Syntonize
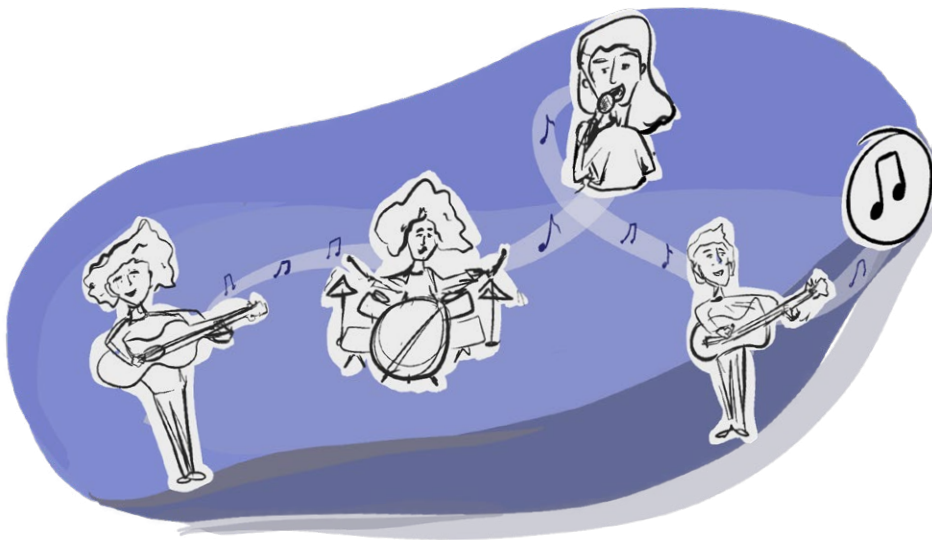
A collaborative music making platform for bandmates

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Master thesis
MSc Design for interaction
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TU Delft

"And those who were seen dancing were thought to be insane by those who could not hear the music."

- Friedrich Nietzsche

Synthonise: A collaborative music making platform for bandmates

Marianne Langrand Kitzing

TUDelft

**A mis hermanitas
Mariandrea y Natalia**

Porque puedan siempre escuchar esa voz interior que transformará sus sueños en vida, y su vida en un sueño.

**To my young sisters
Mariandrea and Natalia**

May you always listen to your inner voice, which will transform your dreams into life, and your life into a dream.

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Executive summary

This thesis describes the design journey that resulted in the creation of a music making app for musicians. It was developed through a double-diamond design approach, involving extensive remote user research, literature review, market research, and iterative cycles of ideation, development and testing. Musicians were constantly involved in this process, driving the design towards a human centered solution that would embrace their needs and values at its core.

An initial study looked closely at the workflow of musicians during early stages of music making – their activities, motivations for tool use, collaboration cultures, and personal relationships that arise. Secondary research was carried out to understand their process from a theoretical standpoint and case studies in practice. This helped identify relevant gaps for further research, as well as potential opportunities for design. A fully remote study was set up under the circumstances of the COVID-19 pandemic, resulting in the involvement of international music bands and the exploration of remote user research techniques. Market research was also conducted to understand the competitive landscape and define a prospective solution space.

The findings collected from this research helped narrow down the scope of this project and define a context to design for: the online collaboration of remote rock bands to build up on each others' music ideas. The key findings of this research were translated into a problem definition, design goal, and a target group. A set of design principles and product requirements derived from musicians' pain points, gain points, needs and values, as well as from foundational research. Moreover, user personas and an interaction vision were created as an inspirational input for

design; as a frame for ideas that would originate from the research.

From creative sessions to sketching activities and clustering exercises, the initial development consisted of generating ideas, and defining the core experiences of the product. Three iterative cycles of ideation, prototyping, and validation transformed initial ideas into a concept that would focus on the buildup of music ideas through remote collaboration. From rough sketches to interactive prototypes, feedback from musicians was constantly gathered in the form of online walkthroughs and evaluation forms. The constant input from musicians in remote rock bands helped shape Syntonize: a simple, collaborative music making app for bandmates in different cities to build up on each others' music ideas in the early stages of songwriting.

