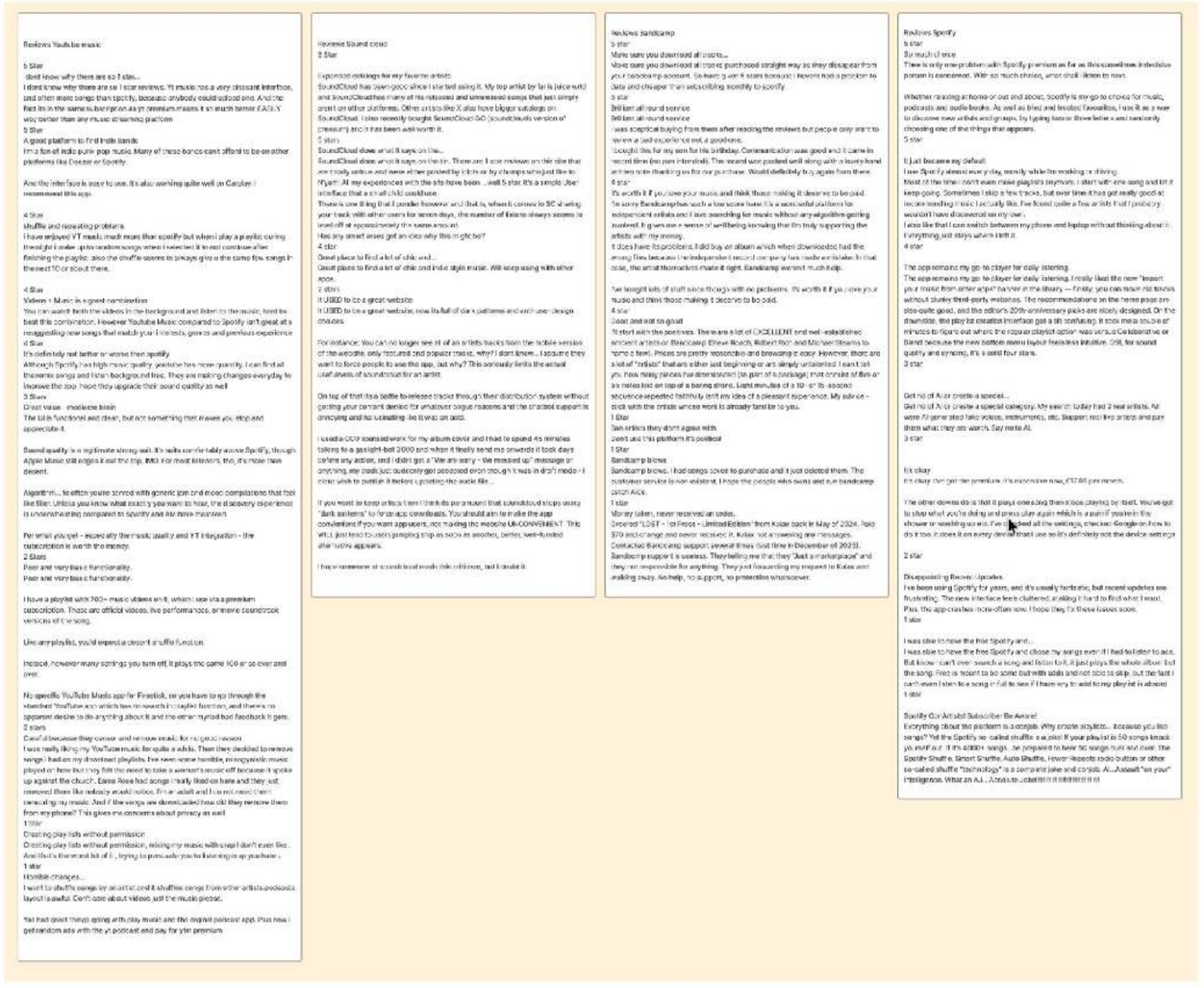
MEMBER JOLINE

The reviews for the platforms was both negative and positive when it came to discovering and listening to music. YouTube music and Soundcloud had the possibility to find remixed versions of their favorite artists as well as finding lesser known artists that weren't available on other platforms. Spotify got positive reviews for the recommendations and how they aligned with the users music interest.

However, there where issues that the users complain about when it came to Spotify and YouTube music was that there wasn't any true shuffle, that songs were played repeatedly, as well as songs that they didn't want to listen to, with no choice to opt out of those types of songs.

The information we gathered from these reviews is that users like having access to large quantities of music and multiple ways of discovering music but that they appreciate having control over what they listen to and what type of music is presented

Digital Platforms



Literature Review

MEMBER MATT

To start with the literature review, I first explored what search-engines to use, and I found the following to be the most fitting:

- Google Scholar
  - Used to cast a wide net and see what is out there
- Music Information Retrieval
  - Good for music specific topics
- ACM
  - Good for HCI based papers and articles

I then also came up with a list of search queries that have then been used in each of the search-engines:

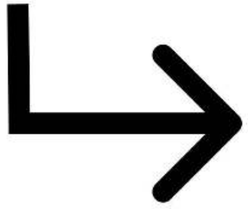
- *("music discovery" OR "music exploration" OR "music search") AND (streaming OR digital OR online)*
- *("music recommendation system*" OR "music recommender system*" OR "music recommendation algorithm*") AND (discovery OR exploration OR preference* OR behaviour OR behavior)*
- *("music recommendation*" OR "algorithmic recommendation*") AND (acceptance OR reception OR perception OR trust OR satisfaction OR relevance OR "user experience")*
- *(Spotify OR "music streaming platform*") AND ("algorithmic recommendation*" OR "personalized recommendation*" OR "recommender system*") AND (discovery OR diversity OR autonomy OR preference*)*
- *("collaborative playlist*" OR "shared playlist*" OR "social playlist*") AND (collaboration OR interaction OR sharing OR communication)*
- *("social music" OR "social music listening" OR "music sharing") AND (community OR interaction OR relationship* OR identity OR participation)*
- *(music OR listening OR playlist*) AND ("social interaction" OR "shared experience*" OR "social bonding" OR "interpersonal communication")*
- *(music OR playlist*) AND ("self-expression" OR "personal expression" OR "self-presentation" OR "musical identity")*
- *("music taste" OR "musical preference*") AND (identity OR "self-presentation" OR belonging OR "impression management") AND (sharing OR playlist* OR streaming)*
- *("tangible music interaction" OR "tangible user interface*" OR "physical music interface*" OR "tangible interaction") AND (music OR audio OR listening)*

15 SEP

Literature Review

MEMBER MATT

The papers that were found to be of interest then got organized and annotated in Zotero, and then put into the following matrix



Source	Context	Method	Key finding	Relevance	Codes
Cole (2025). A song for each moment: Identifying listening modes as reflexive practices in music streaming	Everyday Spotify listening; 20 Spotify Premium users, ages 21–65; primarily Norway, with some Costa Rica	interviews; donated Spotify histories;	Identifies three overlapping listening modes: attentive, emotional lean-back, and emotional lean-forward. People do not simply accept recommendations, they reflexively choose music according to context, emotions and goals, switching between active and passive listening.	Very high. distinguishing intentional music engagement from background/automatic consumption.	listening modes, emotional listening, choosing music in a context,
Lee, Pritchard & Hubbles (2019). Can We Listen to It Together? Factors Influencing Reception of Music Recommendations and Post-Recommendation Behavior	Human and algorithmic music recommendations; 219 respondents, mean age 28; 95% used streaming services	Web survey with closed and open-ended questions; qualitative responses coded	Whether people act on a recommendation depends not only on the music but on timing, trust, familiarity and delivery context. Recommendations frequently lead to conversation, further sharing, shared listening and relationship-building.	Very high. strongest paper for the idea that "human discovery" is valuable because of the social context surrounding the song.	social recommendations carry meta data, conversations, relationship-building
Park et al. (2024). Collaborative Playlists around the World: A Cross-Cultural User Study	Collaborative streaming playlists in Hong Kong, South Korea, Quebec and US; 262 participants total; users and non-users	Cross-cultural exploratory survey with quantitative and qualitative responses	Collaborative playlists are used for co-curation, organization, discovery and social connection, but their use and perception vary across cultural contexts.	High. Shows that digital music discovery can already be social and collaborative without abandoning streaming.	collab playlists help discover, engage in discussions, social connection
Jansson & Hracs (2018). Conceptualizing curation in the age of abundance: The case of recorded music	Music curation in Sweden: record shops, music writers, radio DJs, labels and recommender systems	20 interviews; observation of physical and digital spaces	When music becomes abundant, curation becomes increasingly valuable. Curation is performed by many actors and is shaped by physical and virtual spaces; record shops and human curators do something qualitatively different from merely giving access to music.	Very high. Excellent bridge between Spotify, record stores and the question of what a more intentional discovery environment could look like.	abundance of music makes curation more important, overwhelming selection, physical stores have curated selections, quality control
Porcaro, Castillo & Gómez (2021). Diversity by Design in Music Recommender Systems	Music recommender-system research; focused on diversity and values in recommendation	Interdisciplinary overview/review paper rather than a user study	Diversity cannot be treated as a single technical metric. Music recommender systems influence exposure, taste and decision-making, so diversity should be considered by design and from a value-oriented perspective rather than optimizing only prediction/performance.	Medium-high. Useful theoretical foundation for algorithms users can steer rather than rejecting algorithms entirely. But we don't really have access to the tech.	algorithms are biased, low user agency for algos.
Freeman, Gibbs & Hansen (2022). 'Don't mess with my algorithm': Exploring the relationship between listeners and automated curation and recommendation on music streaming services	Active users of Spotify/other streaming services; 15 participants	Participant observation; interviews	Listeners develop complex socio-technical relationships with recommendation algorithms involving trust, intimacy and even feelings of betrayal. Algorithms are perceived as active actors that help shape habits and musical taste.	Very high. Particularly useful because it complicates the idea that users simply dislike algorithms; people can become emotionally invested in "their" algorithm.	algos as active actors, algos seen as buddies, feeling betrayal from an algo, human connection to their OWN algo, emotional connection to technology
Siles et al. (2020). Folk theories of algorithmic recommendations on Spotify	Spotify users in Costa Rica	30 interviews; 4 focus groups involving 22 users	Users construct theories about how Spotify works. Two major models emerged: Spotify as a social being that observes them, and Spotify as a computational system that can be "trained" through behavior.	Very high. Directly relevant the idea of giving listeners more explicit ways to steer recommendation systems.	algo as social being that observes them, not wanting to mess with the algo, training the algo, multi-account for algo
Knees, Schedl & Goto (2020). Intelligent User Interfaces for Music Discovery	20 years of HCI/MIR work on music browsing and discovery interfaces	Overview/review article	Music discovery is not just an information-retrieval problem. Because music serves entertainment and exploratory needs, interfaces should support engaging, intuitive exploration, not only efficient retrieval of known items.	High. Excellent overview paper and useful source of precedent interfaces and further citations. Show early prototypes in helping users explore different music.	discovery is not just about information, explorational need in humans, playfulness, intuitive exploration, visual exploration,
Siles, Valerio-Alfaro & Arriagada (2024). "Music Is Just Right There on Social Media!": Discovering, Exploring, and Incorporating Songs Across Platforms	Music discovery across TikTok/social media and streaming; 25 Costa Rican participants	Interviews; follow-up reports	Discovery is often cross-platform: a song is encountered incidentally on social media, deliberately explored elsewhere, then incorporated into everyday listening on a streaming service. The interplay / back and forth between platforms.	Very high. Important for age group because discovery may happen far outside streaming platforms themselves.	cross-platform discovery, social media for music discovery,
Alonso & Keyson (2005). MusicCube: Making Digital Music Tangible	Tangible interaction with MP3 collections; 17 university students/staff, ages 20–44, mean 23.8	Working tangible prototype compared experimentally with an iPod; task performance + think aloud + ratings	The tangible MusicCube scored better on hedonic/experiential qualities and engagement, while the iPod performed better ergonomically. Participants valued expressive physical interaction with digital music.	Very high for the physical direction. Strong precedent showing that physical interaction can add experiential value even when digital interfaces are functionally easier.	interacting physically with music more fun, but less ergonomic, more connected to music through physicality
Burnett et al. (2015). Physical Playlist: Bringing Back the Mix-Tape	Reimagining digital playlists as physical, shareable objects	Research-through-design; NFC-enabled customizable physical playlist/bracelet + evaluation with 24 participants	The project argues that physicalizing a digital playlist can restore some qualities of the mixtape: effort, customization, gifting, emotional connection and deliberate curation. The design intentionally introduces slowness into media consumption.	Extremely high as design inspiration, shows that effort and friction can improve the value of the result	physicalizing digital music to get the old mixtape qualities back, more friction leads to more satisfaction, emotional connection to a physical thing,
Porcaro et al. (2026). Surfacing Problematic Recommender System Behaviors Affecting Music Discoverability: A Think-Aloud Protocol	20 Italian digital-native listeners, ages 18–25, mean 23.5	Think-aloud interviews while participants performed music-discovery tasks;	Participants identified three major problems: societal bias, perceived commercial influence, and a pervasive feeling of confinement / narrow discovery.	Extremely high. Exactly our user group and our problem on the digital streaming platforms.	algorithm bias, low user agency, commercial influence of the algo, narrow discovery
Whitehouse (2023). "Taking a chance on a record": Lost vinyl consumption practices in the age of music streaming	14 active vinyl consumers belonging to the UK indie-pop scene	Interviews using participants chosen album artwork as context and help	Vinyl practices derive meaning partly from the effort of acquiring records, anticipation, physical appreciation, nostalgia and temporality. The process surrounding consumption matters, not just playback.	Very high for mechanisms, but population relevance is weaker: these are established vinyl consumers rather than streaming-native 18–24-year-olds.	effort of acquiring records, anticipation, physical appreciation, nostalgia
Giles, Pietrzykowski & Clark (2007). The psychological meaning of personal record collections and the impact of changing technological forms	20 British music collectors across physical/digital formats	Interviews; grounded-theory analysis	Three meanings were prominent: records as sacred objects, collections as an extension of the self, and music as a sensory/emotional experience. Physical collections were especially strongly associated with identity and object attachment.	Very high conceptually (but fairly old). Gives theoretical grounding for why "having a collection" may mean something different from merely saving thousands of tracks.	collections are extensions of the self, sensory/emotional experience,
Garcia-Gathright et al. (2018). Understanding and Evaluating User Satisfaction with Music Discovery	Spotify-style personalized discovery; qualitative phase included 10 users aged 21–41	Sequential mixed methods: interviews -> survey/behavioral analysis -> unsupervised learning/statistical modeling	People approach discovery with different goals: sometimes they want to immediately enjoy recommendations, other times they use a recommendation as a starting point for deeper exploration. Satisfaction therefore cannot be understood from simple playback/skip metrics alone.	High. Useful for challenging the assumption that there is one ideal "discovery experience."	different goals for music discovery, immediate enjoyment, new discovery, digging deeper manually
Lee & Price (2015). Understanding Users of Commercial Music Services Through Personas: Design Implications	40 University of Washington students, all over 18, using 10 different music services	Interviews; think aloud use sessions; observation; card sorting; developed seven personas	Music users differ substantially in the time/effort they want to invest and how social/private they want music listening to be. The resulting personas range from highly engaged Active Curators/Music Epicureans to passive Guided Listeners, Wanderers, etc.	Very high. It warns against assuming that even "people who love music" all want the same level of intentional effort.	active music curation, passive listening, musical exploration

The general findings there gave us key insights we then could use to inform the questions for our interviews later.

DEFINE

Section 2

CONVERGE
Which problem can we impact the most

Discovery Insight Sharing

After completing the three Dicovery methods, Competitive/Market Research, Literature Review, and User Interviews, each team member synthesized their findings into a personal Affinity Diagram to identify key insights within their respective research areas.

We gathered to share insights from our individual findings, before creating a shared Affinity Map for our whole project and define better what our focus will be.



Affinity Diagram

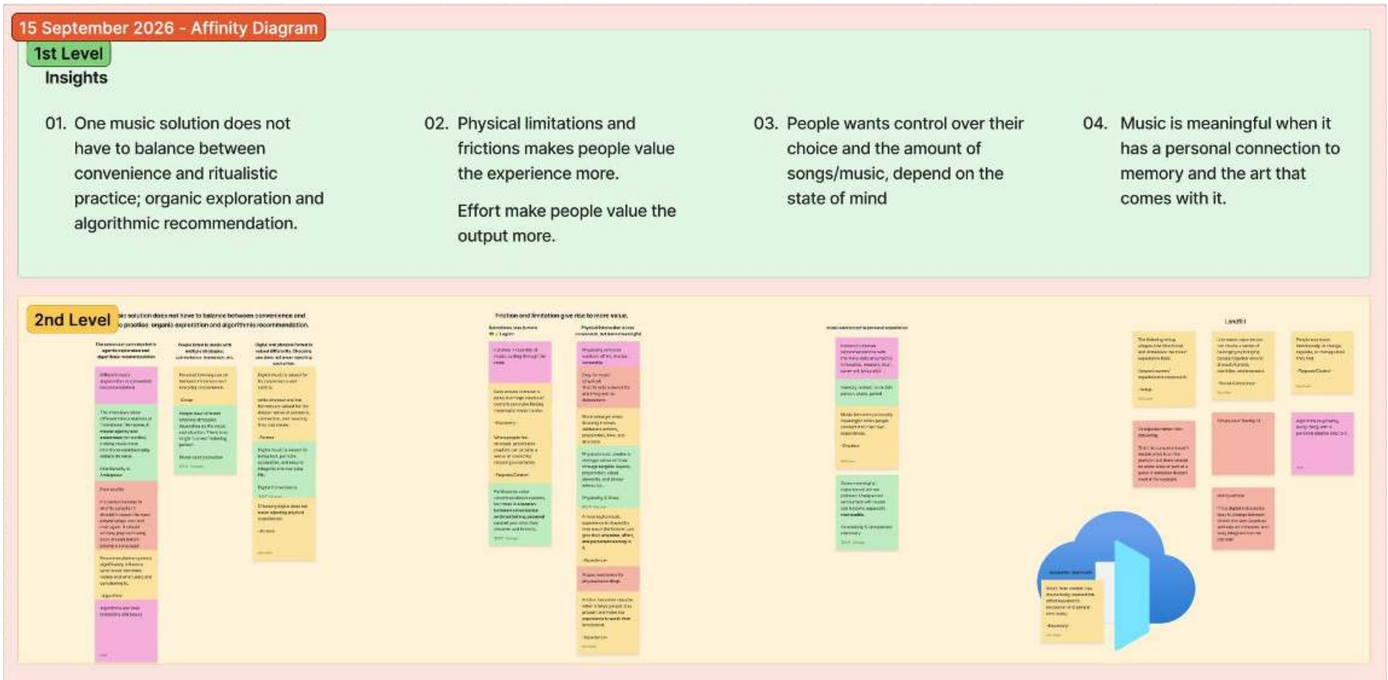
We then brought these individual diagrams together to create a collective Affinity Diagram, grouping related findings, identifying connections across methods, and naming broader themes.

This collaborative process helped us move beyond isolated observations toward a more holistic understanding of the music domain.

1ST LEVEL

2ND LEVEL

3RD LEVEL





Affinity Diagram

Main Insights

01

One music solution does not have to balance between convenience and ritualistic practice; organic exploration and algorithmic recommendation.

02

Physical limitations and frictions makes people value the experience more. Effort make people value the output more.

03

People wants control over their choice and the amount of songs/music, depend on the state of mind

04

Music is meaningful when it has a personal connection to memory and the art that comes with it.

Personas & Scenarios



Alice Ross

Age: 19

Occupation: Student

Status: Single

'I want to have a better way to connect with my emotions and memories using music. Apps on my phone is convenient but it does not seem like I own anything on there.'

Goals:

- Wants to experience music in a more immersive way to connect to her memories and emotions

Problems:

- Limited income
- Limited space (dorm)
- Far away from home
- Has to stay flexible due to ever changing schedule, study-load, and living space
- Cannot afford for physical media

Behaviors:

- Listen Spotify for 5 years
- Wants to explore music in a better way but always falls back to the platform because it is easier.
- Discovers music through Xiaohongshu, TikTok and Spotify Music recommendations.
- Open to different genres and rarely rejects unfamiliar music.
- Uses music as a memory anchor. Songs can become connected to specific places, trips, and periods of life.

Scenario

SCENE
- During the week, Alice occasionally think of her friends and family back home and miss the old days. While managing a new life at school and in a new town, she relies a lot on music to regulate and feel less lonely.

EVENT
- In some moments, when a song is truly special to one of her memory, she needs a better way to be present and experience it.

GOAL
- She wants to experience that fully and immersively, with a better connect to the art of music and her emotions.

OBSTABLE
- Due to limited income and dorm space, she cannot own any physical and is limited to her phone and Spotify subscription. It is convenient, but she is not satisfied with it for a more personal and tangible experience. Part of it is because subscription does not make it seem like she own anything.



Alejandro Perez

Age: 23

Occupation: White-collar

Status: Single

'I play music in the background while commute every day, but I'm afraid that it is becoming too passive and I only listen to what the app gives me.'

Goals:

- Wants to feel more in control over what music he listens to instead of relying on the algorithms all the time

Problems:

- Has a busy life and thus doesn't have a lot of time to listen to music besides on the commute.
- He feels like he only listens to the same couple of songs when using shuffle function of streaming platforms
- Current technology doesn't give enough agency and puts him into a bubble.

Behaviors:

- Commutes every day to work
- Mostly relies on recommendation systems of streaming platform to find and listen to music.
- Enjoys going to concerts.

Scenario

SCENE
- During the week, Alejandro spends a lot of time indoors and on screens at work. He also doesn't have a lot of time after work, as he usually meets up with friends and goes to the gym.

EVENT
- On a sunny Sunday afternoon, he finally finds time to organize his music library.

GOAL
- He wants to create different playlists from all the songs he saved over the past couple of months. He wants the playlists to be separated by different types of music.

OBSTABLE
- As he starts going through his saved songs, he starts to realize that most his songs are from the same couple of artists and genres. And as he tries to find new music, not only the recommendation system, but even the search system seems to be heavily influenced by his prior listening behavior and preferences. He doesn't see an easy way out of this filter bubble.

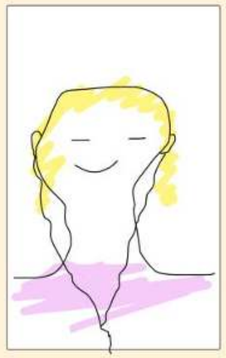
Initial version

Personas & Scenarios

Following the research synthesis & our main target users, we translated our findings into two initial personas, Alice Ross and Alejandro Perez, to represent distinct needs, behaviors, and challenges in young adults relationships with music. As an initial version, these personas and scenarios provided a shared reference point for identifying design opportunities.