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Report structure

This report is structured in 7 Chapters. It first introduces the topic and background, followed by the research methodology and results of the study. Then, the ideation and conceptualization activities are described, and a final design solution is presented, evaluated and discussed. This report concludes with a discussion, reflection, and recommendations for further research. The chapters unfold as follows:

Chapter 1 describes the general topic, as well as the background and relevance of this research. It will introduce the research questions, assignment, project scope, and approach.

Chapter 2 provides a detailed explanation of the research approach and methodology to perform the study.

Chapter 3 contains an in-depth description of the findings of this study, as a combination of the results of user research with musicians, literature review, and market research. It depicts the music making process to answer the research questions. It dives into the pain points, gain points, needs and values of musicians, and ends with a discussion.

Chapter 4 defines the key elements that will guide the design phase. These are the problem statement, design goal, target group, and design principles established from research.

Chapter 5 guides the reader through the development phase of the project. It provides an overview of the ideation activities, such as creative sessions, brainstorms, and sketching. It also shows the conceptualization phase through two iterations of prototyping and evaluation with musicians.

Chapter 6 presents the final design concept for the music making tool, as well as the final evaluation, results, design recommendations, and limitations.

Chapter 7 will conclude this project through a final discussion of the research questions, a reflection on the process, and opportunities for further research.

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Introduction

- Background

- Project scope

- Design approach and process

1.1 Background

Technological developments are disrupting and reinventing creative industries. They are shaping new ways of working through tools to support their activities (Abbasi et al., 2017). This research investigates the role of technology in music making – one of the fields that have been evolving through the surge of digital tools (Love & McGrath, 2017). The goal of this thesis project is to explore the opportunities these developments can bring to musicians' workflows, particularly in collaborative setups of rock bands.

Music making has been widely studied and described, as well as the tools which support it. How should these assist people in collaborative, creative pursuits?

On collaboration and tools

There has been an increase in online collaboration, and consequently the presence of tools to support it. Music is no exception. Recent studies explore collaboration through platforms such as Soundtree and Splice, and how they might benefit from the workflows of software development communities like Github (Calefato et al., 2018). Music making is a unique process to every musician, and there is no sharp understanding yet of how the collaboration within music bands ties to their activities and tools.

Prior studies indicate relevance for further research in this area. According to Dow and Settles (2013), collaborative practices in music making still need to be further understood. In addition to this, the work of Benford, Chamberlain, and McGrath (2016) suggests that the integration of communication and collaborative decision-making is relevant to investigate. Malm (2020) describes rock bands as micro-organizations which develop internal, intimate ways of interacting as a work group.

On the other hand, it has also been researched that musicians use a broad variety of tools to make music, and thus their workflows can be highly complex. These studies indicate that music making tools fail to support them, and a better integration of tools is needed. They claim that "software needs to be designed with an experience in mind (...) Utility is about more than just functionality, but crafting a user experience which encompasses the practices and behaviors of people in this space. How to approach this type of problem is, as yet, unsolved in commercial platforms" (Love and McGrath, 2017).

1.2 Project scope

Studies have explored music making through different lenses, providing a solid foundation and understanding of isolated elements such as tool usability, songwriting activities, and online collaboration. However, there is no holistic understanding yet about how these are interrelated, and specifically, how technology can support collaboration in this domain.

This raised the following research question to frame this study: how might technology support the collaborative practices of bandmates involved in music making?

This research builds on the work of Love and McGrath (2017), who claim that "the challenge here is not to implement a new set of technologies, but consider the implications of technology usage within this space." It will aim to explore the music making practices in the context of rock bands, investigating the following areas: tools, activities, and collaboration. This work aims to unfold how these areas relate to each other, and create further insight into the role technology can play in music making. The following research questions will then guide this work:

1. What is the music making process of music bands?

2. How and why are different tools involved in the music making activities of bands?

3. How do band members collaborate to make music?

Project goal

The goal of this project is to design a digital tool which supports the music making process of members in a music band, by integrating the tools involved in their creative activities and thus enabling the optimal contribution and collaboration of bandmates (full brief in the Appendix 1).

1.3 Design approach and process

This research will be addressed through the Double Diamond design process (British Council, 2019), including the stages of discovery, definition, development, and delivery (Figure 1). The findings will be used as a starting point to design a tool that enables an optimal contribution and collaboration of bandmates in the early stages of music making. Through iterative design cycles and the involvement of musicians, further insights will be created about how technology can support collaborative activities in music making, and potentially, other creative fields.

DISCOVER   DEFINE   DEVELOP   DELIVER

Problem   Solution

Research, Analize, Synthesize   Prototype, Test, Refine
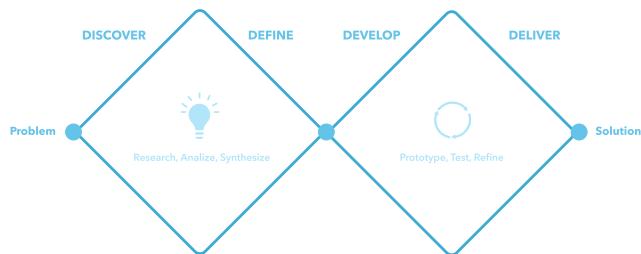
Figure 1. Double diamond design process followed for this project.

Discovery

The primary research of this project was developed through a series of generative design research techniques (Sanders & Stappers, 2012). These aimed to help musicians articulate their needs and envision solutions to address them.

These principles shaped the primary research:

1. Allowing for flexible expression of musicians' own process.

2. Allowing for personal engagement and connection between the researcher and the participant.

On the other hand, the direction of this project was also guided by secondary research, including the review of scientific papers and market research.

Definition

After the discovery phase, the definition of the context to design for was communicated through a problem statement, design goal, target group, personas, and design principles.

Development and delivery

The ideation and conceptualization phases of this project were exploratory, involving creative sessions with designers, brainstorming and clustering activities, as well as iterative prototyping and testing with musicians, from sketches to interactive prototypes. These activities aimed to convey the core experiences, functionalities, user flows, and design concept directions for the digital solution, which would address the major pain points, goals, needs, and values of collaboration.

CHAPTER 2

Research method

- Research scope and goals

- Research approach and methodology

- High-touch netnography

- Low-touch netnography

- Market research

2.1 Research scope and goals

The scope of this research lies in understanding and describing the current ecosystem of music making of bands. It will be broken down in the three key areas (process, tools, and collaboration), along with corresponding research goals and research questions shown in Figure 2.

This research study starts from a general standpoint, and then unpacks it to its granularity. This has also enabled an understanding of the interplay of the three areas described above, bringing to surface their synergies. With this in mind, the research approach and methods to address the research goals were determined and described in the following section.

AREA	Process	Tools	Collaboration
RESEARCH GOAL	To understand the songwriting process of music bands, in terms of the phases and activities carried out, as well as the user motivations and pain points.	To identify the main tools used for the songwriting activities of bands, and understand their use, user motivations, and pain points.	To understand how bandmates collaborate and interact with each other along the songwriting process, as well as other parties involved. To understand the drivers for their interactions as well as major pain points.
RESEARCH QUESTIONS	What are the steps involved in the songwriting process of music bands?	What are the current tools available to support the songwriting process of bands?	How do band members interact and engage with each other in the songwriting process?
	How does the sequence of these steps change from band to band and why?	How do musicians in a band make use of the different tools available?	What different streams of communication do bandmates use in different steps of the process?
	Which factors influence the songwriting process developed by a band?	How do these tools help band members in the songwriting process?	How are the different tasks delegated in bands?
	What are the underlying needs and goals of musicians in the songwriting process within a band?	What makes band members choose for certain tools and not others?	How and why do musicians form collaborations?
		In what way are the tools a limitation to the songwriting process?	Are there different roles required to be fulfilled within the songwriting process? If so, how does this work?

Figure 2. Study scope, goals, and research questions.