16 SEP

POVs



Alice Ross

01 Alice need a more affordable physical music media option because she is a student and she has limited income.

02 Alice need a more portable and small volume music player devices because she is living in dorm.

03 Alice need a better way to emotionally connect to her emotions and past memories via music because she is far from home.



Alejandro Perez

01 Alejandro wants to connect to music **in a more meaningful way**, because he notices how music just slipped into the background over time as he just listens to music on the commute since he started working.

02 Alejandro needs to **find another way of listening to his playlist**, because the platform keeps playing the same songs out of it over and over again, even though he uses the shuffle function.

03 Alejandro needs a new way of discovering new music, as the current streaming platforms he uses have very nontransparent and uncontrollable algorithms that keep him in his filter bubble and don't allow him to explore more brightly.

How might we...

01 ... design a more affordable physical music media option for student who has limited income?

02 ... design a small music player devices for those who live in limited living space?

03 ... a better way to emotionally connect to her emotions and past memories via music, especially for student who is far from home?

How might we...

01 ... help young working adults for whom music slipped into the background of everyday life to pull it back into a more meaningful and present experience / space again?

02 ... give users more agency about how they can listen to their digital music collections (maybe even in a platform independent way)?

03 ... design recommendation systems (algos) to be more controllable and predictable?

04 .... create new ways of exploring music, without falling into algorithmic bubbles?

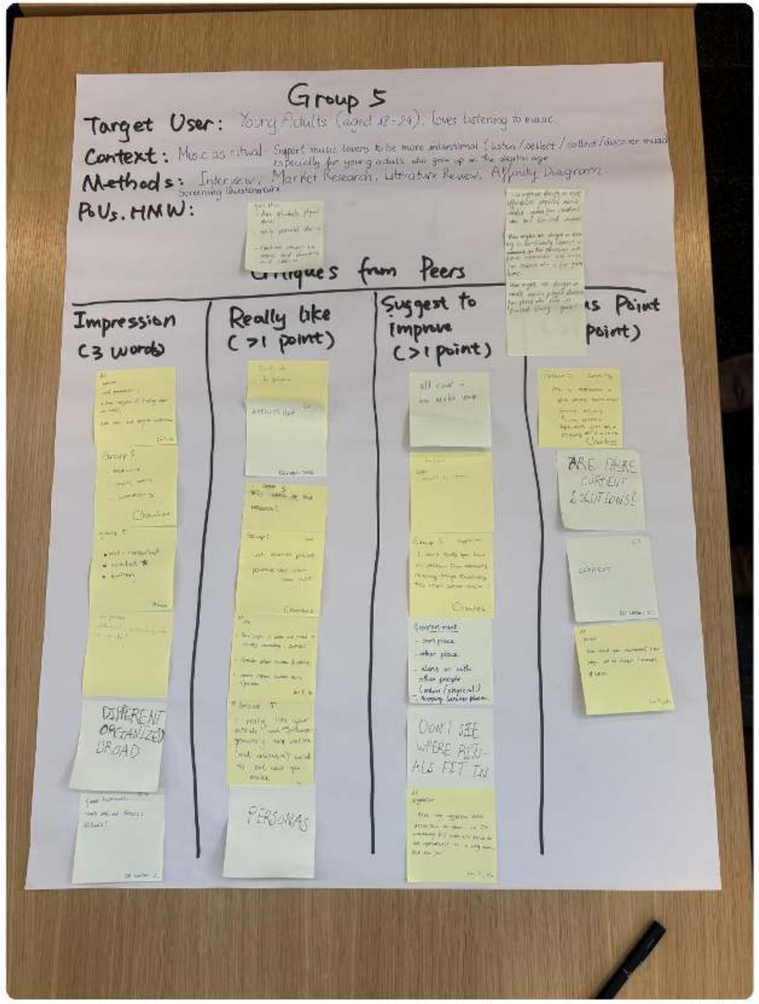
05 ....make music exploration more easy without relying on any algorithms at all?

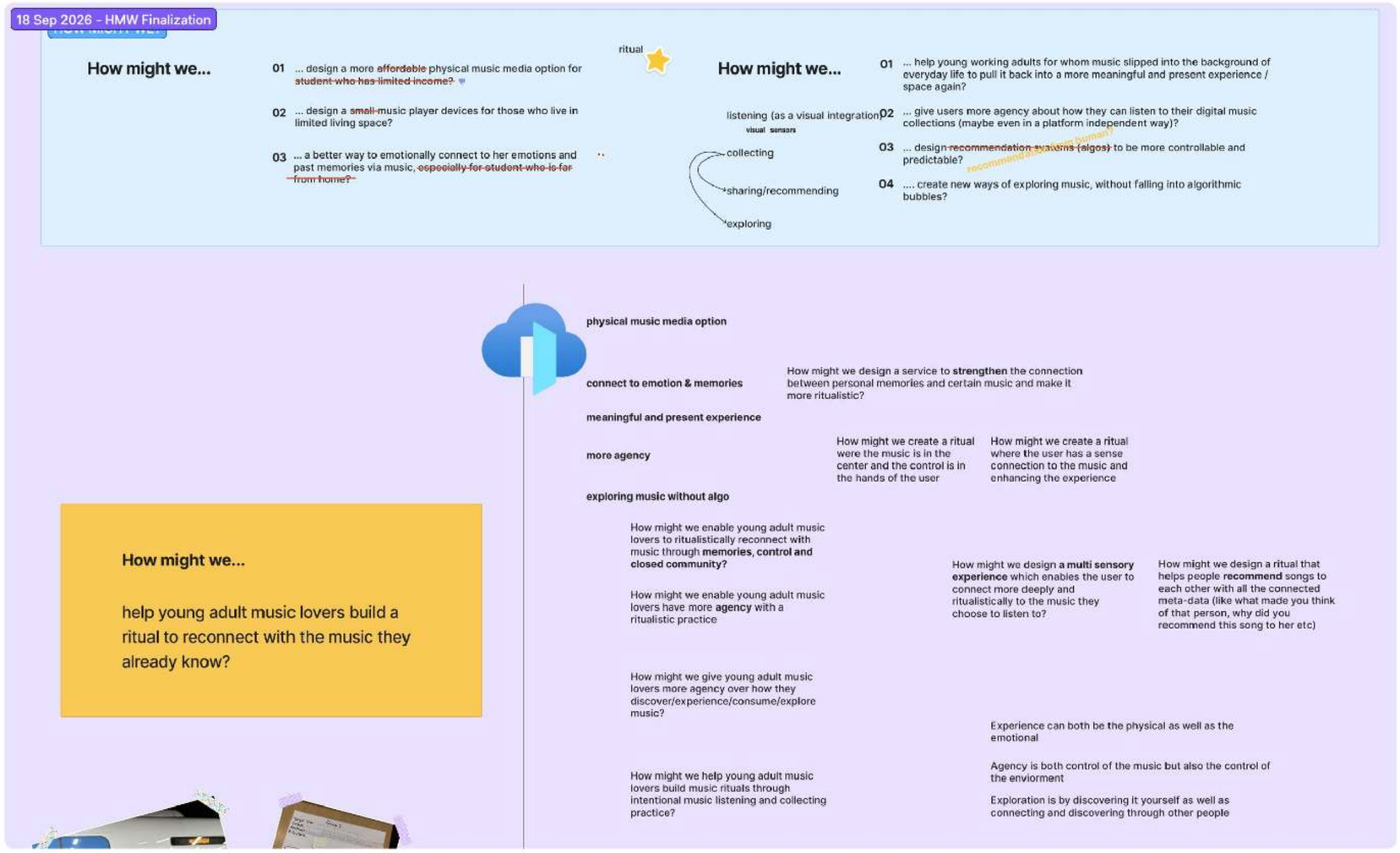
Initial version

POVs & HMWs

While Alice's questions initially leaned toward tangible products, Alejandro's explored broader interactions with music platforms and discovery systems. This gave us different starting points for ideation, ranging from physical music experiences to new ways of organizing, discovering, and engaging with music.

At this stage, the POVs and HMWs served as an initial translation of our research rather than a final definition of the problem. Keeping the questions open-ended would allow us to explore alternative approaches without prematurely committing to a particular product or feature.





Refining HMWs

After the peer critique workshop, we revisited our HMW questions to identify the directions that best aligned with our research findings, user needs, and interests.
We refined the questions to focus on more relevant and actionable opportunities, removing ideas that exceeded our project's scope or capabilities. This helped us narrow our focus while keeping the design space open for further exploration.

DEFINED - Personas & Scenarios



Alice Ross

Age: 19

'I want to have a better way to connect with my emotions and memories using music. Apps on my phone is convenient but it does not seem like I own anything on there.'

Goals:

Wants to experience music in a more immersive way to connect to her memories and emotions

Problems:

- Struggle with stress of new environment and study
- Has to *stay flexible in her time allocation* ***on a fking ritual*** due to ever changing schedule
- Cannot afford a big collection of physical media

Behaviors:

- Listen Spotify for 5 years
- Wants to explore music in a better way but always falls back to the platform because it is easier.
- Uses music as a memory anchor. Songs can become connected to specific places, trips, and periods of life.

Scenario

SCENE
- During the week, Alice occasionally think of her friends and family back home and miss the old days. While managing a new life at school and in a new town, she relies a lot on music to regulate and feel less lonely.

EVENT
- In some moments, when a song is truly special to one of her memory, she needs a better way to be present and experience it.

GOAL
- She wants to experience that fully and immersively, with a better connection to her emotions and the art of music .

OBSTABLE
- As a student, she cannot afford a big collection of physical, limited to her phone and Spotify subscription. It is convenient, but she is not satisfied with it for a more personal and tangible experience.



Alejandro Perez

Age: 24

'I play music in the background while commute every day, but I'm afraid that it is becoming too passive and I only listen to what the app gives me.'

Goals:

Wants to feel more in control over what music he listens to instead of overly relying on the algorithms.

Problems:

- Feels like he only listens to the same couple of songs when using shuffle function of streaming platforms.
- Feels like current technology doesn't give enough agency and puts him into a bubble

Behaviors:

- Often listen to music passively on long commute everyday to work.
- Mostly relies on recommendation systems of streaming platform to find and listen to music.
- When he has time, he enjoys going to live performances.

Scenario

SCENE
- During the week, Alejandro spends a lot of time to commute to work. While traveling, he passively put on music.

EVENT
- On Sunday afternoon, Alejandro finally has time to slow down and spend time with music. He wants to revisit the songs he has saved and rediscover some of his favorites.

GOAL
- He wants an easier way to regularly revisit his liked music and turn it into a personally currated experience

OBSTABLE
- Over time, he accumulates hundreds of saved songs. However, he rarely goes back to them because his daily recommendations and personalized mixes constantly introduce him to something new. Songs he once enjoyed gradually get buried in his library.

DEFINED - POV

Alice wants to **experience music in a more immersive way** because music has become a tool her to feel connected to her memories and emotions. However, when a song carries special emotional meaning, simply playing it through her phone doesn't feel sufficient to fully experience it.

Alejandro wants to **connect with music in a more personal way** because his everyday listening has gradually become passive during commute. Meanwhile, algorithm-driven recommendations keep pushing more music toward him, making it harder for him to intentionally return to and reconnect with the music he already loves.

DEFINED - HOW MIGH

How might we help young adult music lovers build a ritual to reconnect with the music they have already saved digitally?

Further refinement of our HMW questions led us to revisit our personas, scenarios, and POVs to ensure they remained aligned with our evolving design direction. Initially, we retained two personas with more refined needs, behaviors, and contexts. However, following feedback from our supervisor, we reconsidered whether addressing both personas would make our scope too broad.

We ultimately consolidated our focus into one primary persona, bringing the project closer to a specific user group and a clearer set of needs. This decision helped us avoid trying to solve too many different problems at once and established a more coherent direction for the subsequent design phase.

Refining Persona, Scenario, POV

18 SEP

Final Version

Persona, Scenario, POV, HMW

Persona



Remi Bach

Age: 21
Music Lover

“I have so much music saved that means something to me, but i rarely go back to it as music starts to slip into the background

I want music to feel personal and meaningful again”

Goal:
want to reconnect with her memories and emotions through a more immersive and self-directed music listening experience

Problems:

- Their current music streaming service doesn’t give them enough agency over what / how they want to listen to music.
- Also, listening to the music they love through their phone doesn’t feel immersive enough.

Behaviors:

- Uses streaming platforms regularly and has accumulated a large collection of saved songs.
- Has music as a memory anchor. Songs can become connected to specific places, trips, and periods of life.
- Mostly relies on recommendation systems of streaming platform to find and listen to music.
- When she has time, she enjoys going to live performances.

Scenario

Scene
During the week, Remi listens to music while commuting & studying. While managing a new life as a young adult, she relies a lot on music to regulate and feel less lonely.

Event
On a quieter day, Remi wants to slow down and reconnect with music that already has meaning to them.

Goal
Remi wants to intentionally revisit the music she has saved and reconnect with the memories and emotions attached to it in an immersive way.

Obstacle
Their smartphone is convenient, but they are not satisfied with it for a more immersive and tangible experience.

Streaming platforms keep pushing new songs using the algorithms, making the ones they once loved get buried further.

POV

Remi wants to experience music in a **more immersive** way, while being in **total control over** what she listens to because the current music streaming service tries to force new music onto her, and listening to it simply through the phone doesn't feel sufficient to fully experience it emotionally.

HMW

How might we help young adult music lovers build a ritual to reconnect with the music they already love and have collected?

DEVELOP

Section 3

INE

DIVERGE
Which problem can we impacthe most

Ideation Planning

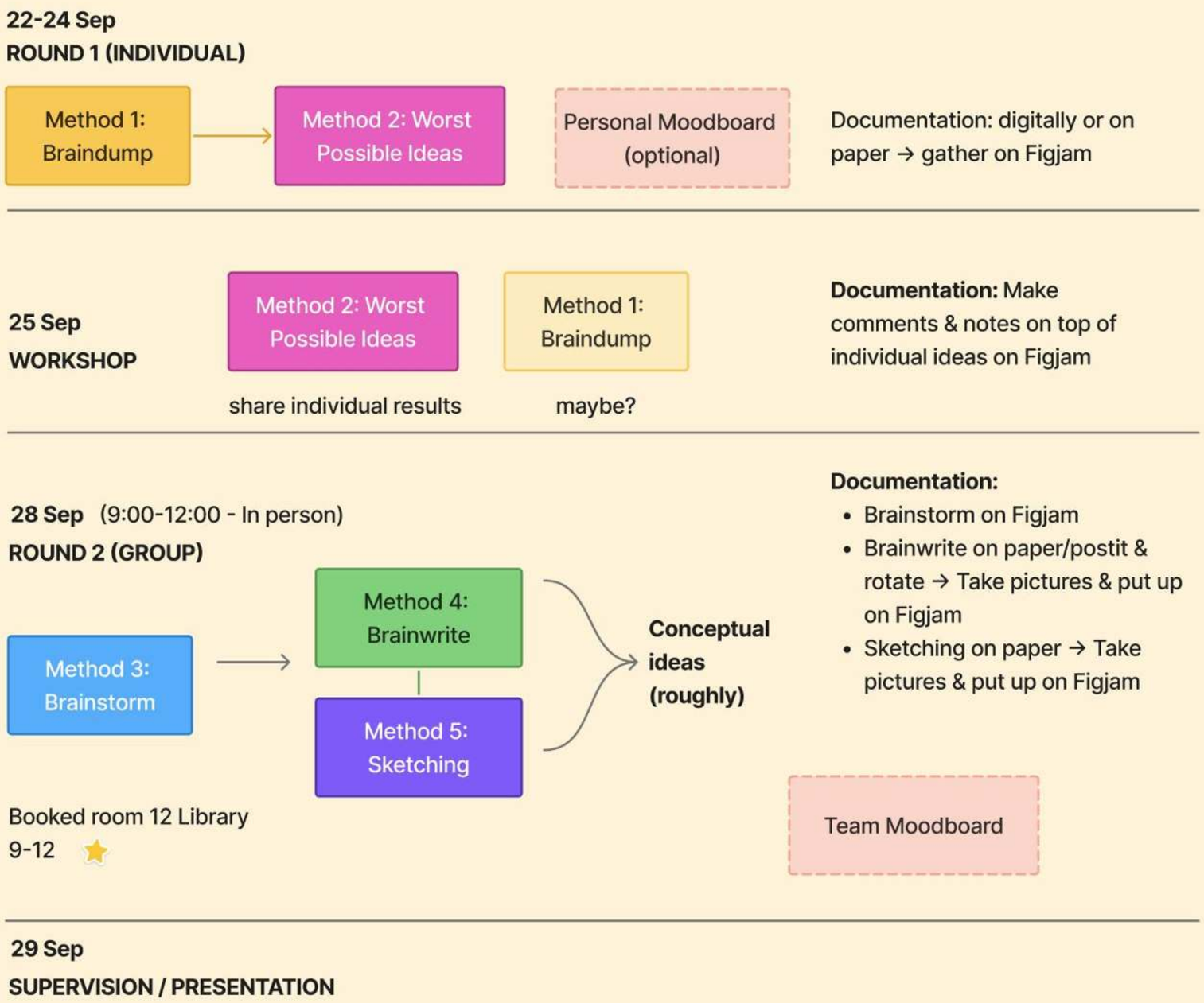
In this phase, our group has conducted several rounds of ideation, both individually and as a team.

METHODS DONE INDIVIDUALLY

1. Braindump
2. Worst Possible Idea
3. Sketching

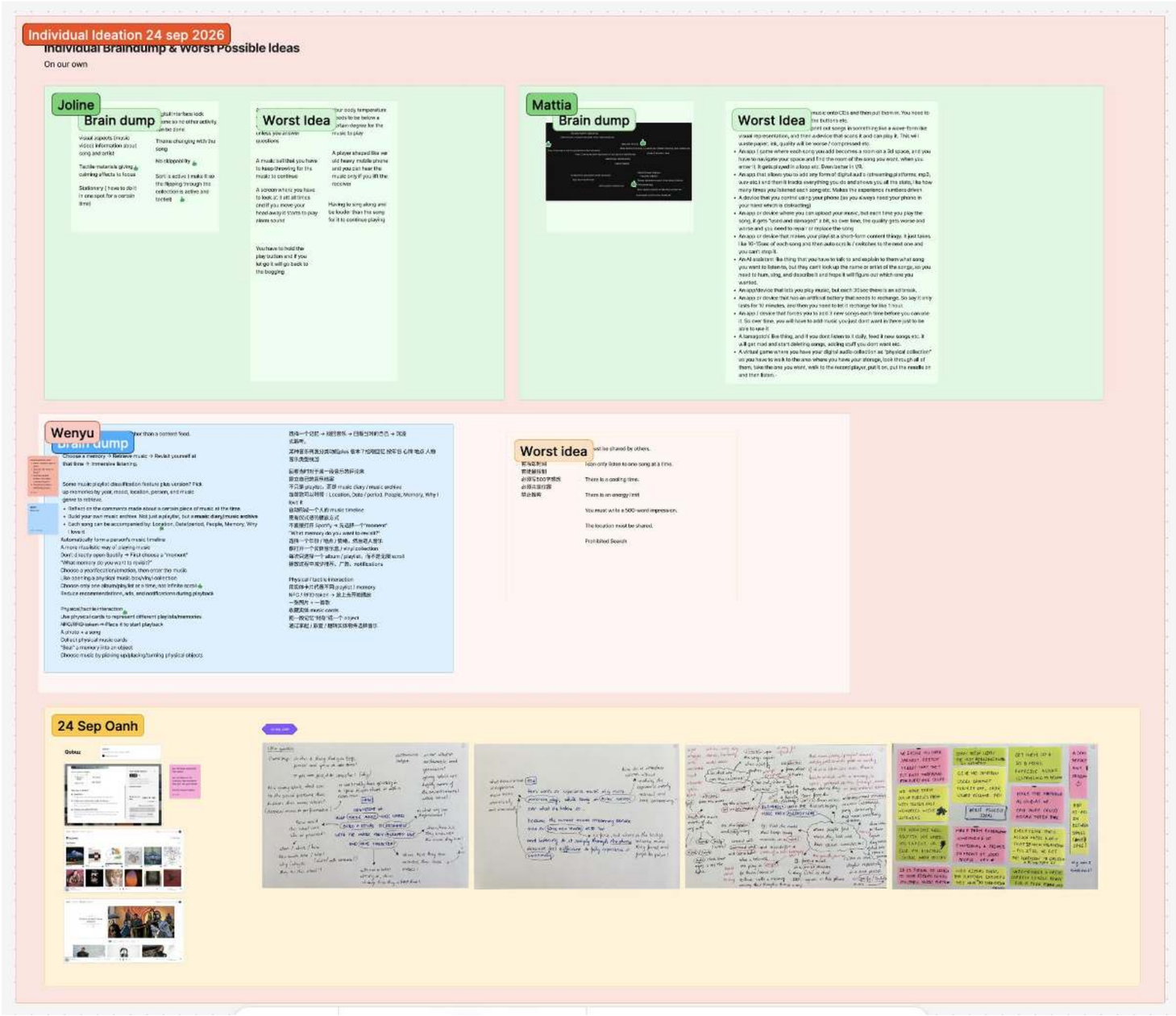
METHODS DONE AS A GROUP

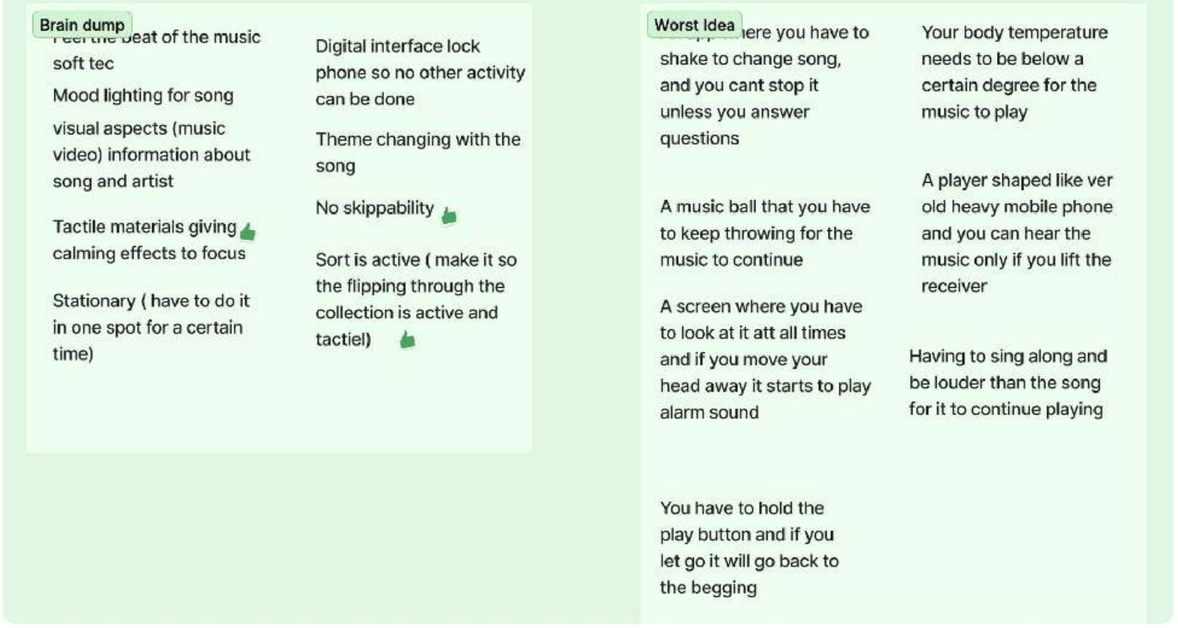
1. Worst Possible Idea
2. Brainstorm
3. Brainwrite
4. Moodboard



Braindump & Worst Possible Ideas

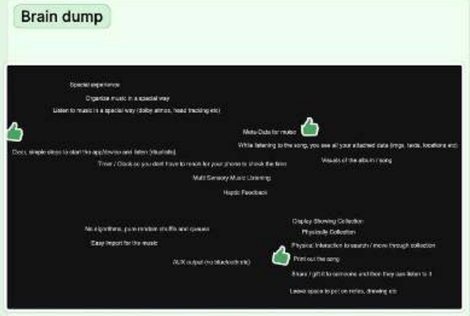
Methods done individually & what each of us brought to the table





MEMBER JOLINE

I had a hard time starting the brain dump as i hadn't used it before but ones I revisited what we had discoverer and all the memories form the discussions we had so far thoughts started flowing and it was easier to get them down in writing.
The worst possible idea was so enjoyable as it let me say the most annoying things i could think of, i would definitely use it again because it lets you say the wildsest ideas you have



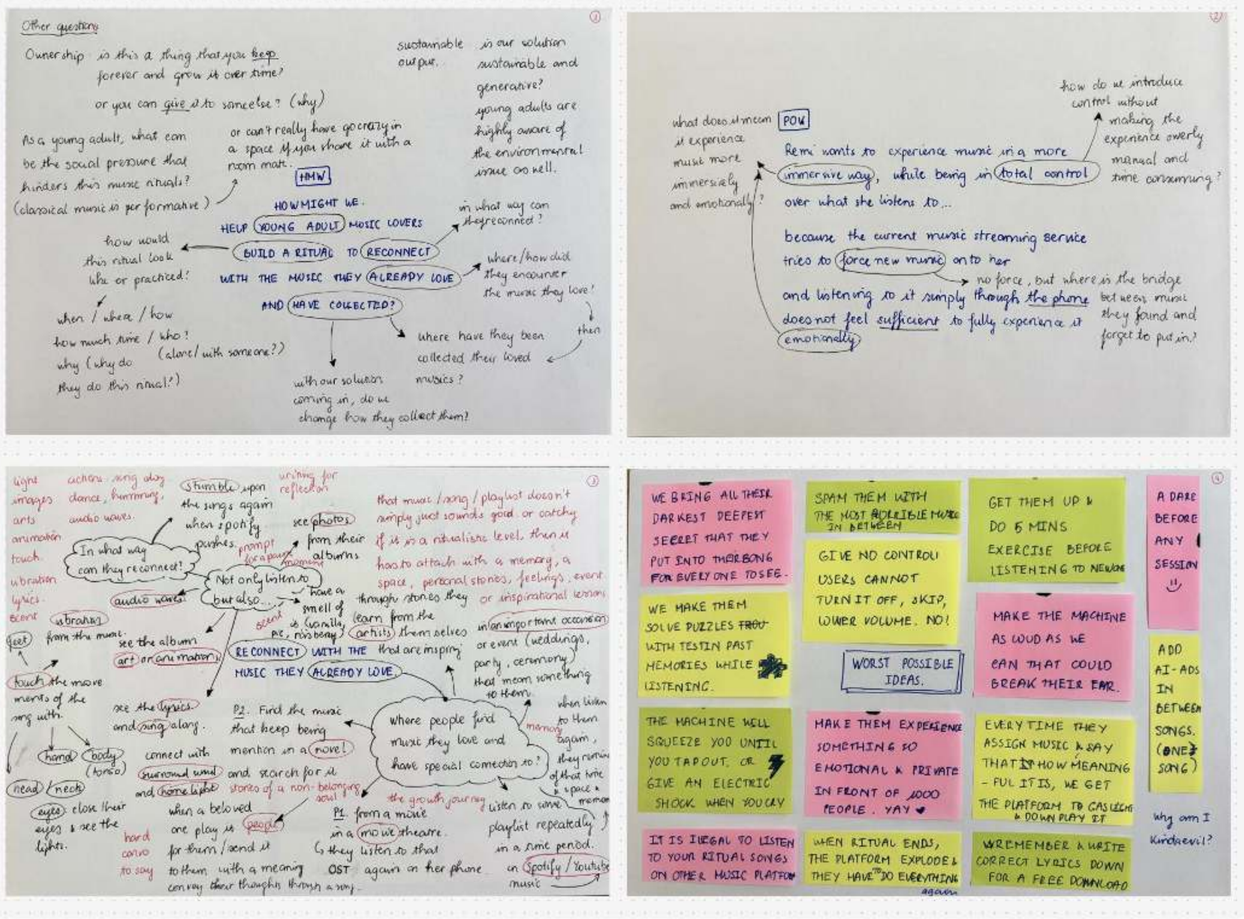
Worst Idea

- Juke-Box where you burn your music onto CDs and then put them in. You need to manually change the labels on the buttons etc.
- Make a system where you can print out songs in something like a wave-form like visual representation, and then a device that scans it and can play it. This will waste paper, ink, quality will be worse / compressed etc.
- An app / game where each song you add becomes a room on a 3d space, and you have to navigate your space and find the room of the song you want, when you enter it, it gets played in a loop etc. Even better in VR.
- An app that allows you to add any form of digital audio (streaming platforms, mp3, wav etc.) and then it tracks everything you do and shows you all the stats, like how many times you listened each song etc. Makes the experience numbers driven.
- A device that you control using your phone (so you always need your phone in your hand which is distracting)
- An app or device where you can upload your music, but each time you play the song, it gets "used and damaged" a bit, so over time, the quality gets worse and worse and you need to repair or replace the song
- An app or device that makes your playlist a short-form content thingy. It just takes like 10-15sec of each song and then auto scrolls / switches to the next one and you can't stop it.
- An AI assistant like thing that you have to talk to and explain to them what song you want to listen to, but they can't look up the name or artist of the songs, so you need to hum, sing, and describe it and hope it will figure out which one you wanted.
- An app/device that lets you play music, but each 30sec there is an ad break.
- An app or device that has an artificial battery that needs to recharge. So say it only lasts for 10 minutes, and then you need to let it recharge for like 1 hour.
- An app / device that forces you to add 3 new songs each time before you can use it. So over time, you will have to add music you just dont want in there just to be able to use it
- A tamagotchi like thing, and if you dont listen to it daily, feed it new songs etc. it will get mad and start deleting songs, adding stuff you dont want etc.
- A virtual game where you have your digital audio collection as "physical collection" so you have to walk to the area where you have your storage, look through all of them, take the one you want, walk to the record player, put it on, put the needle on and then listen.-

MEMBER MATT

For me, the brain dump was the perfect way to free up some mental space again.
From the beginning my brain started producing ideas. By finally writing them all down, I could feel some tension releasing.
I first was skeptical about the worst possible idea, as to me it seemed like a contra productive thing to do. But as I tried to think of bad ideas, I noticed myself going to good ones, and basically flipping them to be bad. By then going further with the bad direction, I could then flip it back again to find actual good ideas i couldn't come up with before. That's also how we ended up using one of the worst possible ideas in the end.



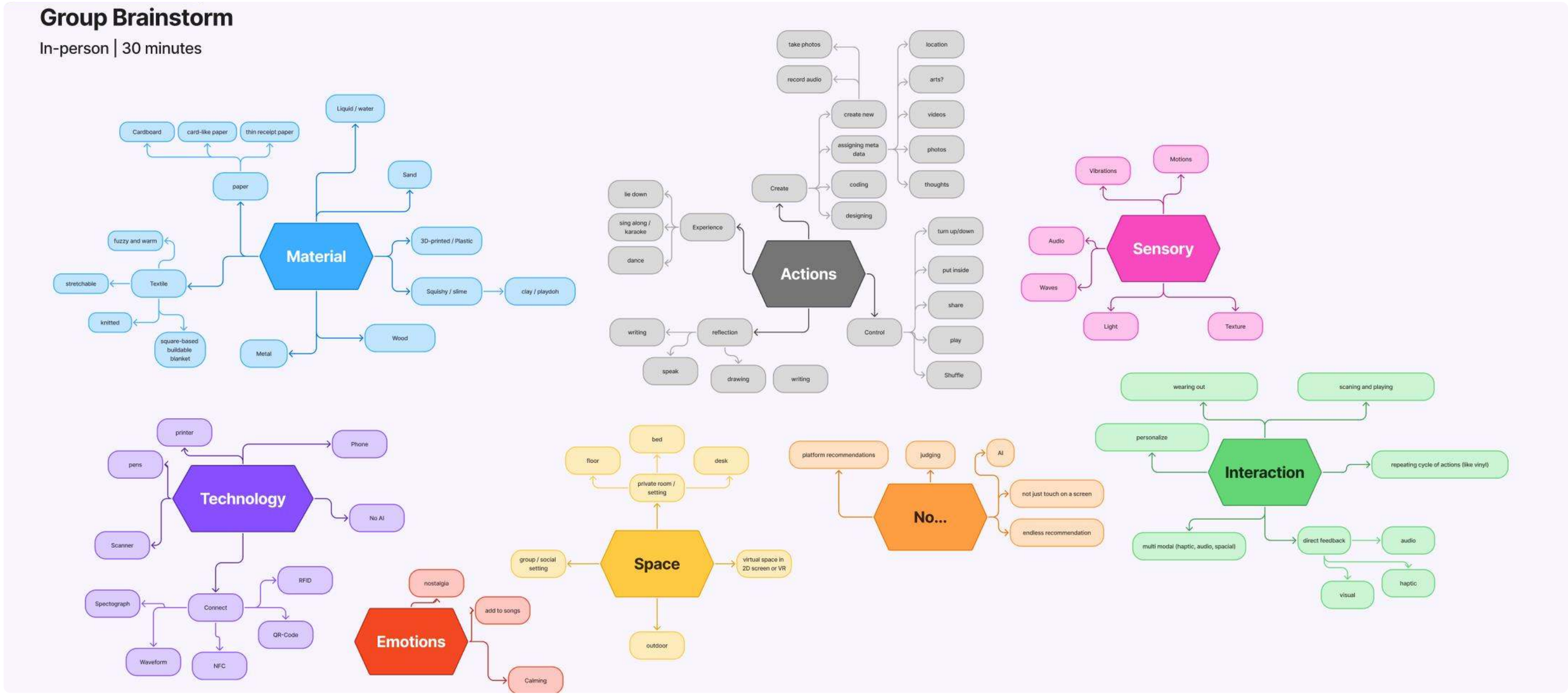


MEMBER WENYU

Briandump is a good way to catch everything you had in your mind. This can help me to break my mind-box. And the worst idea is even more extremely on this. I can write a lot of crazy ideas, which are normally be rejected. Like make the user experience worse or harder.

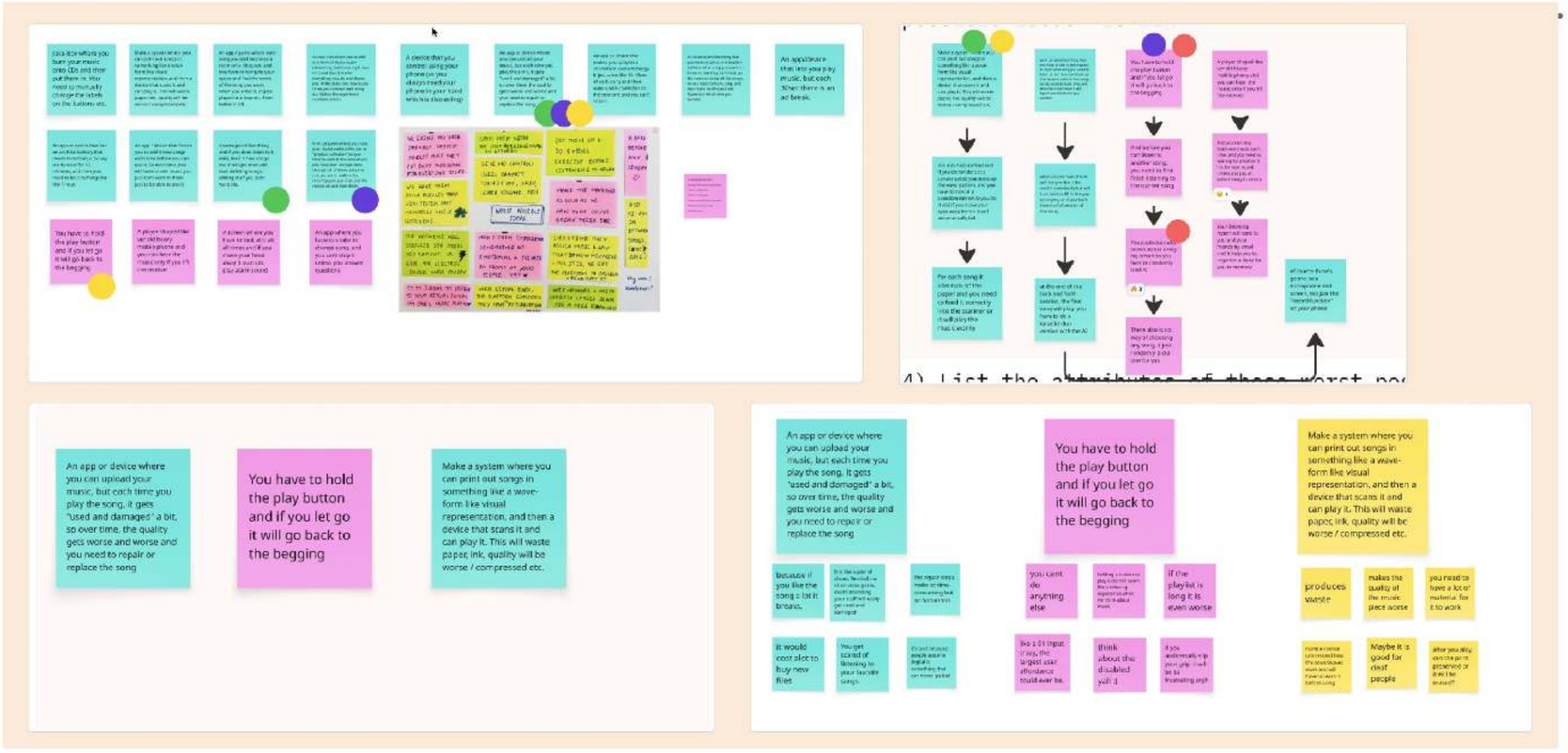
MEMBER OANH

I did my Braindump by breaking down the HWM questions that we finalized previously and targeting each section. For example, within “HMW ... reconnect with the music ...?”, I created a mind map exploring “in what ways can they reconnect?”-such as random discoveries, reminders from old albums, listening differently, singing along, and immersing in light design, etc.



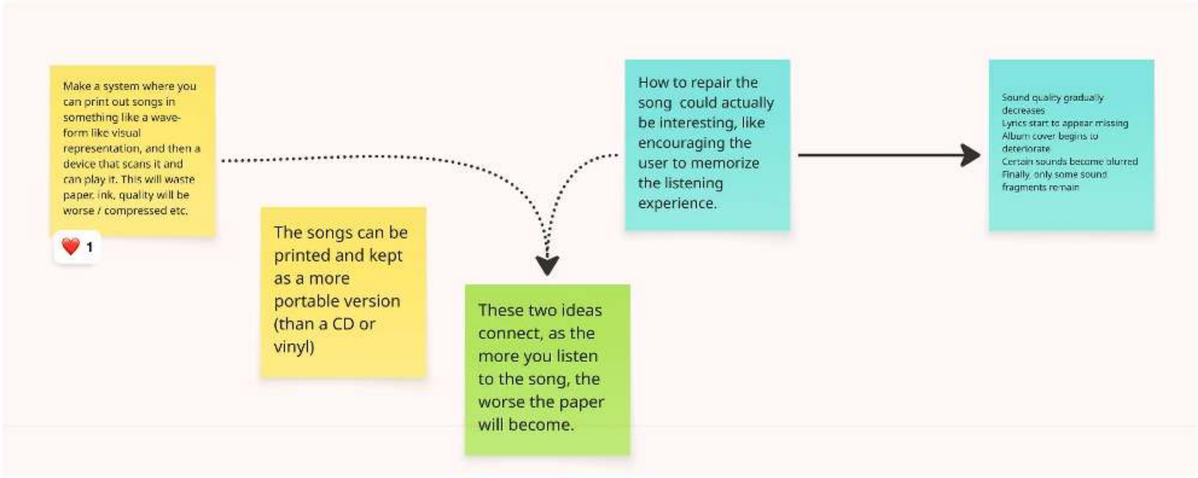
Brainstorm

We initiated the Develop phase with Brainstorming to rapidly generate a broad "idea pool," preventing early fixation on narrow solutions. However, live brainstorming naturally suffers from social conformity, where individuals tend to mirror dominant voices. To counteract this "double-edged sword," we introduced Brain Dump as a silent, individual exercise. This gave each team member uninterrupted space to process thoughts independently before returning to group discussions.



Worst Possible Ideas

To push our creative boundaries beyond conventional solutions, we conducted a Worst Ideas workshop. Surprisingly, this was one of our most valuable sessions. Generating deliberately "bad" or impractical concepts lowered our psychological barrier to failure and unlocked provocative avenues. For instance, one "worst idea" suggested that the audio quality of the card should degrade each time it was played. While counterintuitive for product design, we extracted a valuable insight from it: intentional "wear and tear" — much like a favorite pair of well-worn jeans — can actually create a sense of history and foster deeper emotional attachment between the user and the physical artifact.

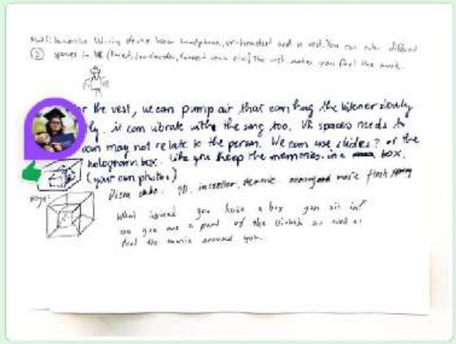


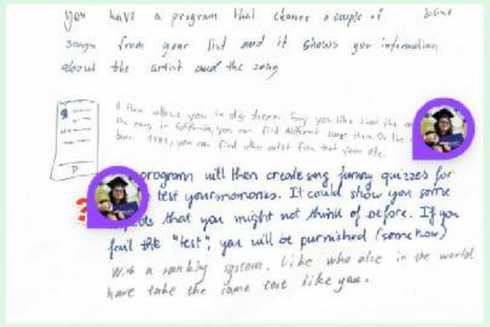
Brain write

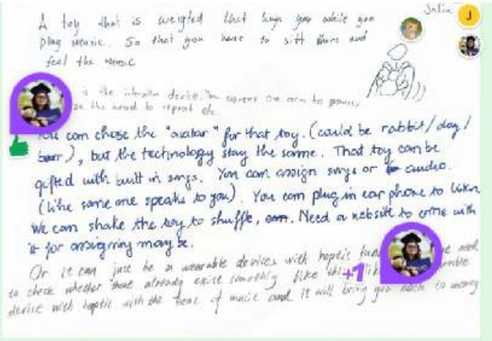
Brain Write allowed ideas to evolve like branches of a plant, pushing concepts in unexpected directions as cards were passed clockwise in silence.

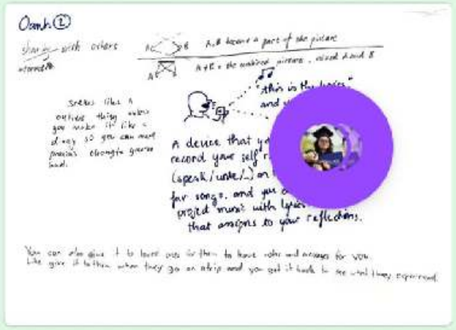
Group Brainwrite

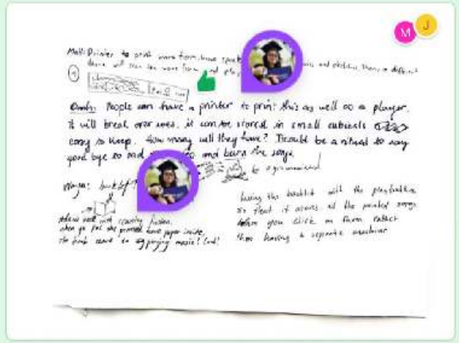
In-person | 1 hours

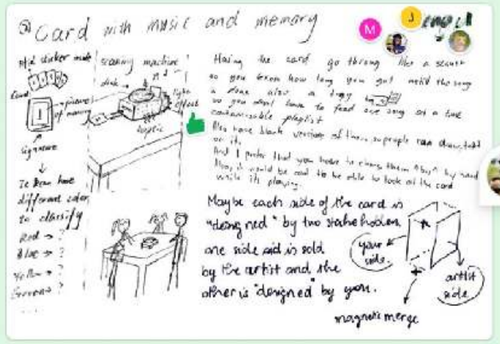


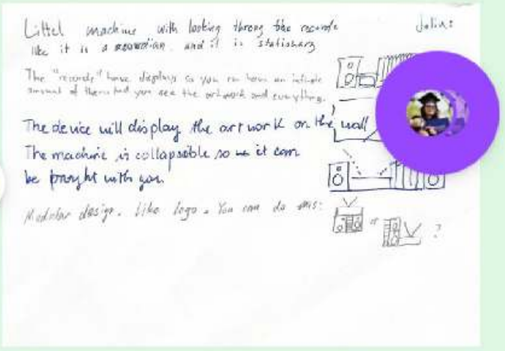




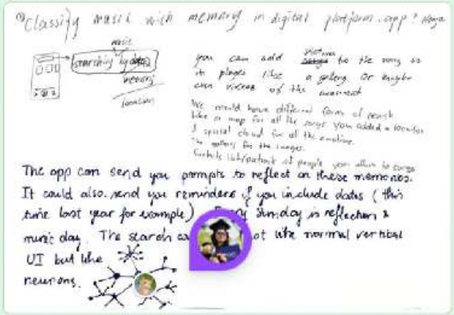


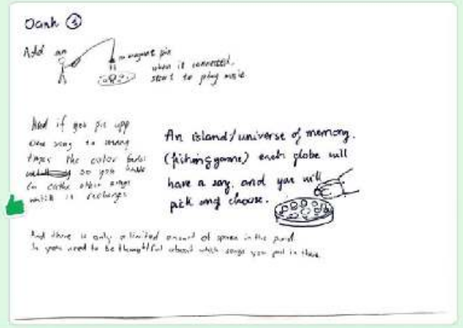


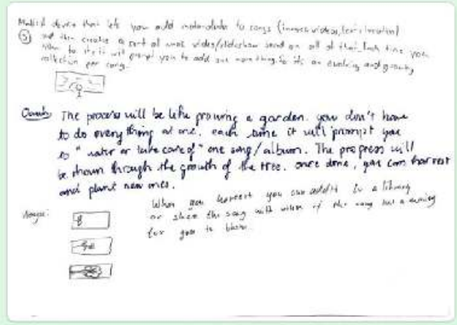








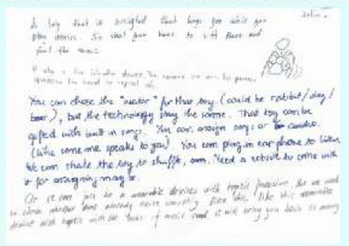


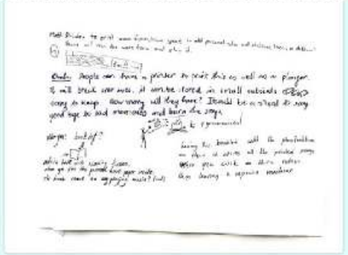


Conceptual Ideas

After the brainwriting session, we voted to select the top four conceptual ideas with the most potential. We then mapped out key attributes for each — such as candidate materials, technologies, interactions, and spatial contexts — which helped us validate their feasibility and narrow down our final two concepts.