2.2 Research Approach and Methodology

2.2.1

Approach

The nature of the primary research was qualitative and ethnographic (involving observations and interactions with people), as it would allow for a deep understanding of musicians' practices. Previous studies describe this approach as suitable to explore their creative process (Love & McGrath, 2017). On the other hand, given the circumstances of the COVID-19 and social distancing regulations during this research, a netnographic (online) approach to the primary research was pursued . It was framed to embrace the constraints of the situation and outweigh its limitations, resulting in a series of online activities to frequently engage with participants, and thus gain knowledge about their context from various perspectives (Goulding et al., 2017).

A literature review was carried out in parallel to frame and support the research, as well as to gain foundational knowledge of the topic. It helped shape a global understanding of songwriting from an interface design perspective and the contextual levels of user experience. Following the user research analysis, market research was carried out to identify and understand the solution space.

Hence, a combination of netnographic activities, purposed as high-touch and low-touch, along with a literature review and market research, were carried out to understand musicians' creative practices in music making . Figures 3 and 4 on the next pages present an overview of these methods. The following sections in this chapter will dive into each method, describing their goals, research questions, and activities for data collection, analysis, and synthesis.

2.2.2

Overview of research methods

Method	Goal WHAT?	Impact WHY?	Description HOW?
High-touch Netnotraphy	To get a closer look at the creative practices and processes of musicians by being in touch with them online.	To gain deep insights about their songwriting process, uncovering latent needs and identifying major pain points.	Interacting with participants remotely through sensitizing activities, video calls, messaging, and collecting samples of their music making material.
Low-touch Netnotraphy	To perform observations and interactions with online communities of musicians, to learn about their ways of doing and thinking.	To fill in knowledge gaps due to the lack of expertise of the author, identify patterns in behavior, validate data from other methods, and gain understanding of unknown concepts.	Observing online communities, forums, blogs, videos, and occasionally interacting with musicians in the form of polls or open questions.
Literature research	To frame and support the research, as well as gain foundational knowledge about music making.	To shape a global understanding of music making from an interface design perspective and the contextual levels of user experience.	Reviewing existing literature about online collaboration, music making, and supporting technologies.
Market research	To gather inspiration and knowledge about products and market segments that address the needs and parts of the problem defined through the other research activities.	To gain understanding of relevant areas of the market, to deepen the understanding about them and identify relevant areas for development.	Competitive landscape, bechmark and feature analysis of products relevant for music making.

Figure 3. Overview of research methods.

Overview of research and data collection activities

High-touch Netnotraphy	Low-touch Netnotraphy	Literature research	Market research

DATA COLLECTION RESEARCH DESCRIPTORS

High-touch Netnotraphy	Low-touch Netnotraphy	Literature research	Market research
Screener survey	**Forum** Reddit	Online creative collaborations / Crowd creativity	Current tool use
Sensitizing activity	**Facebook community** Songwriting and music production	UX of music making tools	Music related products
Video calls	**Blog** Songtown	Musicians and music composition	
Further chats			Collaborative workspaces
Material collection	**Videos** Youtube	Technology and creativity	

ANALYSIS AND SYNTHESIS ACTIVITIES

High-touch Netnotraphy	Low-touch Netnotraphy	Literature research	Market research
Thematic analysis on the wall with statement cards with interview content and participant material collection	Material collage and key insights summary	Highlighting, note taking and summary table	Benchmark + Function analysis

Figure 4. Overview of the research activities carried out, as well as how the data was collected, analyzed and synthesized.

2.3 High-touch netnography

2.3.1

Method

Netnographic research activities (Figure 5) were carried out to interact with musicians as a form of online user research (Goulding et al., 2017). A high-touch level of research, involving frequent interaction with participants, aimed to get a closer look at their creative process, as well as to dive into their motivations and decision-making. The work of Love and McGrath (2017) suggests that "on research methods proven to be effective with musicians - voice recording, photographs (...) The approach shows real promise in generating rich, contextual data."

Activity	Description	Knowledge level
Screener survey	Screener survey for participant recruitment.	SAY
Sensitizing activity	Prior to a first interview, particpants were asked to visualize their songwriting process, and include their activities, tools, and collaboration with others.	MAKE
Video calls	A series of 30 minutes to 1h informal chats with participants were held through Facetime, Whatsapp call, or Zoom (depending on their preference).	SAY
Messaging	Conversations with participants through messaging platforms (Facebook messenger or Whatsapp) were held with participants frequently in the form of text messages and voice messages.	SAY
Material collection	Participants shared material related to their songwriting process in the form of pictures, videos, and voice recordings. The material collected was quite diverse, ranging from their music demos, to screenshots of their digital tools or notebooks, to video walkthroughs of their DAWs or gadgets, as well as shared examples of communication with other band members.	MAKE / DO

Figure 5. Method descriptions for research activities of high-touch netnography, as well as levels of knowledge reached (from Sanders and Stappers, 2011).

The implementation of these activities fostered an intimate, close relationship with participants; one in which personal stories were shared comfortably, and the participant was comfortable with getting in touch often. They were framed with these goals in mind:

- To allow for familiar, intimate communication

- To collect personal stories

- To adapt to participants' preferred ways of expression

- To collect personal material related to their process

Initially, a sensitizing activity was sent to the participants via Whatsapp (Appendix A) to elicit their music making practices (Sanders et al., 2005). Then, an initial interview was carried out informally through the communication tool of their preference. It consisted of a guided conversation to get to know them, and they would explain their music making process. This was followed by informal interactions through short calls, text messages, and audio messages. This helped gain deeper insights about their doings, as they would share their recent experiences and music making material.

Communication was held with participants with a varying range of frequency, from 2-3 times a week, through 15-minute to 1 hour video calls, or text or voice messages. Some were more responsive than others, which might have resulted in a better understanding of some participants.

2.3.3
Participants

This study involved a range of 8 participants segmented through the criteria described below. These were the basis of a screener survey, which was created to recruit participants through informal reach-outs to bands on social media. More details can be found in the Appendix 3.

RECRUITMENT CRITERIA

Collaboration: Bands who write music in collaboration with their bandmates

Profession: Part-time to full time professional

bands who have released at least a single.

Years of experience: At least 3 years of experience

Music expertise: Self-taught, conservatory, or University level

Music genres: Rock and subgenres

2.3.4
Analysis

A thematic analysis on the wall was carried out to analyse and synthesise the information from the high-touch netnography. Statement cards were created for each participant, as well as a collection of photographs from their music making tools and activities. The analysis was carried out following a systematic clustering approach described by Sanders and Stappers (2008). This analysis started out on a physical wall (Figure 6), and proceeded on a digital whiteboard once the cluster sizes were manageable on a screen (Figure 7). The results of this analysis will be described in the next chapter combined with the literature research and low-touch netnography.

Figure 6. Analysis carried out for high-touch netnography.
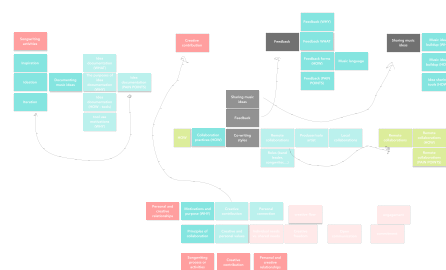
Figure 7. Digital analysis on the wall.

2.4 Low-touch netnography

2.4.1

Method and data collection

A series of low-touch netnography activities were carried out as a form of user observations on online communities, as well as posting interventions on selected online communities and reading relevant articles (Reynolds & Xun, 2010). The purpose of this low-touch form or research was to fill in the knowledge gaps about music making, complement the high-touch research, and gain a global undrestanding of musicians' practices in music making. Figure 8 shows an overview of the sources selected for these activities.

Forums, communities, blogs, and video channels were selected to collect data from a diversity of sources and audiences. For instance, SongTown provided a more expert perspective on songwriting and collaboration. Reddit provided a more thorough understanding on the individual level on how people ideate and their struggles with music making. The community "Songwriting and Music Production" provided a general view of what people consider relevant (what they value and what they struggle with) when it comes to music making.

The data was collected in the form of screenshots and categorized into folders. For the online interventions carried out by the researcher, the data was in some cases classified into tables.