Musical card

- Material
  - card：Thick paper with RFID in it
  - Scanner/player: wooden or Fabric
- Technology
  - RFID, NFC
  - Arduino
  - speakers/headphone
  - Screen
  - LED light
- Interaction
  - collect card, attaching memory and music to card
  - put card into the player
  - change a card, take the old one out of the player and replace it with a new one
  - shuffle, casually choose one memory/ music to recap
  - exchange your card with friends
  - buy or sell card
  - Digitally simulate the loss effect, like the quality of your memory or music need to be repaired if you didn't listen it for a long time. The music quality will turn down
- Space
  - At home
  - Party
- etc

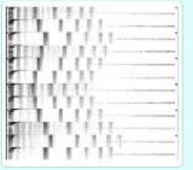
The sound of a hug

- Material
  - soft textiles
  - weights
- Technology
  - vibration sensors
  - speakers
  - headphones
  - Arduino
- Interaction
  - Using phone to feet music to it or if it has a memory stick slot
  - Holding the teddy bear you will be able to feel the beat of the music as well as it having weight it gives giving a calming feeling
  - Moving/pressing the arms and legs gives different control over the music
- Space?
  - At home
  - traveling
- etc

SoundSlip

- Material
  - Receipt Paper Roll
  - 3D printing?
- Technology
  - Receipt Printer (Heat-Printing)
  - Headphones / Speaker
  - Arduino / RP
    - Camera & Light
    - Step-Motor
- Interaction
  - Choose audio and send it to the device from your phone / computer
  - Collect the slips, take care of them etc.
  - Write, draw, scribble on them
  - Share / Gift them to people
  - Feed them back into the machine to listen to the audio
  - (Manipulate the audio wave form by drawing over it
- Space
  - At home, but would still be kind of portable
- etc

The ritual lies in connecting your thought and feelings with the song, but then also taking time in coming back to them, looking at / reading the slip, listening to it etc.



Music in the Sand Garden

1. Materials

- Sand
- A box/container that holds the sand and music-playing mechanism
- Built-in speaker
- Alternative：Water and ripples instead of sand

2. Technology

- Arduino: a machine translates the music into physical movements and draws patterns in the sand as the music plays
- Water version: A screen can be placed underneath the water. It can display images or videos associated with the music while the surface of the water creates constantly changing ripples

3. Interaction

- The user selects the music
- The machine analyzes elements of the music and translates them into movements that create patterns in the sand
- The final artwork is partially unpredictable, emerging from a combination of human drawing participation and machine-generated movement
- Each song produces a different visual result, making the experience tangible yet temporary

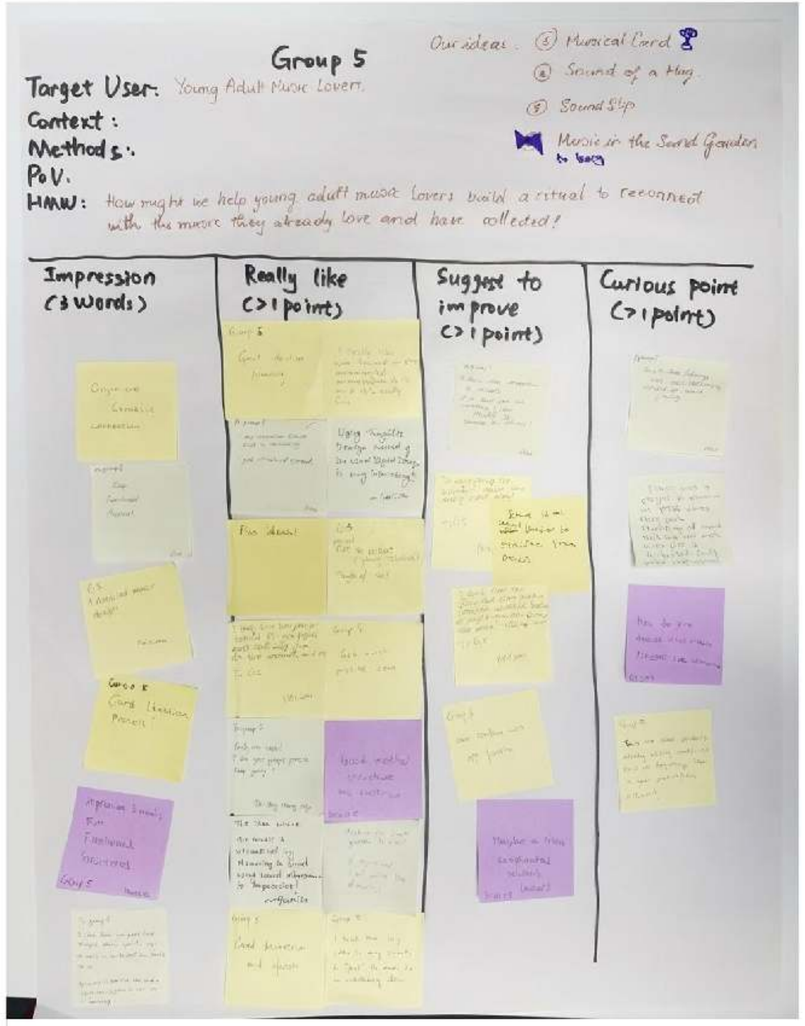
4. Space

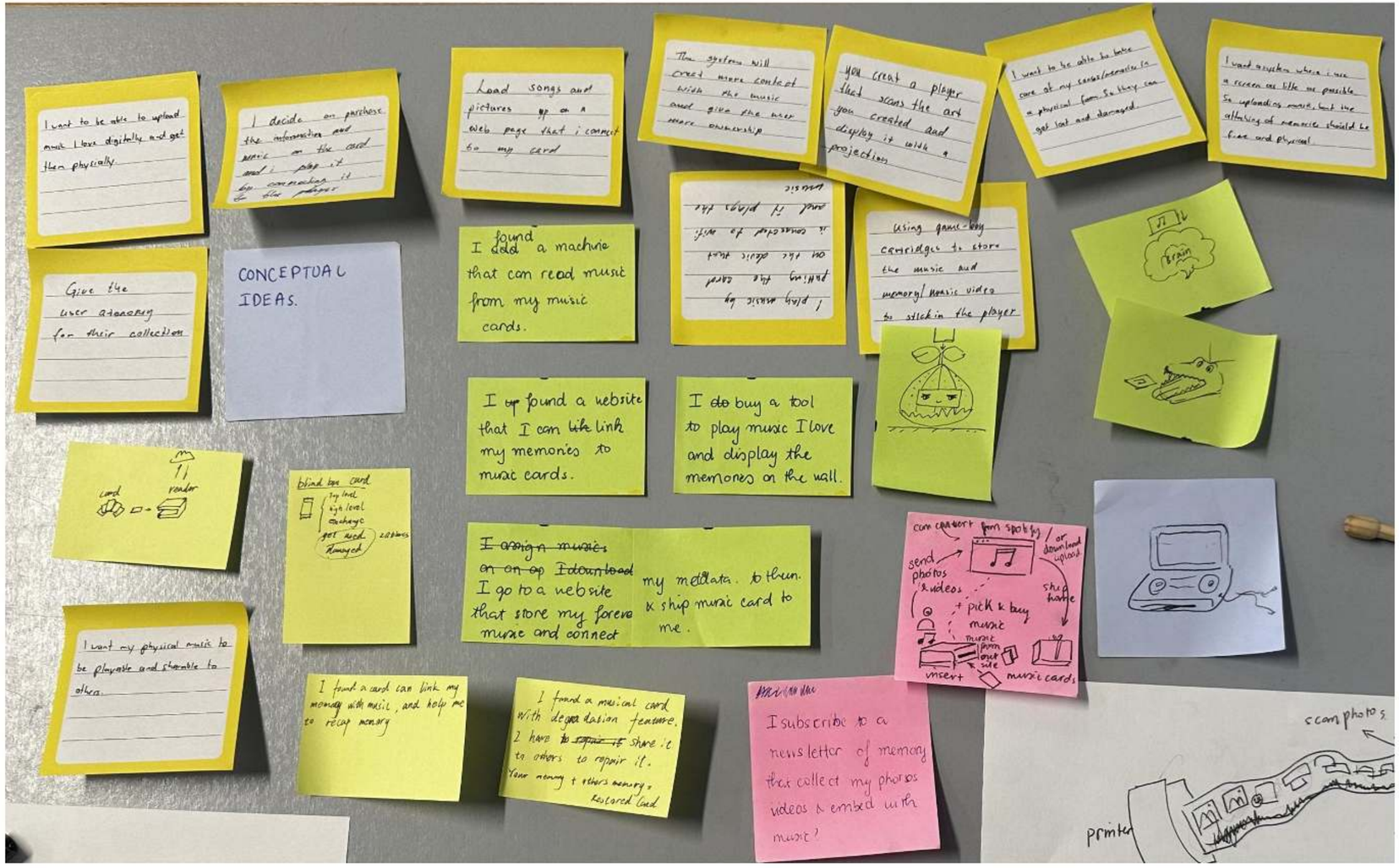
- Designed as a stationary object for the home

5. Inspiration

- Inspired by Zen sand gardens and their use as a contemplative ritual for relaxation and stress reduction
- Inspired by the physical qualities of sound: rhythm, vibration, frequency, and amplitude can be translated into visual patterns

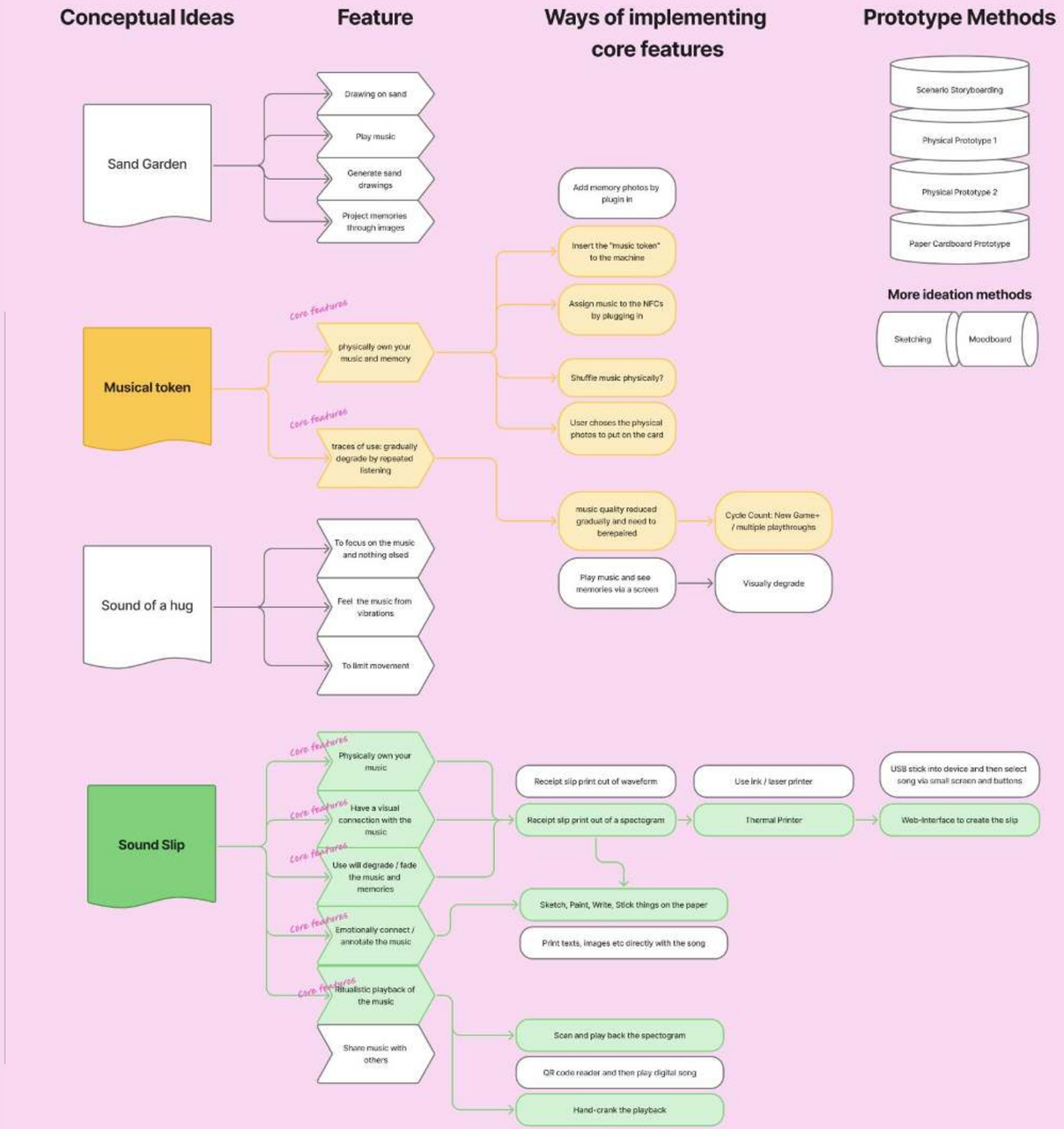






After receiving positive feedback during our peer critique workshop on the four conceptual ideas, our team revisited each idea to evaluate how well it aligned with our user personas and How Might We (HMW) question.

To help us make an informed decision, we practised articulating each concept in a simple sentence, focusing on what we would create, what it would do, and how it would address our users' needs. This exercise helped us communicate the core value of each idea more clearly and identify which concept best addressed our users' needs and the design challenge.



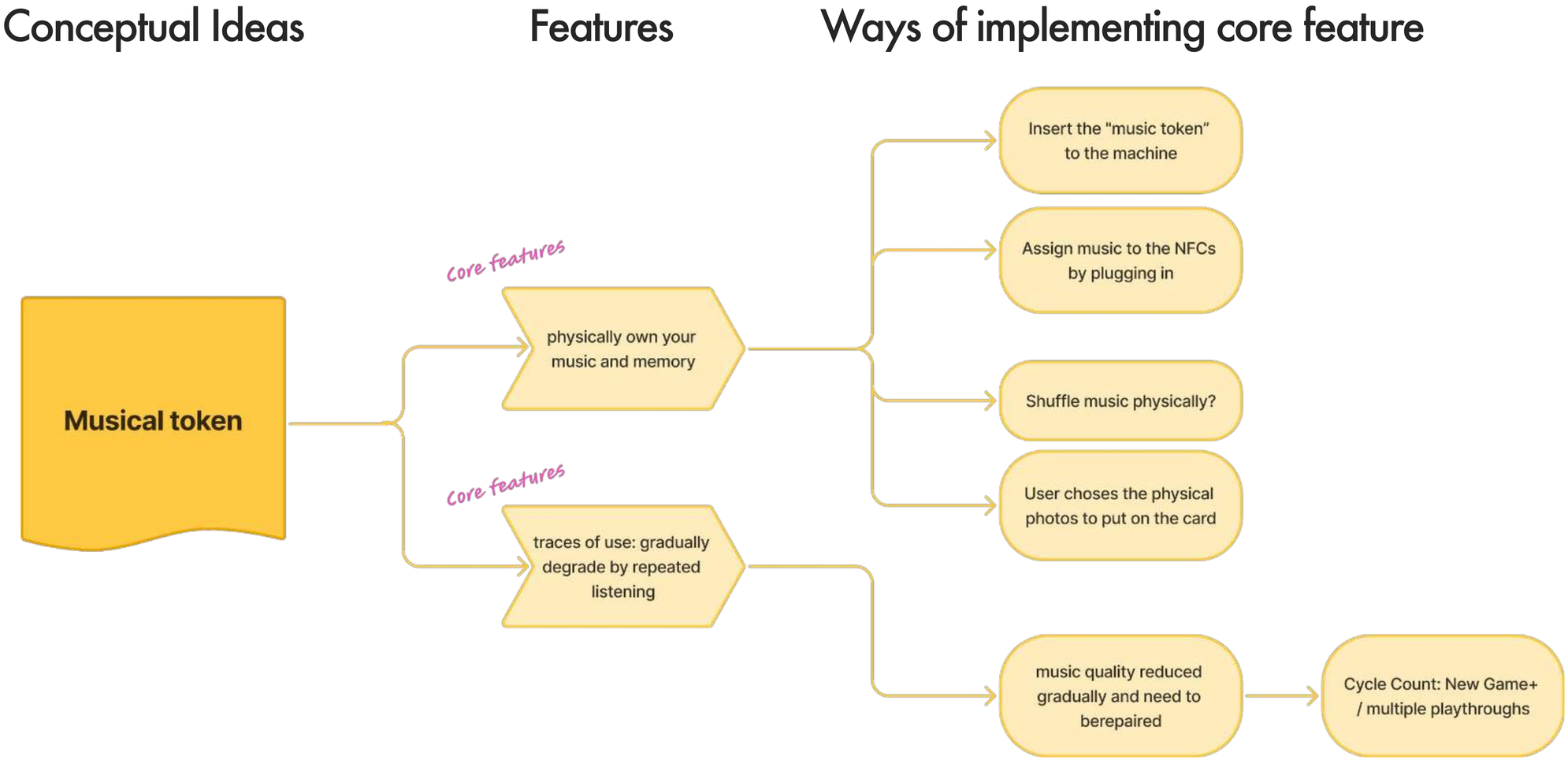
Conceptual Ideas & Core Features Mapping

After mapping the conceptual ideas against their core features and exploring different ways to implement them, we narrowed our selection down to two concepts: **Musical Token** and **Sound Slip**.

We selected these two ideas because they offered promising ways to connect users with music and memories through tangible, interactive experiences.

Musical Token focuses on personalising music through physical tokens and connecting songs to meaningful memories.

Sound Slip, on the other hand, allows users to visualise, interact with, and annotate music through printed spectrograms, creating a more personal and expressive connection to their listening experience.

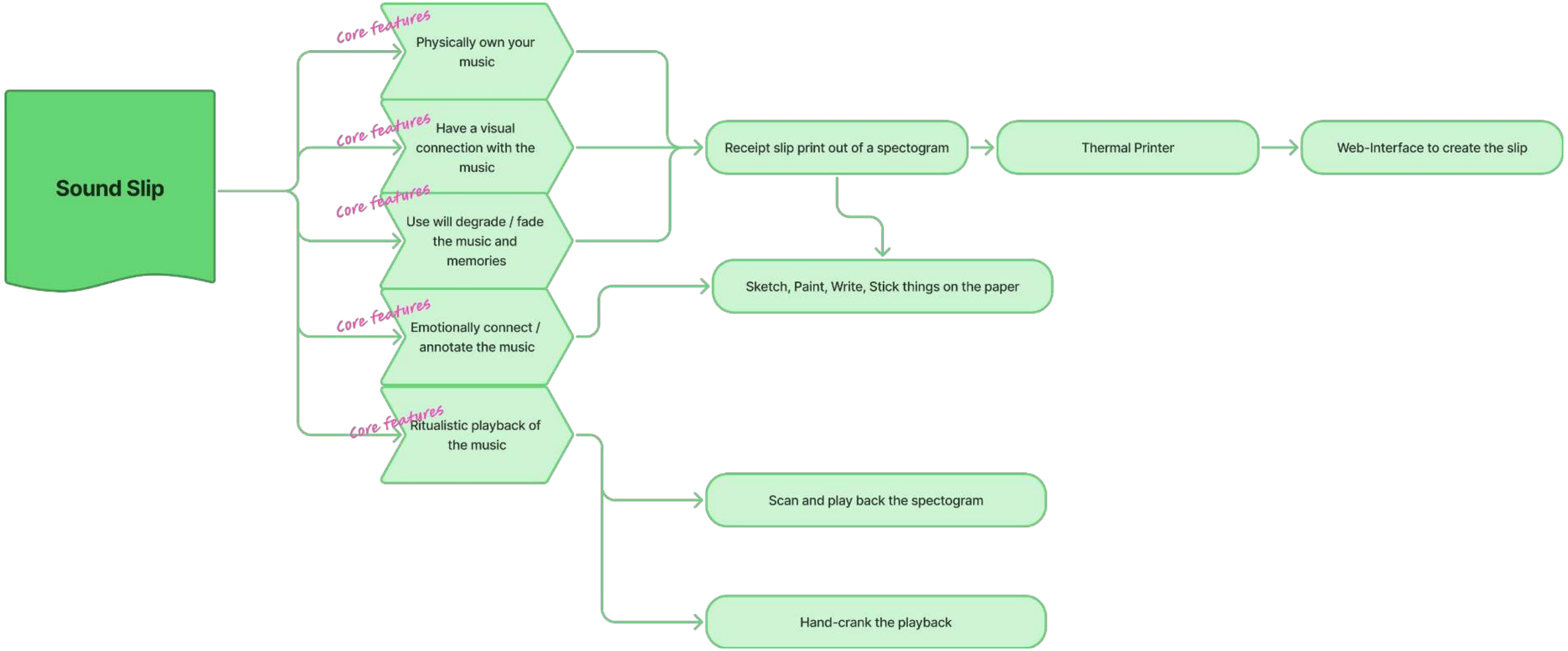


Conceptual Ideas 1

Conceptual Ideas

Features

Ways of implementing core feature



Conceptual Ideas 2

7 OCT

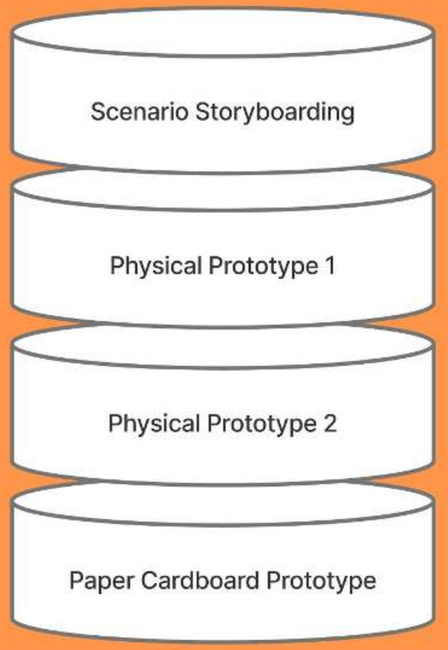
To explore our two selected concepts, Musical Token and Sound Slip, we planned a series of low-fidelity prototyping methods to test their core features and interactions before committing to a final design.

We began with scenario storyboarding to visualise how users might interact with each concept in real-life situations. Next, we planned two physical prototyping to explore the form, functionality, and user experience of each idea. We also did paper-and-cardboard prototypes to quickly test physical interactions and gather feedback with minimal resources.

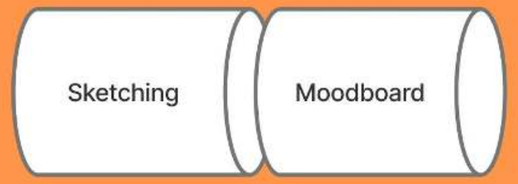
Alongside these methods, we used sketching and moodboarding to explore possible forms, visual styles, and design directions. This iterative approach allowed us to make ideas tangible, identify potential issues early, and refine our concepts based on user needs and feedback.

Lo-fi Prototypes

Prototype Methods



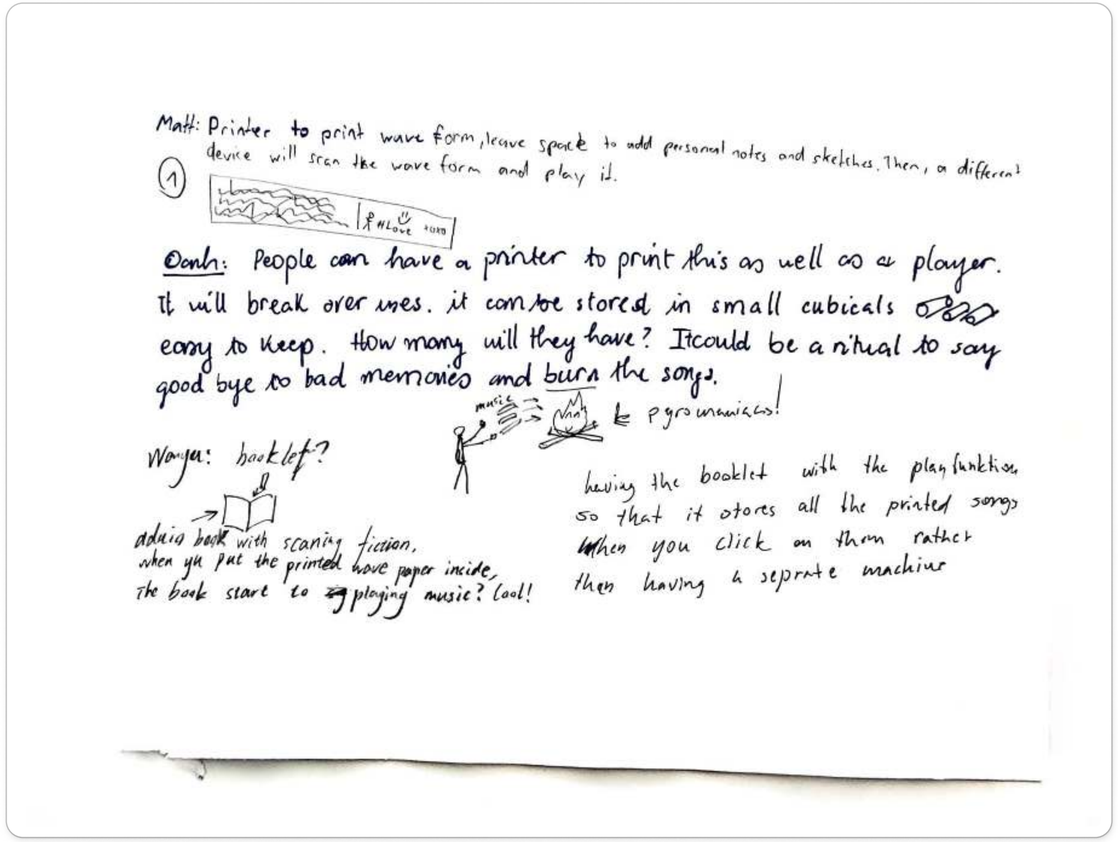
More ideation methods

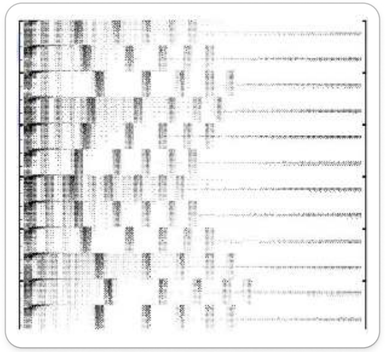


Slippy

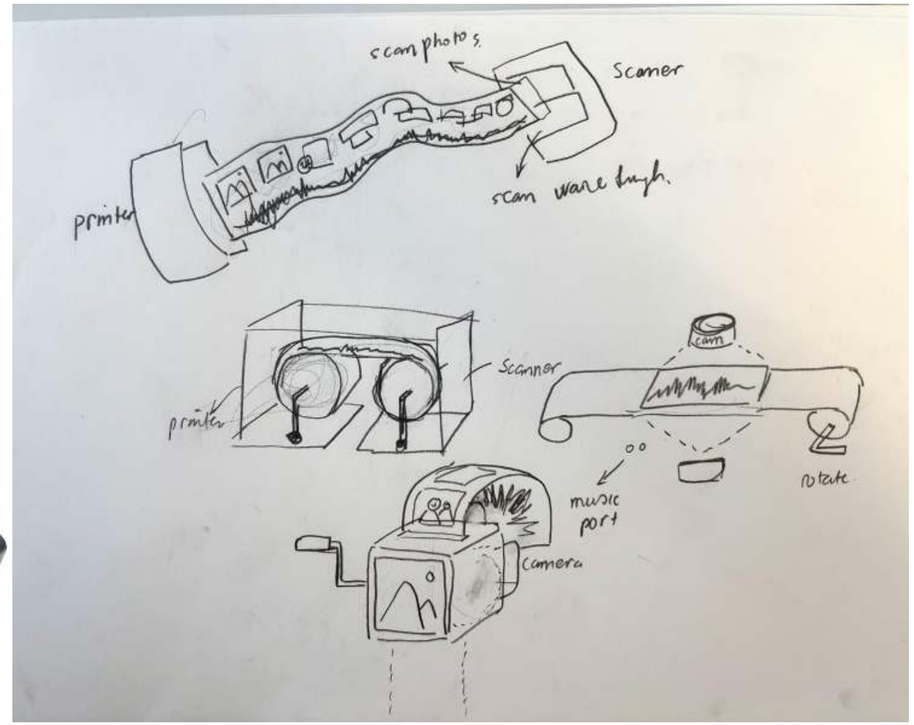
Print your music → annotate it → listen to it

Conceptual Idea









Slippy
Prototypes



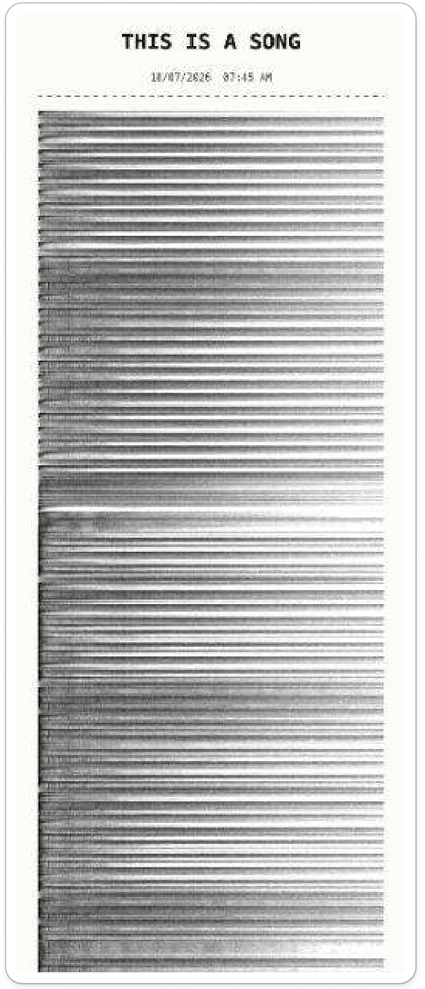




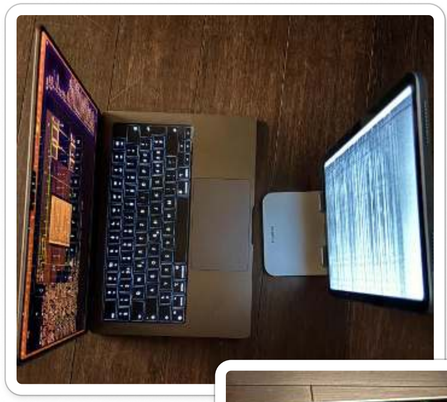


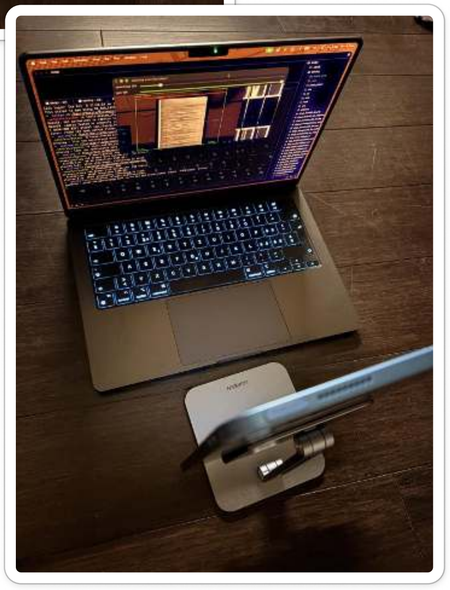
PHYSICAL DEVICE





WEB INTERFACE FOR GENERATING

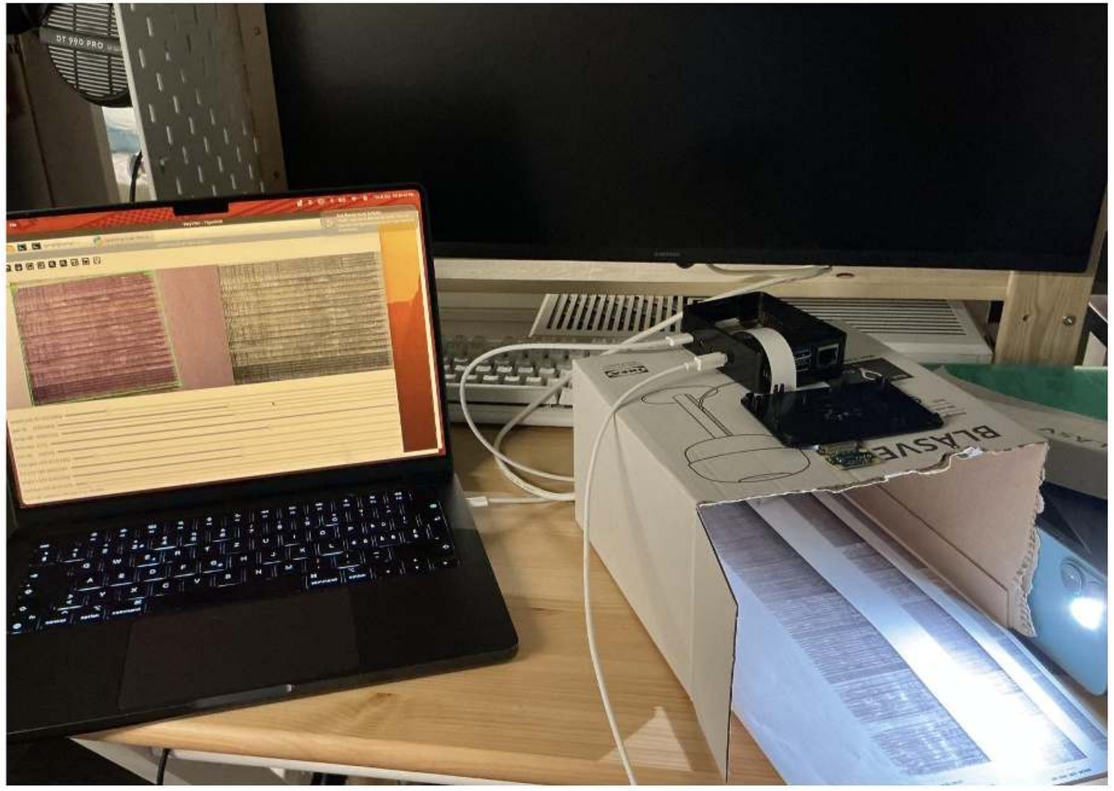




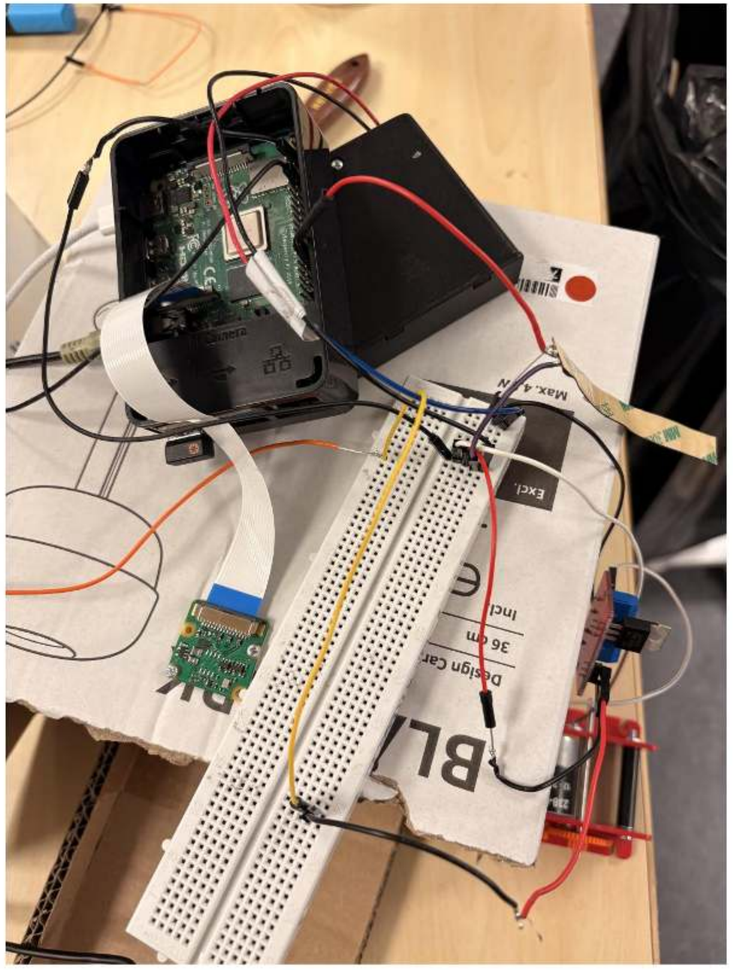
CAMERA-BASED PLAYBACK SOFTWARE

Slippy

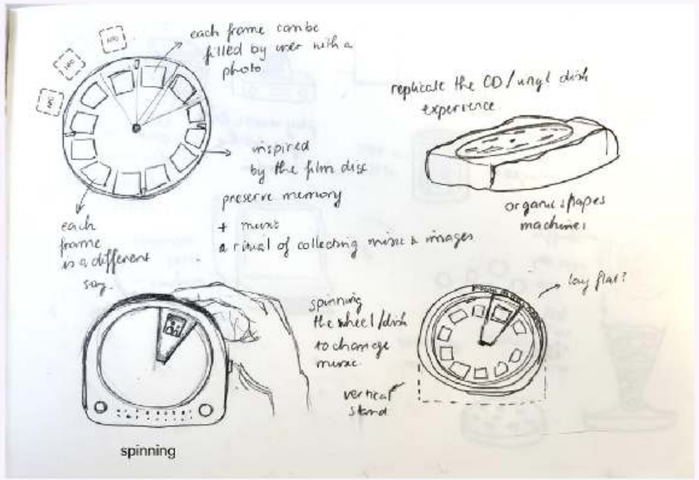
Bringing the software to the hardware

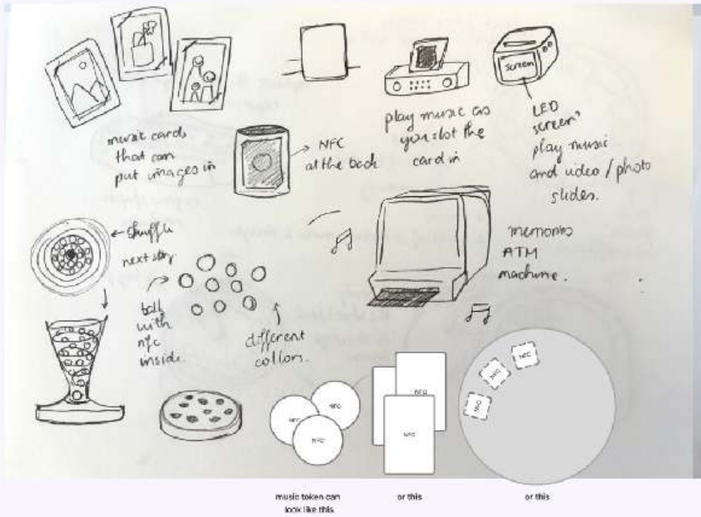


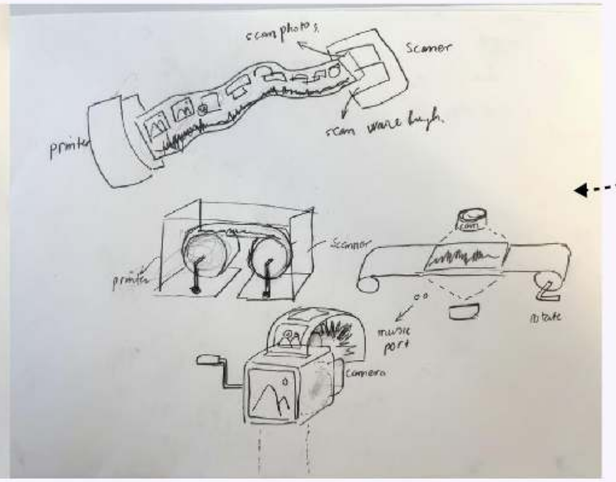
Even tho this was just for the lofi prototype, it was crucial to at least have a software based proof of conecpt as the idea of having sound on a piece of paper can be abstract and unbelievable that you can actually store real songs this way.



So while the Pi camera didn't really work well enough to reproduce any form of sound, we could still show the concept to the users and proof that with the right hardware, it can work.

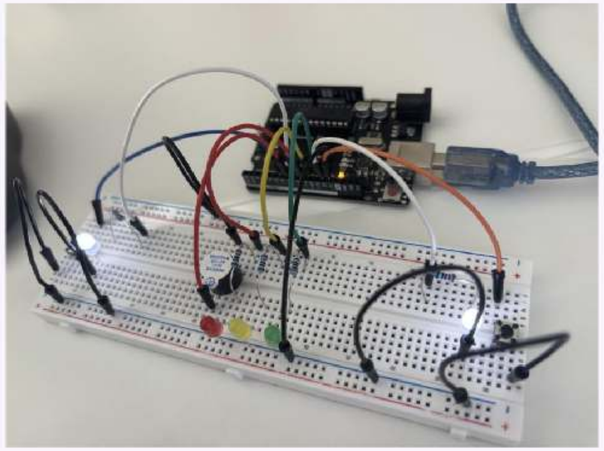




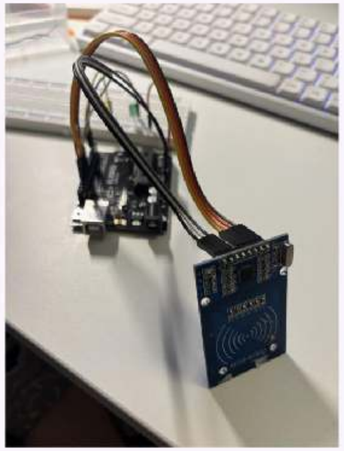


SKETCHING

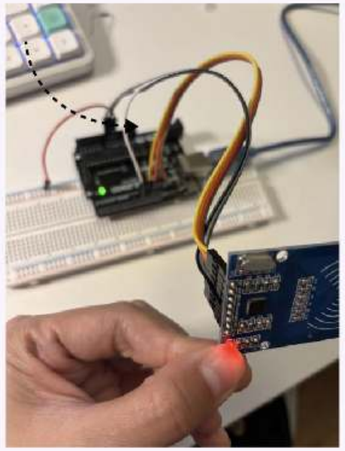
I find that sketching and building physical artifacts should go hand in hand, as they enhance and elevate each other tremendously.



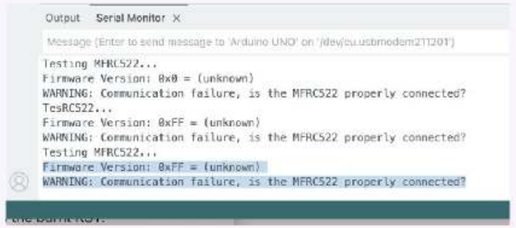
Testing with starting sound for music to play (like the beginning sound when you start radio or vinyl



RFID Reader is troublesome :)



RFID Reader is troublesome :)



Somebody ruined the reset pin (MIDDLA) so it keeps returning Communication failure

PHYSICAL PROTOTYPE

Musical token

MEMBER OANH

Physical Prototype & Sketching

This is my first time building with Arduino. Although I have wanted to learn it, I was afraid it would slow the group's pace. As a newbie, my inexperience can influence my decisions about choosing what is easy versus what is right.