2.4.2

Analysis

To analyze the data collected, a series of collages were made on an online whiteboard as a clustering exercise. Patterns were found by interpreting the data on post-its (Appendix 4).

Source	Platform	Description	Added value
Forum	**Reddit** /wearethemusicmakers	These are online groups to share knowledge and material related to music making. The researcher observed interactions among users, and posted polls and open questions to the public.	- Long, descriptive content - +1M users (large, diverse audience)
Community	**Facebook** Songwriting and music production		- Raw content sharing - High activity and responsiveness - Diversity of expertise
Expert Blogs	Songtown	This is a creative community that has a blog with articles about songwriting.	- Expert perspectives - Filtered content written by 2 expert and successful songwriters
Videos	Youtube	Watching videos about the songwriting and bands, by producers and musicians.	- Large variety of content - Crowd validation of videos for credibility

Figure 8. Sources of low-touch netnography research.

2.5 Market research

Several digital platforms support musicians on their music making processes, such as digital audio workstations (DAWs), audio recorders, music management platforms, music sharing platforms, and music networking platforms. Even though some of the tools most commonly used by musicians were described as part of the user research, further market research was carried out to understand what other products are available to musicians, how they might solve the pain points identified in this research, and which gaps could be addressed through design. Figure 9 shows an overview of the activities carried out, starting from a broad overview of the competitive landscape, and other activites directed towards the product market fit.

Competitive landscape
HIGH LEVEL OVERVIEW OF MUSIC RELATED PRODUCTS

2x2 matrix
SOLUTION SPACE MAPPING

Feature analysis
IN-DEPTH VIEW OF
FEATURE COMPARISON
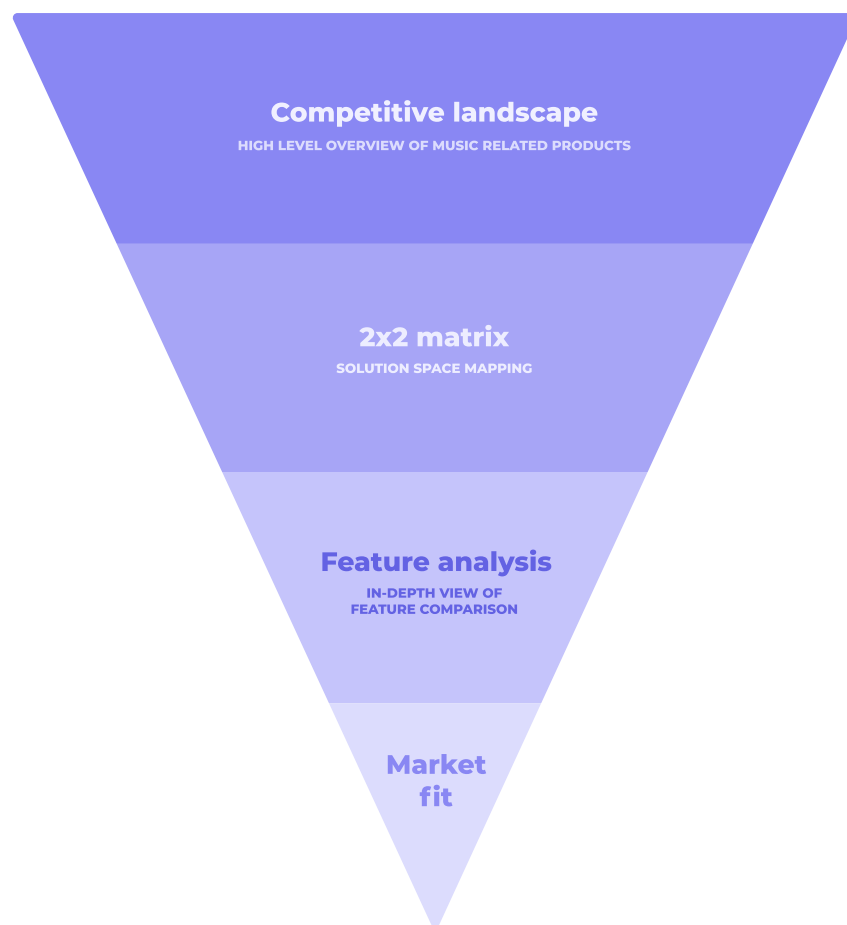
**Market
fit**

Figure 9. Overview of market research activities.