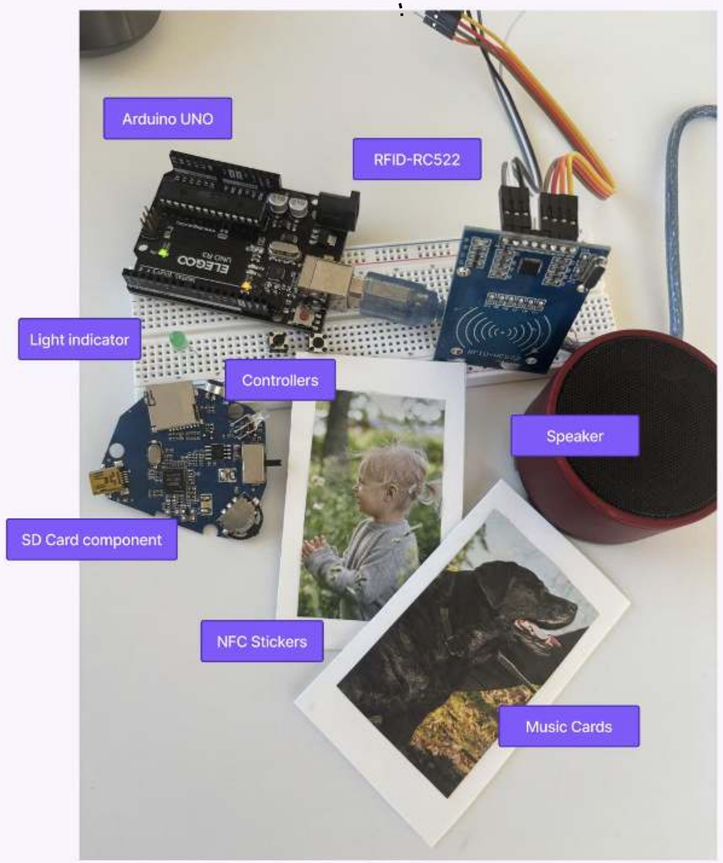
However, I chose to be super upfront about these downsides with my team, and they are very supportive of my learning. Therefore, I try to put in my best effort regardless of the challenges.

Musical token

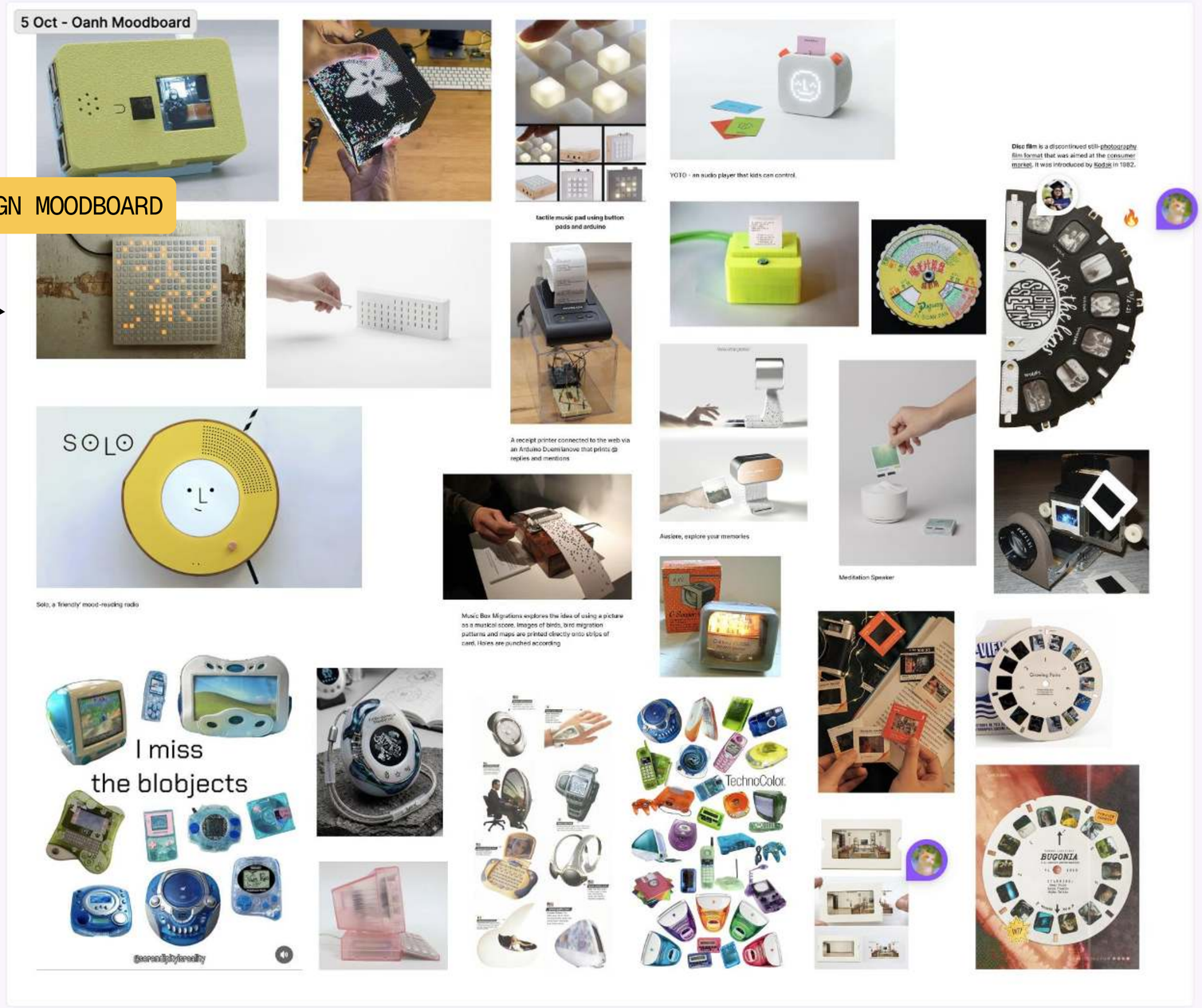
Physical Prototype & Moodboard

MEMBER OANH

AARDUINO MODULES



PHYSICAL DESIGN MOODBOARD



Musical token

Physical Prototype / Cardboard Prototype

Main Functionality
Each memory is represented by a personalised card containing a user photo, an NFC tag, a memory photo, and an associated song.

Key Components
- NFC cards: Each card has a unique ID linked to a specific memory.
- MP3 player: An audio player with an SD card to store songs in MP3 format.
- Display screen: Shows the photos assigned to the selected memory.

How It Works
When the user inserts an NFC card into the music box, the system identifies the card, plays its associated song, and displays the corresponding memory photos on the screen. This creates a tangible, interactive way to revisit personal memories through music and images.



For this low-fidelity prototype, Oanh was responsible for building the cardboard music box, while Wneyu explored how to use a smartphone's existing features to simulate the core functionality. The phone was configured to read NFC tags and trigger a shortcut that plays the associated song and displays the corresponding memory photos simultaneously. This approach allowed us to test the user experience without building the electronic components from scratch.

MEMBER OANH WENYU

Musical token

Cardboard Prototype

MEMBER JOLINE

Main Functionality
It would function like stereoscope were each photo on the wheel would represent a song.

How It Works
When the user inserts the disk so that a picture would align with the frame and press the button the song associated with the picture would play. By rotating the disk there the user could change the song.



The thought for this low-fidelity prototype came from the film disc and retro style of toys from the 90/00s where it is more in the simplicity and chunkiness of the object

Slippy

Cardboard Prototype

MEMBER JOLINE

Main Functionality
To move the music to your own tune. The concept would be that you would have a printed version of your songs that you then could play and store as a physical memorabilia but also that they would wear and tear over time, but also that you could modify your music

How It Works
First one would be to lay the music slip and then place the crank over to then move then with a top motion move the slip over the camera that would read the music to then play the music.
Second version would be that the music would go in to the box and you would feed it through whit a crank in this version as well and there would also be a camera reading the music of the slip, the difference, however, would be that the user could ad things such as drawings, writing or glue/stick things to the back

1.






2.

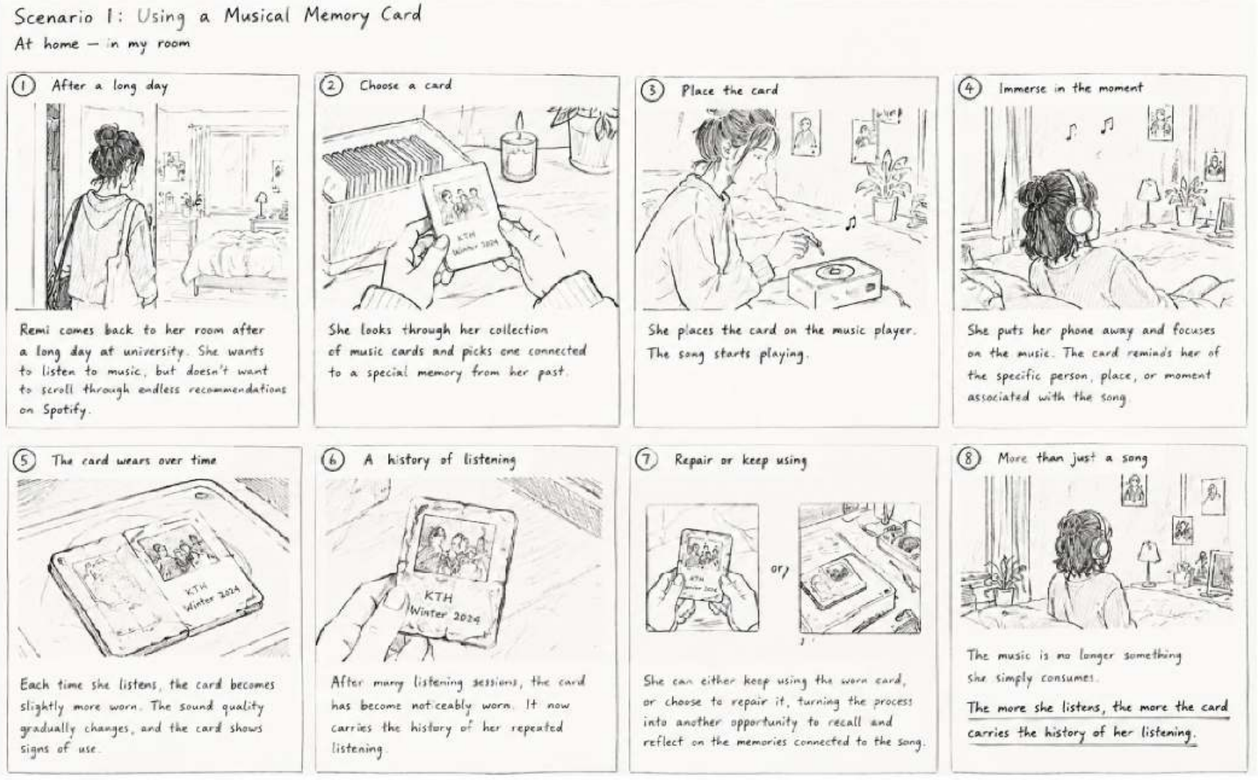


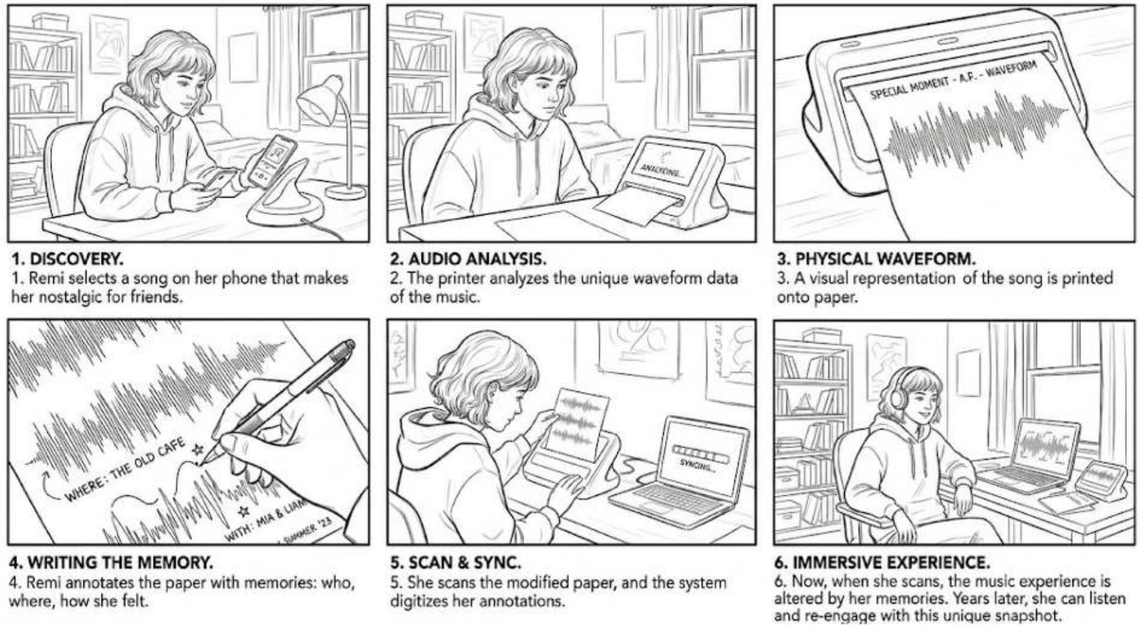


Scenario Storyboarding

MEMBER WENYU

Based on our persona, I first drafted a user scenario story. I then used AI to generate a visual storyboard, refining it through multiple iterations until it fully met my expectations before making the final selection.





1. DISCOVERY.
1. Remi selects a song on her phone that makes her nostalgic for friends.

2. AUDIO ANALYSIS.
2. The printer analyzes the unique waveform data of the music.

3. PHYSICAL WAVEFORM.
3. A visual representation of the song is printed onto paper.

4. WRITING THE MEMORY.
4. Remi annotates the paper with memories: who, where, how she felt.

5. SCAN & SYNC.
5. She scans the modified paper, and the system digitizes her annotations.

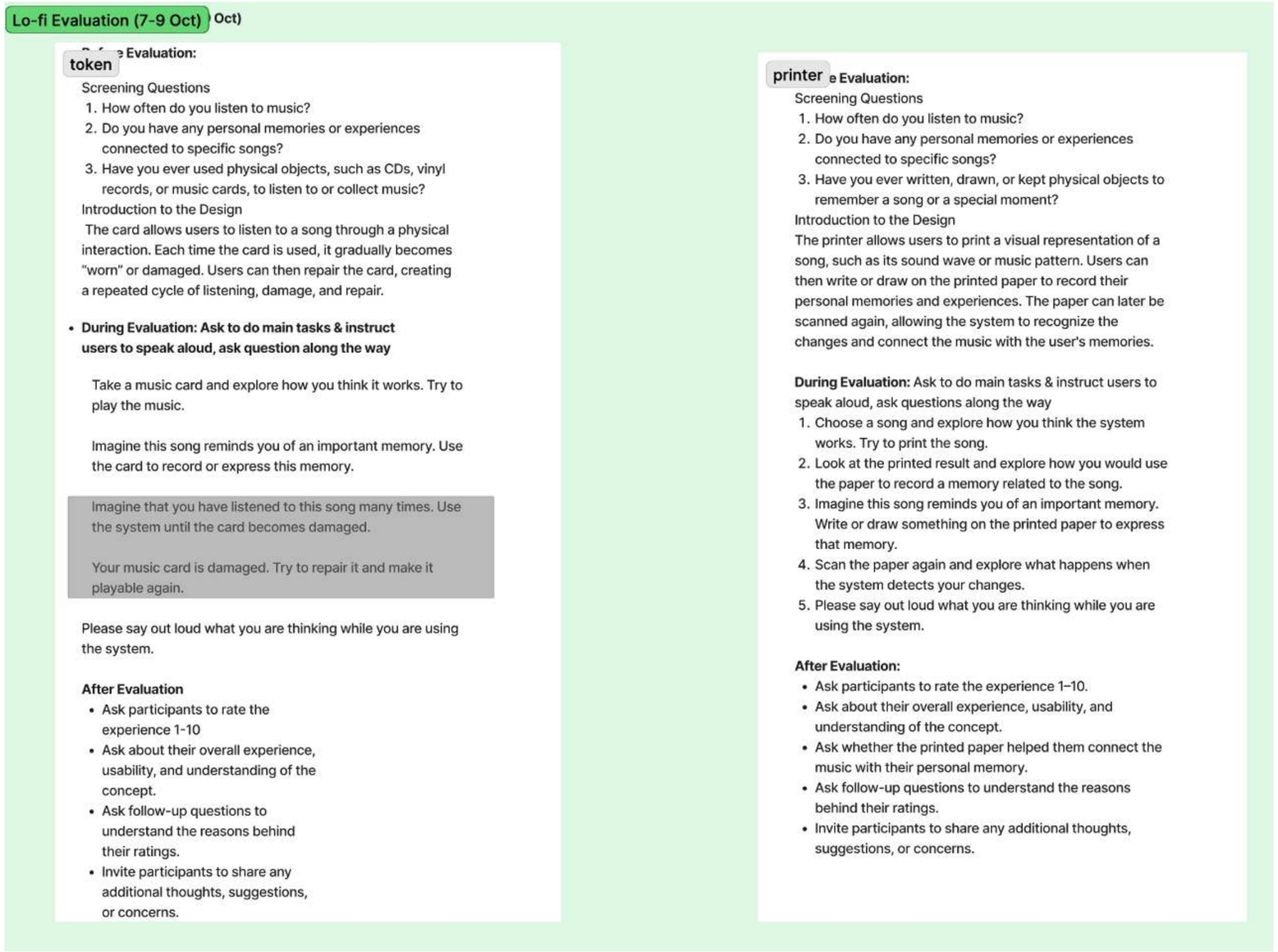
6. IMMERSIVE EXPERIENCE.
6. Now, when she scans, the music experience is altered by her memories. Years later, she can listen and re-engage with this unique snapshot.

Interview script

Add your writing here

MEMBER WENYU

During user testing for our low-fidelity (Lo-Fi) prototype, we employed semi-structured interviews combined with the think-aloud method, which enabled us to gather highly valuable user feedback.



Lo-fi Evaluation (7-9 Oct)

token

Evaluation:

Screening Questions

1. How often do you listen to music?
2. Do you have any personal memories or experiences connected to specific songs?
3. Have you ever used physical objects, such as CDs, vinyl records, or music cards, to listen to or collect music?

Introduction to the Design

The card allows users to listen to a song through a physical interaction. Each time the card is used, it gradually becomes "worn" or damaged. Users can then repair the card, creating a repeated cycle of listening, damage, and repair.

- **During Evaluation: Ask to do main tasks & instruct users to speak aloud, ask question along the way**

  Take a music card and explore how you think it works. Try to play the music.

  Imagine this song reminds you of an important memory. Use the card to record or express this memory.

  Imagine that you have listened to this song many times. Use the system until the card becomes damaged.

  Your music card is damaged. Try to repair it and make it playable again.

Please say out loud what you are thinking while you are using the system.

After Evaluation

- Ask participants to rate the experience 1-10
- Ask about their overall experience, usability, and understanding of the concept.
- Ask follow-up questions to understand the reasons behind their ratings.
- Invite participants to share any additional thoughts, suggestions, or concerns.

printer

e Evaluation:

Screening Questions

1. How often do you listen to music?
2. Do you have any personal memories or experiences connected to specific songs?
3. Have you ever written, drawn, or kept physical objects to remember a song or a special moment?

Introduction to the Design

The printer allows users to print a visual representation of a song, such as its sound wave or music pattern. Users can then write or draw on the printed paper to record their personal memories and experiences. The paper can later be scanned again, allowing the system to recognize the changes and connect the music with the user's memories.

During Evaluation: Ask to do main tasks & instruct users to speak aloud, ask questions along the way

1. Choose a song and explore how you think the system works. Try to print the song.
2. Look at the printed result and explore how you would use the paper to record a memory related to the song.
3. Imagine this song reminds you of an important memory. Write or draw something on the printed paper to express that memory.
4. Scan the paper again and explore what happens when the system detects your changes.
5. Please say out loud what you are thinking while you are using the system.

After Evaluation:

- Ask participants to rate the experience 1–10.
- Ask about their overall experience, usability, and understanding of the concept.
- Ask whether the printed paper helped them connect the music with their personal memory.
- Ask follow-up questions to understand the reasons behind their ratings.
- Invite participants to share any additional thoughts, suggestions, or concerns.

Usability Testing feedbacks: Musical token

MEMBER OANH WENYU

3 participants / Think Aloud / Interview

What works?

Intuitive interaction for the card insert prototype

Kim

Rotating disc is a cool idea, though inserting the cards are easier to understand

Kim Oanh

What doesn't works?

Lack the adding music & photo step by users

Kim

Lack of clarity on how to connect their action of adding music elsewhere and make it work here at the music box

Kim

Difficulty in rotating the disc (due to lo-fi built)

Kim Oanh

Suggestions

Participant recommended having their own photos and display as an album for all of their memories

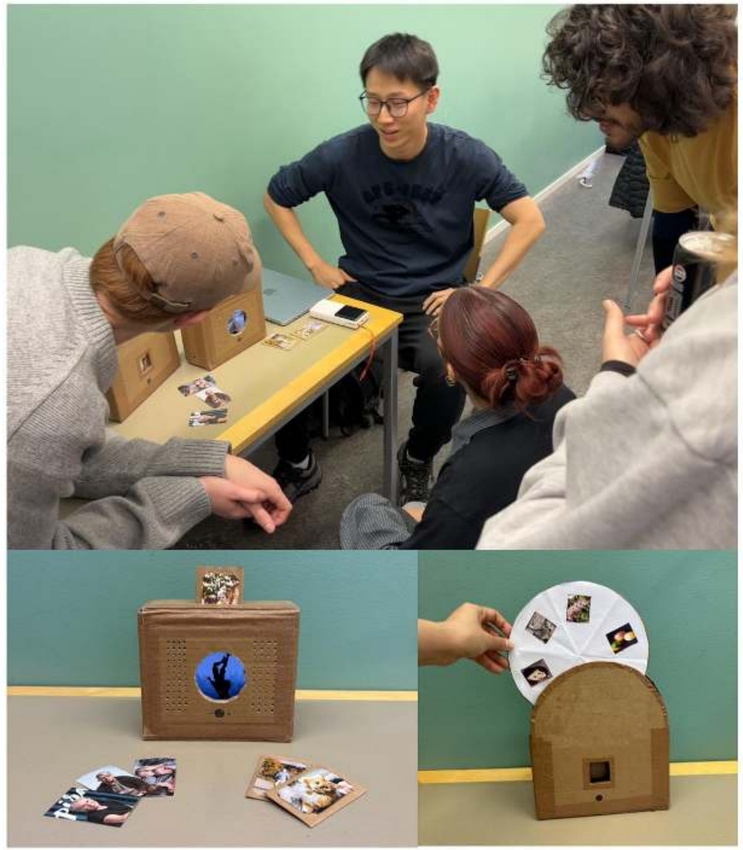
Kim

3/3 participants prefer the card over the rotating disc for the ease of use and comprehension

Kim

One participant prefer viewing all the cards at once, rather than the disc. Sometimes, they don't want to put some memory together on one thing.

Kim Oanh



Usability Testing feedbacks: Slippy

MEMBER JOLINE MATT

3 participants / Think Aloud / Interview

What works?

Cheaper “alternative” to vinyl

Spectogram is hypnotic and nice to look at while its moving

matt

Cool technical thing

matt

Drawing on it etc. is a fun thing to do, even tho its probably not that useful

matt

What doesn't works?

How / why do i connect with a spectrogram? Its not really personal

mat

Hard to understand

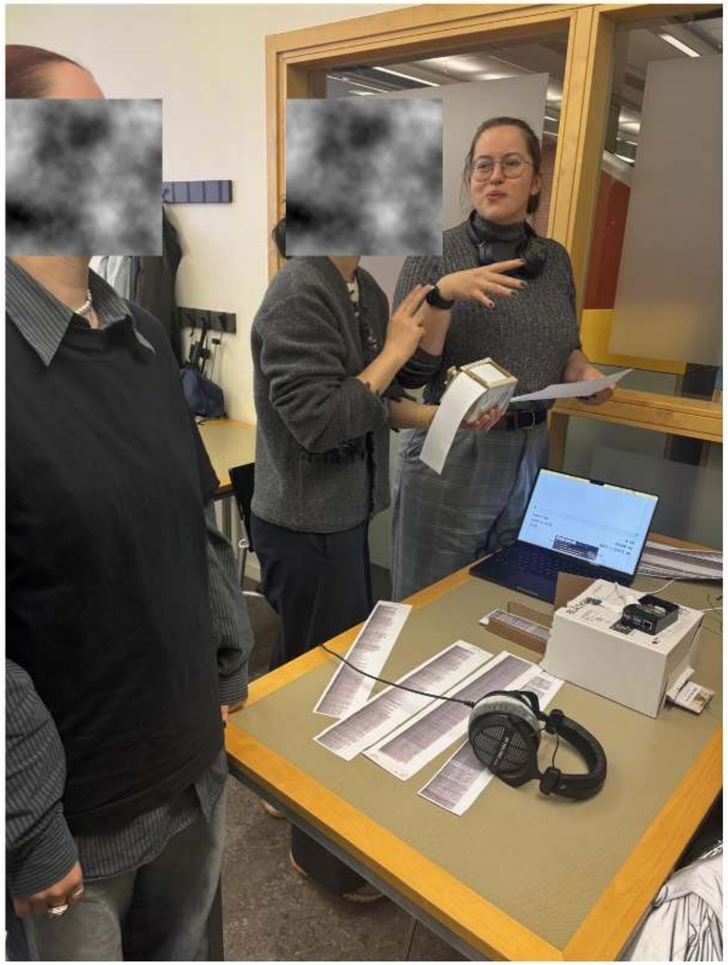
matt

Suggestions

Make the interaction of how you put in the slip and how it moves very reproducible and nice so it really feels like an alternative to vinyl

It would be cool if the printer and the listening device are one, combined device

matt



DELIVER

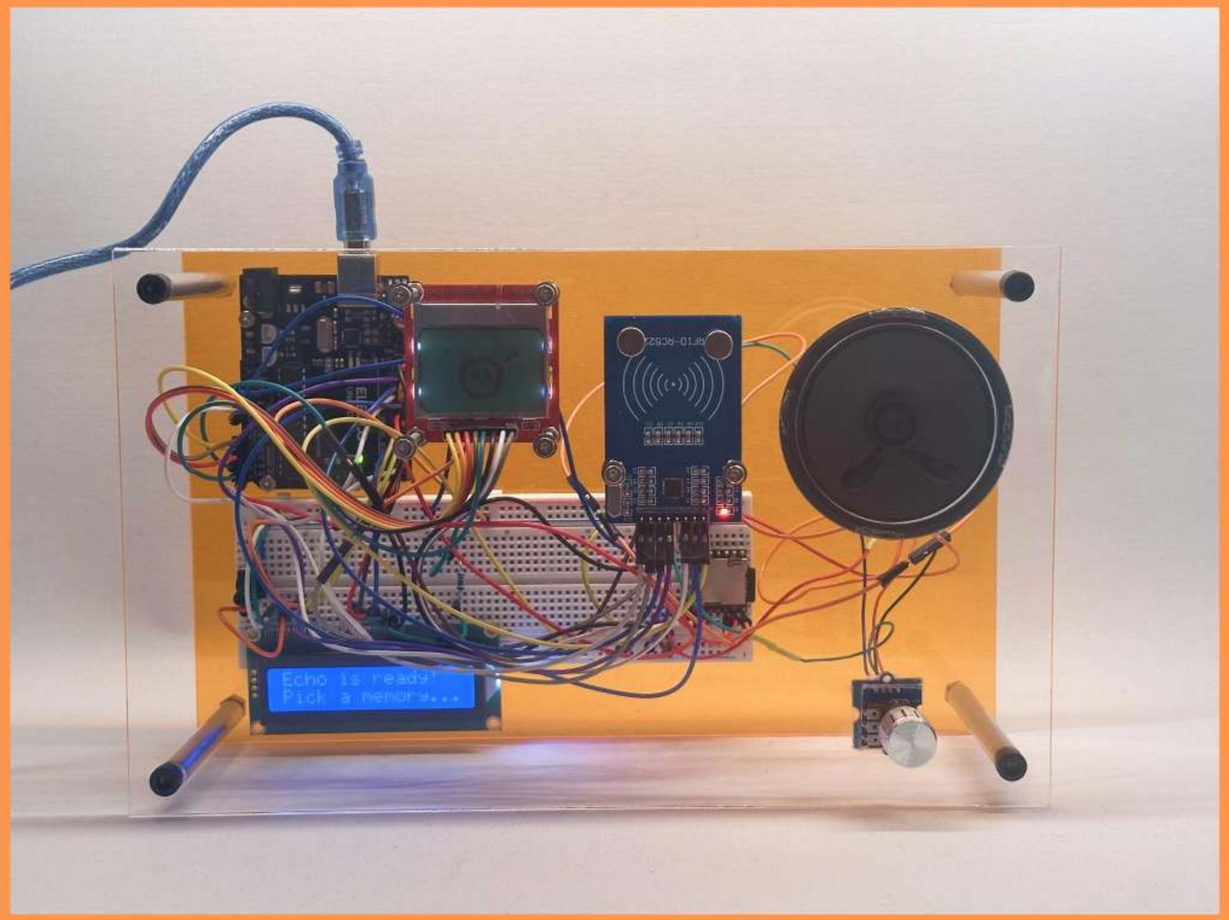
Section 4

CONVERGE
To select & make concrete
from abstract

Hi-Fi Prototype

Following feedback on our low-fidelity prototypes, we are advised by our supervisor to develop two separate high-fidelity prototypes as a product line, rather than merge the two conceptual ideas into one product.

Based on our team's capabilities and the positive feedback both concepts received during the previous testing, we decided to develop two separate hi-fi prototypes rather than combine them into one product: Echo and Slippy.

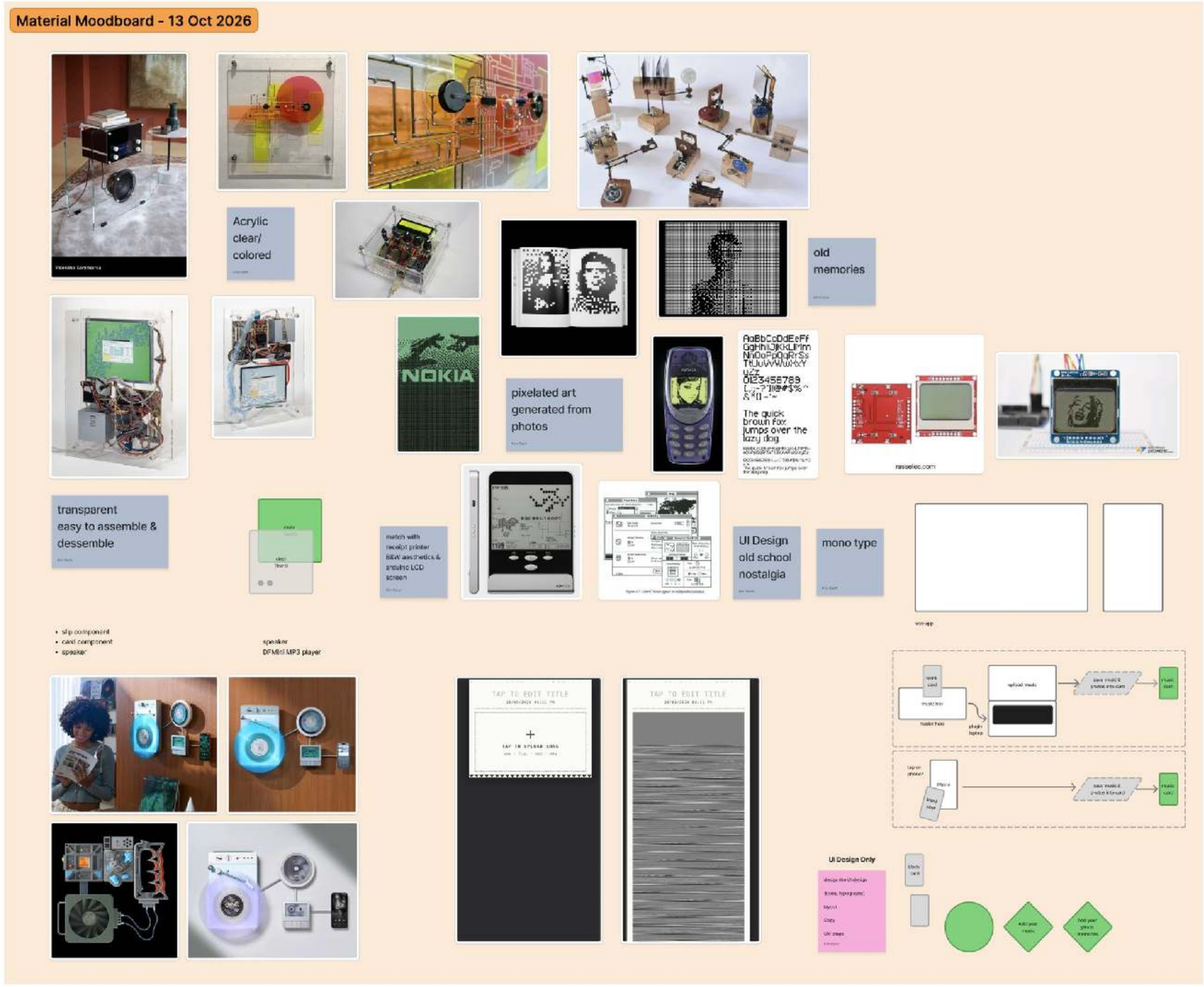




Material Moodboard

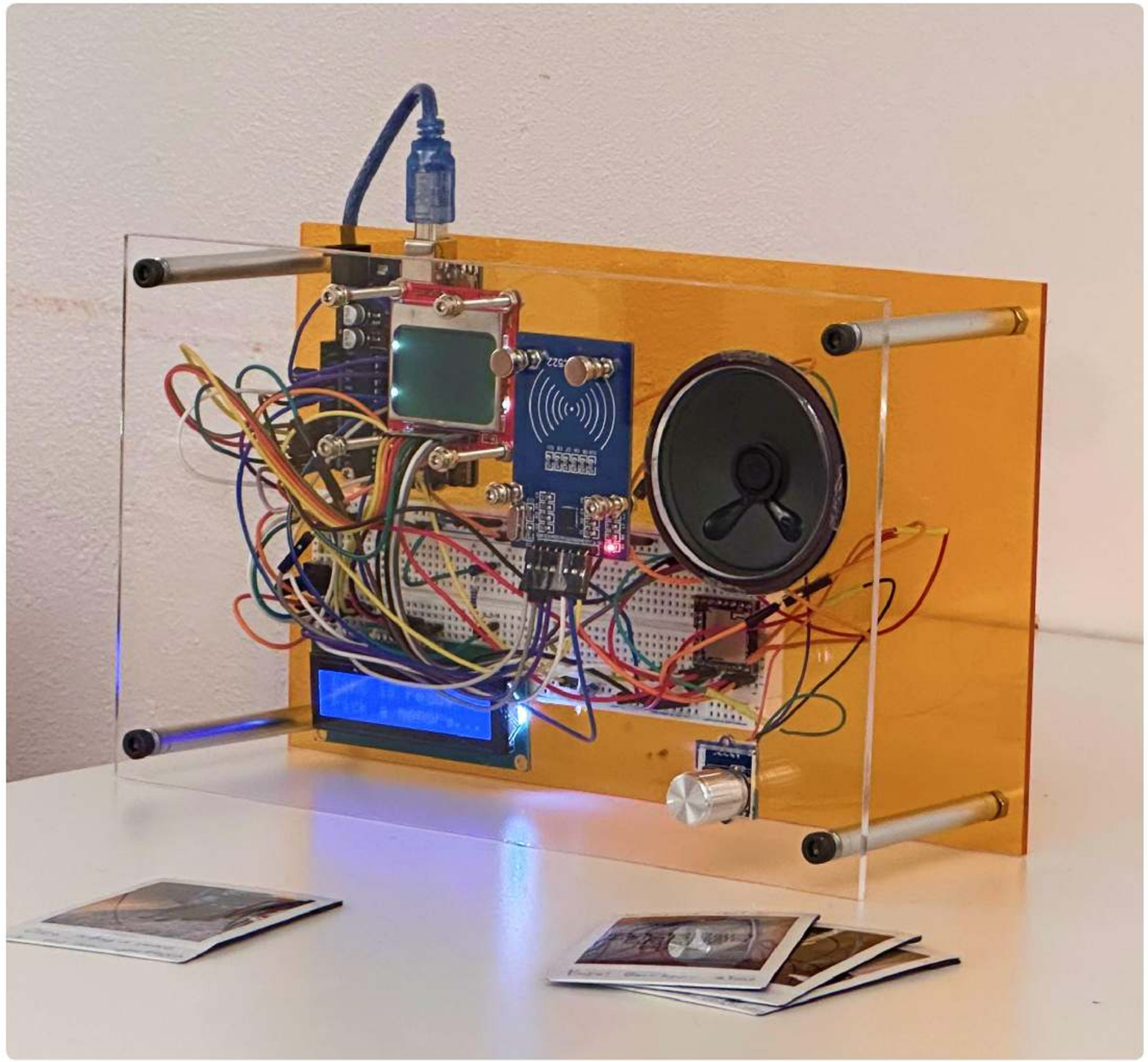
As we began developing our final prototypes, we established a shared design language for Echo and Slippy to create a cohesive product family. Inspired by multi-component music devices, we combined transparent technology aesthetics with pixelated visuals to evoke a nostalgic, retro feel that reflects the role of music in preserving memories.

For the materials, we chose acrylic from available waste materials to reduce unnecessary 3D printing. Beyond being readily available, acrylic offers greater flexibility for adjusting and modifying the prototypes throughout the development process, allowing us to iterate more easily while maintaining a consistent visual identity across both products.



Hi-fi Prototype 1: Echo

Echo is a physical music player designed to help people revisit personal memories through music and photographs. It connects a tangible interaction , inserting a personalised NFC memory card. with digital media, allowing users to relive meaningful moments through sound and visuals.

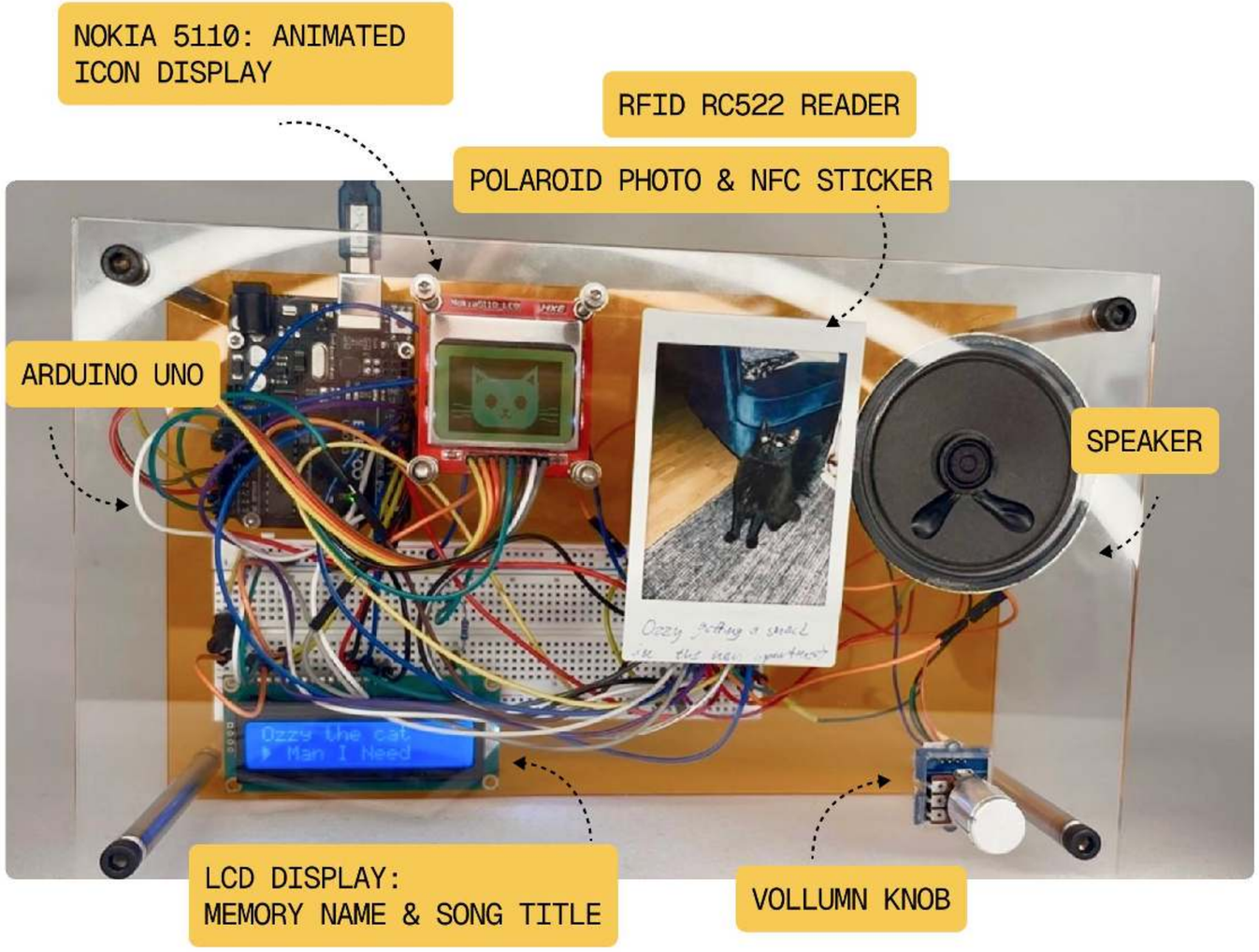


Main component & Functionality

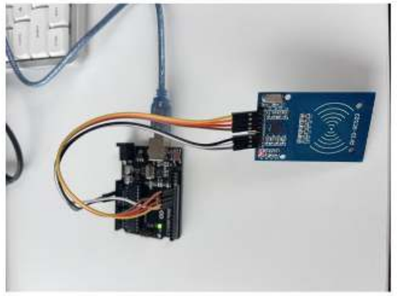
Each card is linked to a specific memory, combining a song with personal photographs. When the user inserts a card into Echo, the system identifies it, plays the associated song through its speaker, and displays the corresponding images.

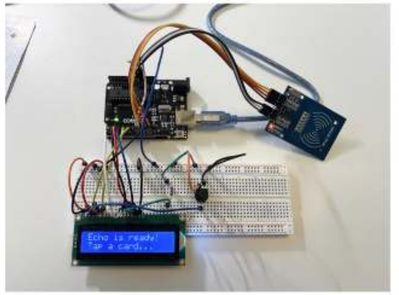
From a physical computing perspective, Echo integrates NFC technology, audio playback, and visual output into a single interactive object. Its design draws on nostalgic music devices, transparent acrylic, and pixelated graphics to create a retro-inspired aesthetic that reflects the relationship between music, memory, and emotion.

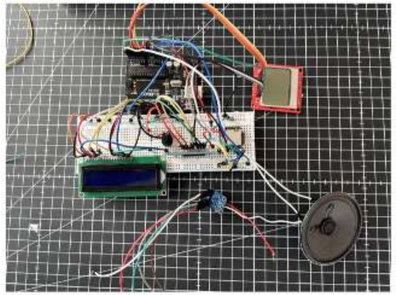
The goal is to make revisiting memories feel more tangible, personal, and intentional than simply opening a playlist or scrolling through a photo gallery.