CHAPTER 3

Research results

- Summary of the key findings

- Introduction to music making

- The experiential journey of collaborative music making

- Market research

- Collaboration

- Needs in tension

- Discussion: Why technology fails

This chapter will dive into the findings of the research study, aimed to understand the music making practices of musicians in a band. It focused on their activities, tools, and collaboration.

3.1 Summary of key findings

	Activities	Tools	Collaboration
Key findings	Music making is collaborative, iterative, and chaotic. It consists of musicians individually ideating and documenting loose musical elements, and then combining them into songs. Musicians' process is personal and does not follow a particular structure.	Music making takes place e-v-e-r-y-w-h-e-r-e. Motivated by tool accessibility, practicality and adaptability to their context of use, musicians use a broad range of music making tools (from voice recording apps to note taking, communication and file sharing tools). This results in ideas documented in many places.	Shared music making is about communication and values. It requires frequent interaction among bandmates for feedback and idea buildup. As communication and personal relationships become highly significant, values and work ethic are important to establish.
Key pain points	Combining music ideas is inefficient because ideation tools are not collaborative and don't layer audio. This forces musicians to turn to complex music production software early in their process, as well as alternative tools for communication, file sharing, and management.	Cataloguing or organizing music ideas is not smooth in their current workflow because they are documented all over the place. This makes it inefficient to combine and iterate on them.	It's hard to communicate effectively for feedback on a granular level because feedback on audio material is not enabled by generic communication tools nor ideation tools used. This is particularly challenging in the context of remote bands.
Key gain points	Creative contribution. Being able to give creative input to the making of a song.	Flexible creative expression. Being able to express the musical self, experimenting and logging ideas whenever and wherever.	Community and connection. Sharing a passion and ownership with others and being part of something. Sharing knowledge with others to grow as a musician.

* Further descriptions in the Appendix 6.

3.2 Introduction to music making

Music making is an iterative and unstructured process in which band members collaborate throughout individual and shared activities to co-create a song (Figure 10). They make use of a broad range of offline and online tools to create, combine, and build up on their ideas, making communication the essence of collaboration and the key to the song's success.
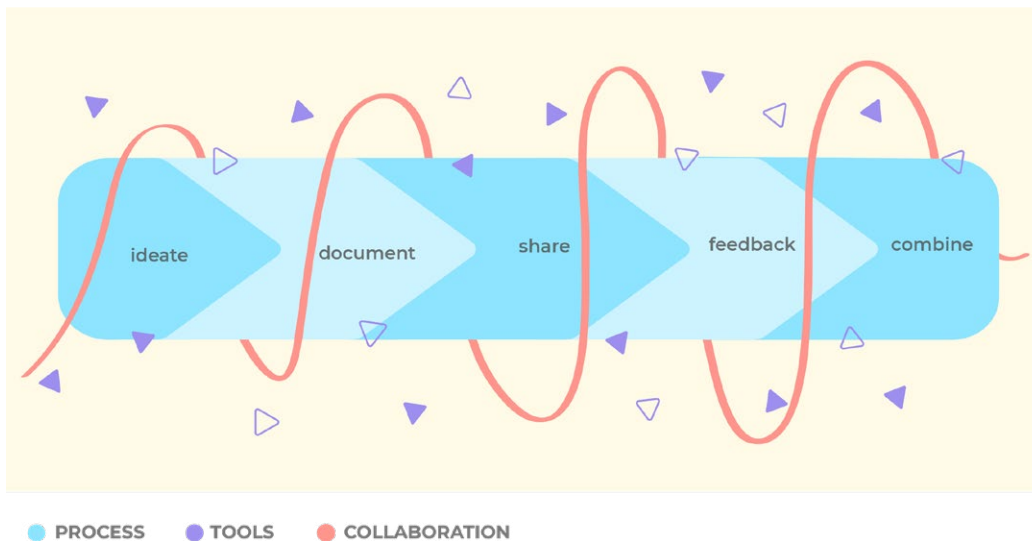
Figure 10. Main stages of the music making process, in which collaboration comes and goes, and a broad variety of tool come into play at different moments.