Process: Arduino Code

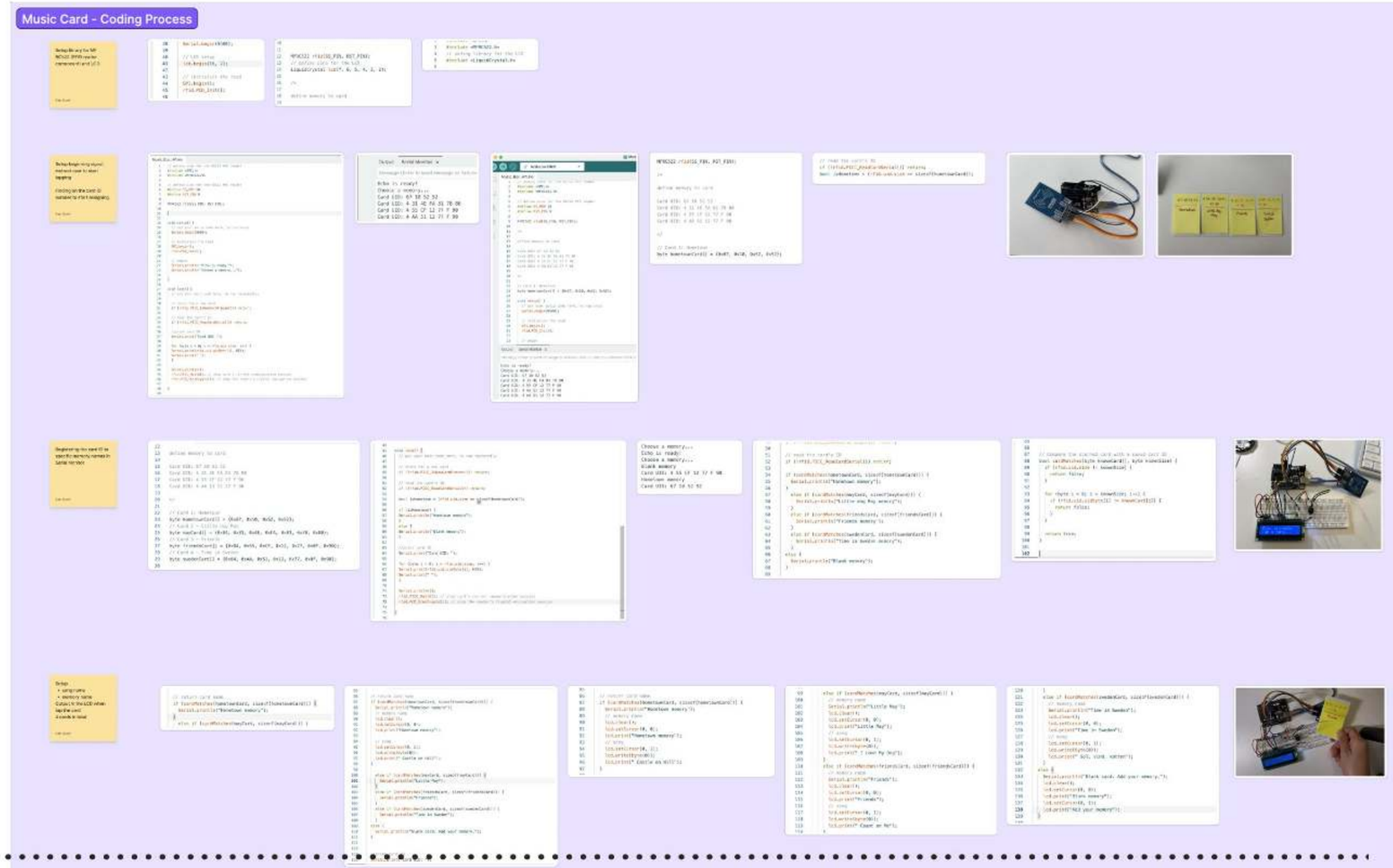






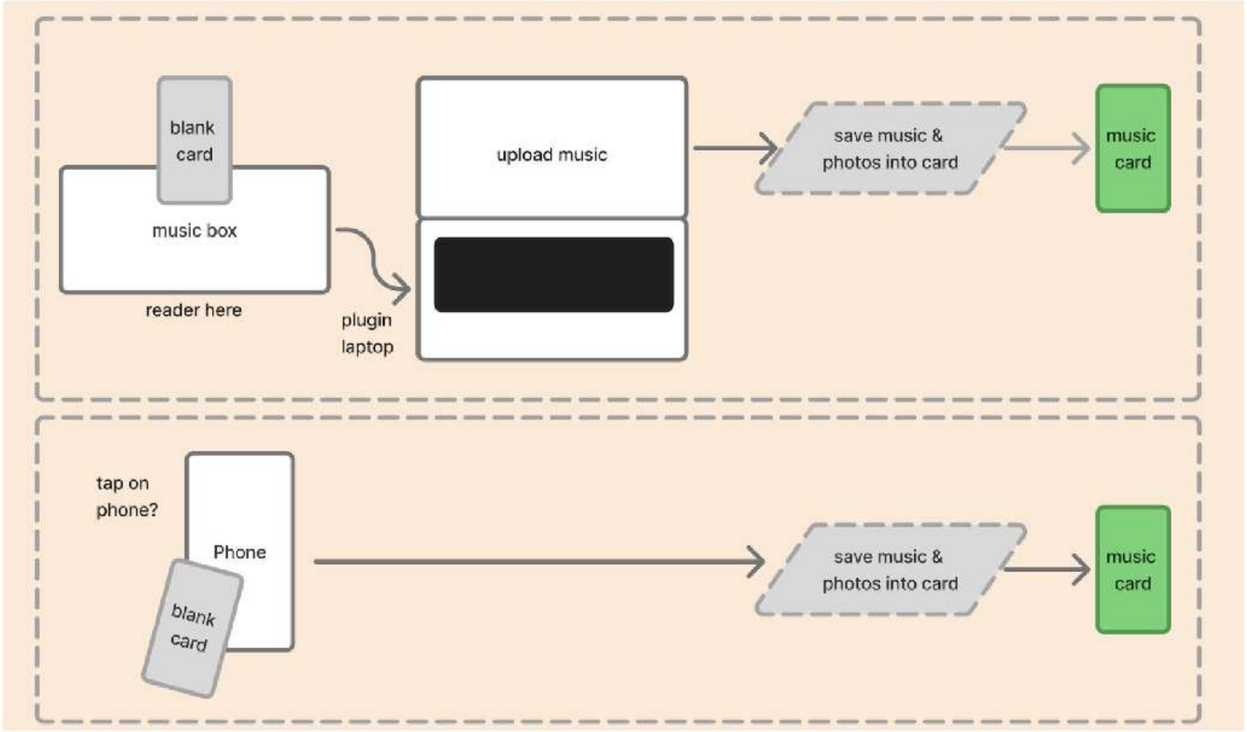


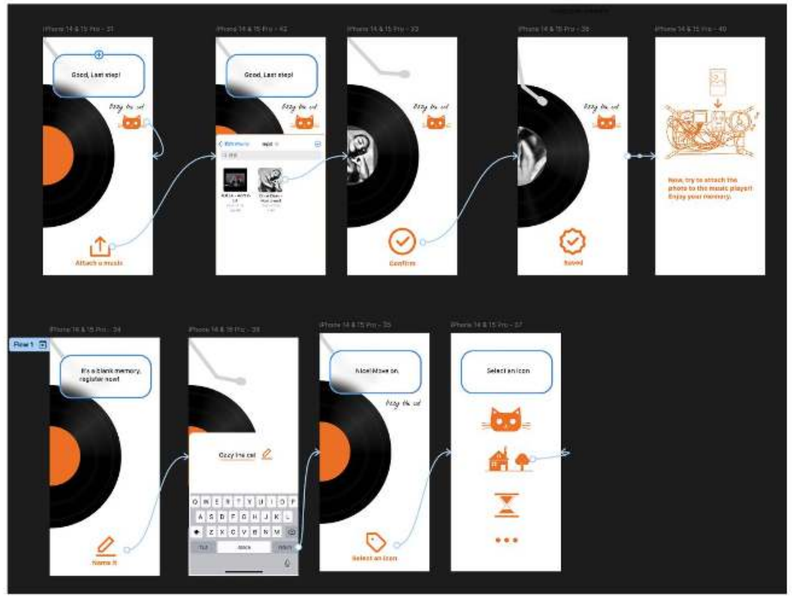
1. **Set up the hardware:** connected the RFID reader, microcontroller, Nokia 5110 display, speaker, and DFPlayer Mini MP3 playback components.
2. **Configured Arduino:** set up the Arduino IDE and installed the necessary libraries to control the connected components.
3. **Read NFC cards:** programmed the system to detect each card's unique ID and associate it with a specific memory.
4. **Implemented audio playback:** connected each card ID to its corresponding song stored on the audio storage system.
5. **Integrated the display:** programmed the screen to show the animated pixelated icons associated with the selected memory.



Input Mobile App

A lightweight web-based application that allows users to link music to specific photos. When an RFID tag is scanned, the user's phone automatically redirects to this webpage. With a series of simple, intuitive steps and a sleek, minimal interface, the design consistently retains our signature orange theme.

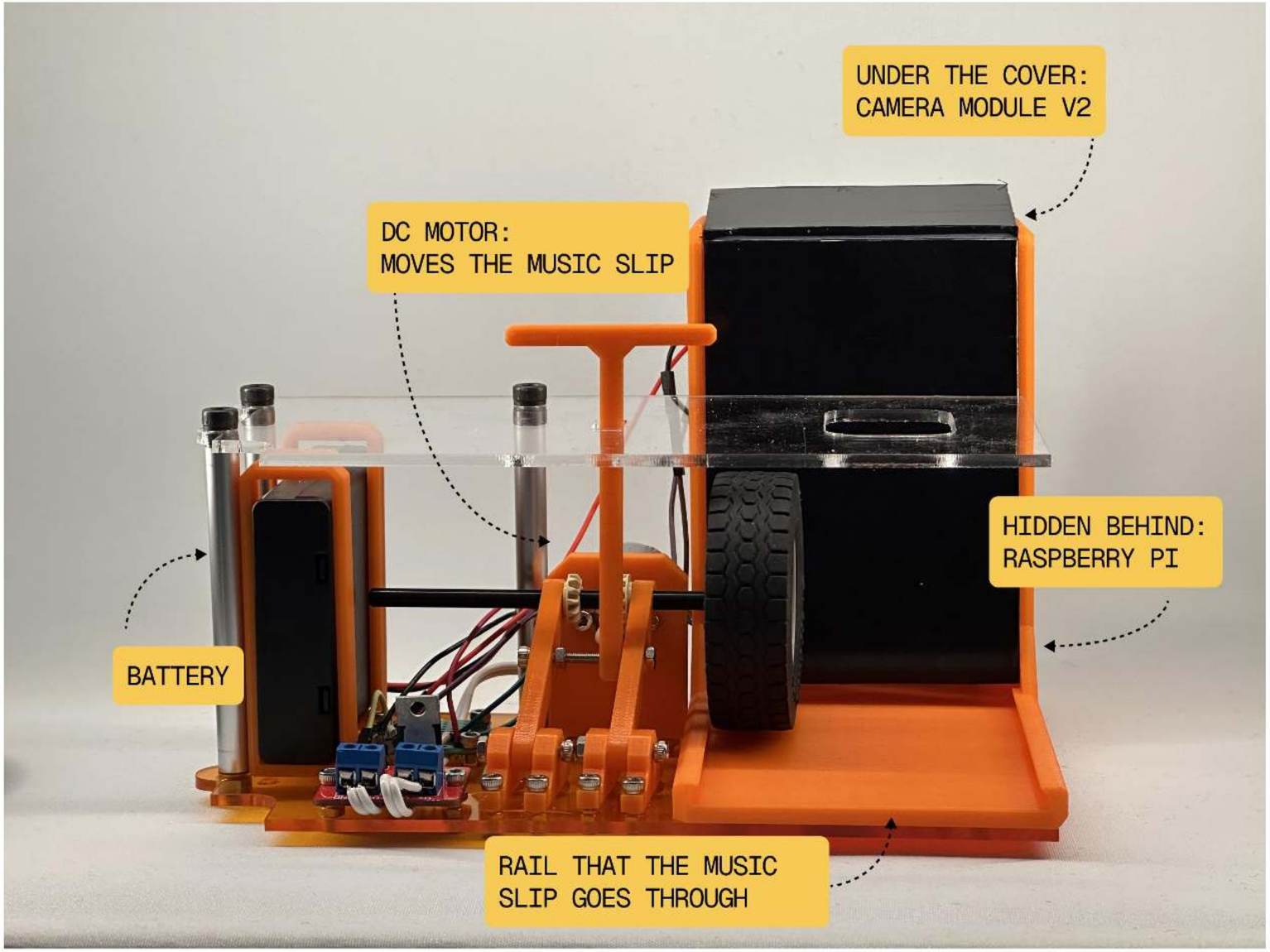




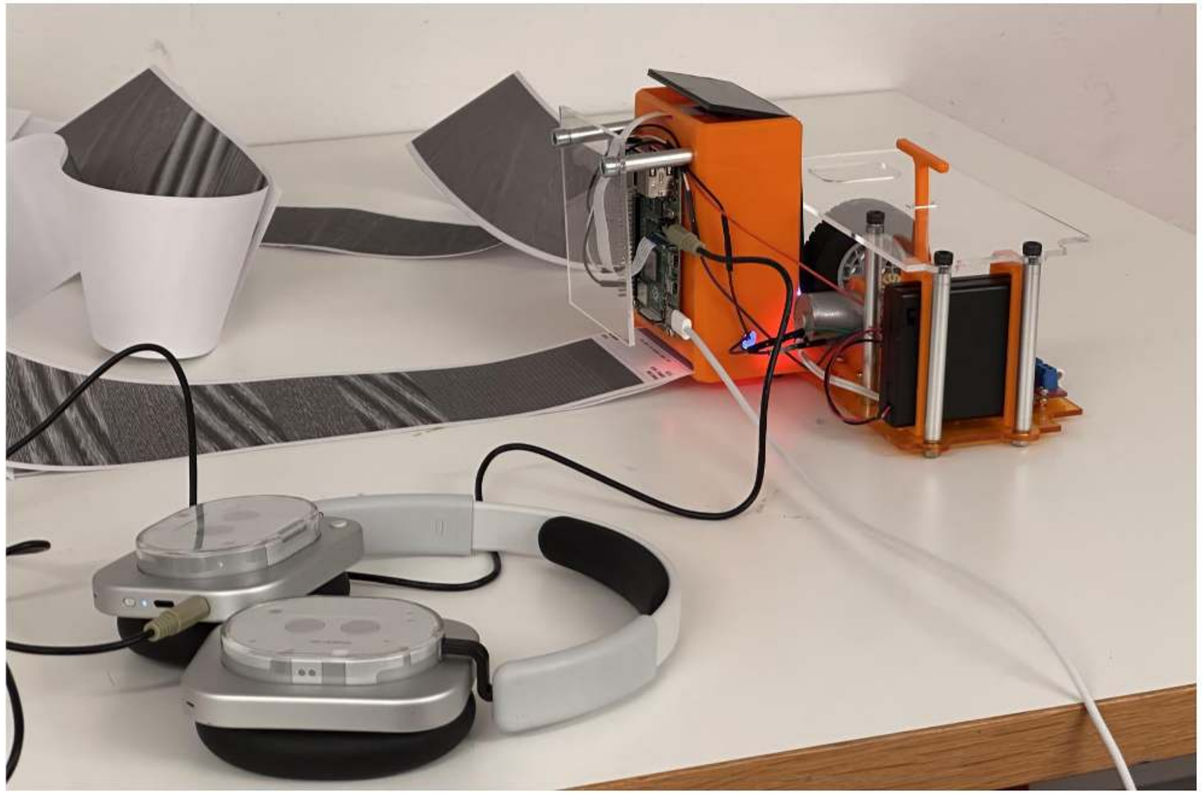


Hi-fi Prototype 2: Slippy

Slippy is physical device that aims to enhance the intentionality of listening and owning music in todays age of streaming services. It draws inspiration from the physicality and interaction of vinyl record players.
Instead of buying expensive records, users print their own slips of music. They then can collect, share, gift and annotate them. To listen to the music, users can simply insert the slip into the opening and put the wheel down using the handle for the playback to start.



Main component & Functionality



The core component that allows Slippy to become part of a ritual comes form its interaction. The user has to select a specific slip from their collection, place it into the opening, and then put down the wheel.
This will then start to play back the slip.

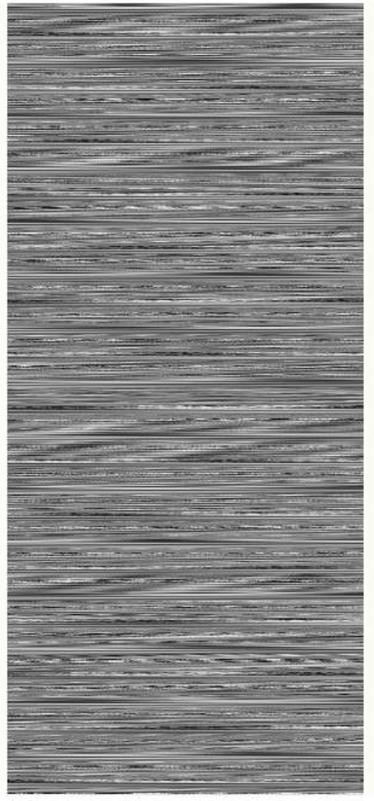
Additionally, slips can become something extremely personal and meaningful, as one needs to take good care of the fragile piece of paper. One can annotate it, sketch on it, write on it, and gift to someone for example.
So the slip become the medium that connects human experiences and emotions with music-or any sort of audio for that matter.

Process: Rasberypi Code

The Pi mainly runs one script that controls all parts needed

1. **The camera:**
   It can be configured to correct for perspective, white balance, brightness etc.
   Then, in each frame, it will read one line of horizontal pixels, and then converting them into sound. Each horizontal line is basically a short timeline from left to right of how the membrane of a physical speaker will move. White means it is pushed forward, black means pushed back, and a gray means it stays in the center. With the "souddevice" library, we can then send those signals to the audio output channel set by the Pi (the AUX port)
2. **The Light:**
   Inside the tower, where the camera actually scans the slip, we have a small light strip to get an even lighting which is crucial, as the scanning relies heavily on the brightness of each pixel. It just sets the lights to 100% brightness and withe light. But because we still have ambient light, and reflections from the orange case, we still need to also convert each frame to a gray scale image.
3. **The motor:**
   The Pi also controls the speed of the motor via a MOS module. So in the GUI, i can fine tune the speed of the motor, which directly correlates to the playback speed of the slip.

We first wanted to use spectrograms, as they are visually more appealing and easier to understand, but since they are way less information dense, we had to switch over to wave forms.



WAVE-FORM



SPECTROGRAM

Web App

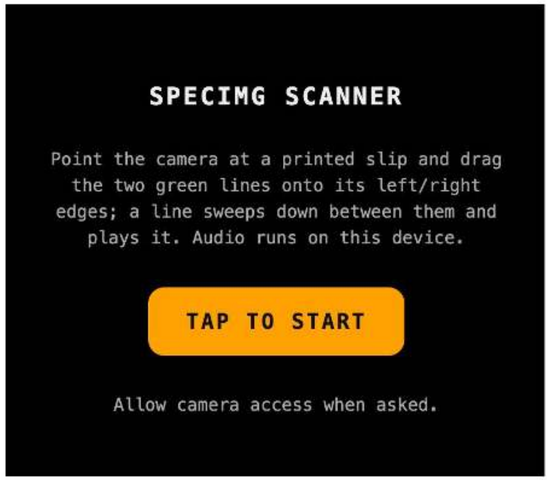
The web-apps main functionality is to convert uploaded audio to wave-form and make it look nice on the slip.
Here, we just directly use the browsers audio codec APIs that essentially hands us back an array of raw floats that we can then convert to grayscale values and thus produce the the line.

But for testing and simulating purposes, it also offers the following modes:



SCAN

Allows to scan a slip with the devices camera



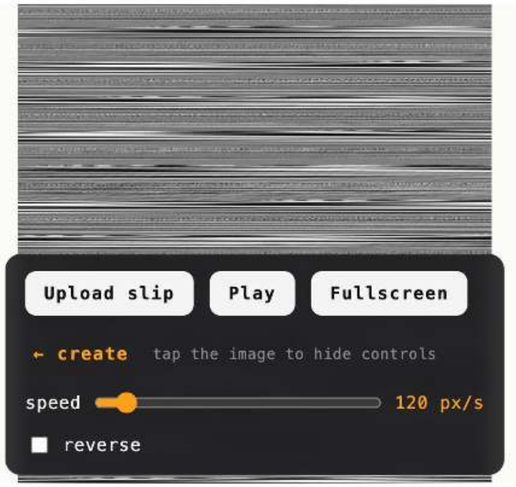
LOOP

Upload a slip and hear how it sounds under perfect conditions



SCROLL

Infinity scrolls the slip for simulation purposes



Hi-fi Prototype Usability Testing

3 participants
Think Aloud Method
2 prototypes







Feedback

Hi-fi Prototype 1: Echo

What works?

Intuitive interaction

Kim

Easy to navigate and understand the concept

Kim

User like the idea and design, would love to have it at home

Kim Oanh

What doesn't works?

LCD screen at the bottom is quite hard to see

Kim

User don't instantly get where to put the photo on with the first try

Kim Oanh

Suggestions

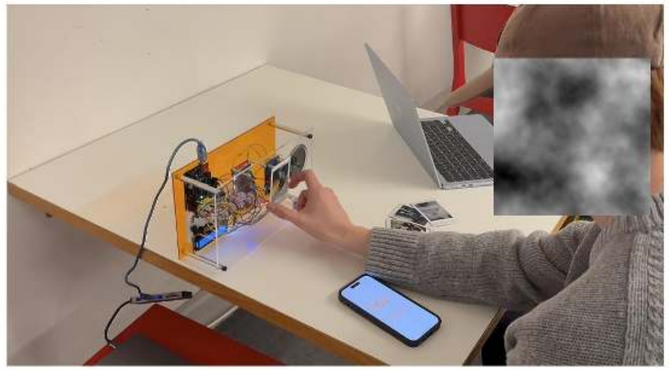
The hi-fi app can be more extensive with what can happen after users added a song

Kim Oa

The Echo box be be experiment more with its orientations: lying, standing, hanging on walls, etc.

Kim Oanh







Feedback

Hi-fi Prototype 2: Slippy

What works?

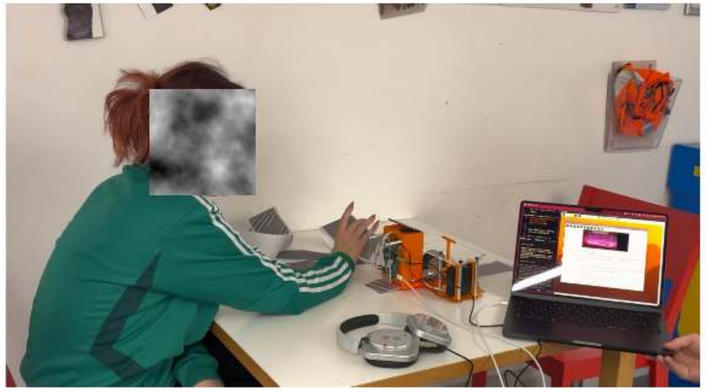
- Fun concept
- Looks super cool, like an art / collectors piece
- Reminds them of vinyl record players - so intentional music listening
- The digital version is also super cool and works fairly well — matt

What doesn't works?

- Technical issues with the motor / wheel
- Audio quality is very bad
- Concept of the slip representing actual music is very abstract — matt

Suggestions

- Keep the visual style
- Also make the digital version available
- Build with better components (motor and camera - maybe even a scanner-camera instead)
- Give a nice option on ho wto store those long slips (like a roll or something) — matt







21 OCT

Reflection & Future Work

OANH

Adding clear directional labels is an easy fix for Echo, so I've already printed some to make the magnetic photo-tapping interaction more intuitive.

In the future, Echo will need further development to fully bridge the gap between users adding photos and music and having that content integrated into the Echo music player box.

MATT

I think all our processes and methods worked well and we came up with 2 really nice prototypes. While Echo even works perfectly fine, I personally would like to invest some more time (and money) to get more suitable hardware to really make it work.

WENYU

We tried out a lot of design methods, which gave us a really wide range of options to choose from in the early stage of the design. And combining Polaroid photos with music to create customized memories was just so interesting! I think we could further refine the interaction of how the RFID sticker and the photo come together. For example, the shape of the sticker doesn't have to look like a standard sticker — it could be something much more fun, like our project's theme of an orange vinyl record, or something directly related to the memory itself.

JOLINE

The process of creating these designed have been a fun and interesting process as I got the chance to using different methods I have not seen or used before.

And we have all been eager to create these prototypes and I cant have asked for better team members.

I would love develop Slippy and Echo further, with working out the printing process for slippy and making Echo into a fully portable device.

Thank you!

GROUP 5 JOLINE MATT WENYU OANH

Special thanks to MIDDLA for the great work environment and allowing us to use all their space, tools and material.

Links to Prototypes

👉 Github

- 👉 Hi-fi Prototype 1: Echo (code)
- 👉 Hi-fi Prototype 1: Echo (mobile app)
- 👉 Hi-fi Prototype 2: Slippy (pi code)
- 👉 Hi-fi Prototype 2: Slippy (web app code)
- 👉 Hi-fi Prototype 2: Slippy (web app interactive)

👉 Demo Video

Links to Workbook

👉 Workbook slides on Figma