The outcome of this process is a song, which consists of music elements that are put together to create musical sense. Figure 11 is a visual representation of a song as an ice cream cone. The song structure holds the song together. The ice cream scoops refer to the melody, lyrics, and chord progressions. These loose elements come together in musical fit, and match the purpose of a song. As in an ice cream, flavours that go well together are combined, and through this, a particular theme or emotion is conveyed. Finally, the arrangement is represented as the toppings of this ice cream, which fall on the three scoops and give a boost to the ice cream's flavours. That is, the instrumental interpretations bring the song to life. A more in-depth explanation of this process can be found in the Appendix 5.

Figure 11. The anatomy of a song as an ice cream cone.

A music making storyboard

Figure 12 presents a simple storyboard or what a collaborative songwriting process could be like for a band.

Carmen is on the way to the park. She suddenly listens to a melody in her head.
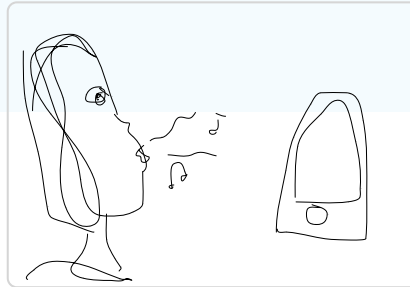
Carmen takes out her phone, unlocks it, opens the voice memos app, and records herself humming the melody.
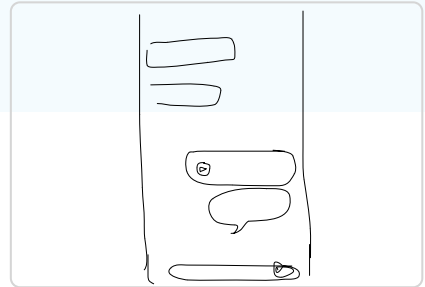
Carmen shares her voice memo with her bandmates through their Whatsapp group.

Jimmy tells Carmen what he thinks of her idea through a Whatsapp message.

When Carmen is home, she picks up her guitar and starts to strum some chords that match her melody.
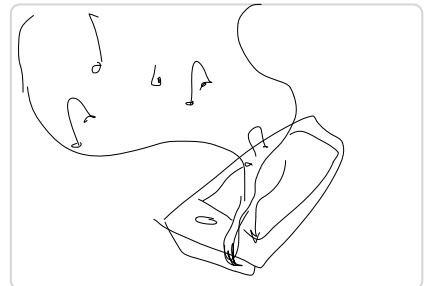
She takes her voice memos app again and records some riffs and chords.
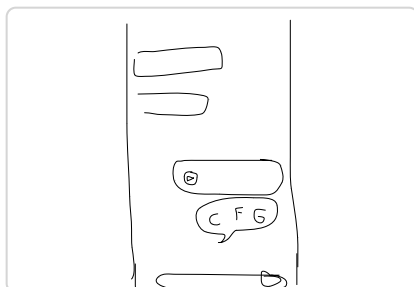
Carmen sends this new idea through Whatsapp to Carl, the bass player. She writes down the chords in the next message.

Carl listens to Carmen's music file on Whatsapp. Inspired, he takes his bass and starts to improvise some bass lines until he achieves something he likes.

Carl sends his audio file to Carmen through Whatsapp and they discuss about it.

Carmen records her guitar on a DAW and sends it to Carl through email.
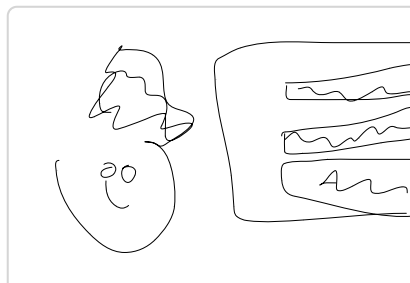
Carl opens his email on his computer, downloads the DAW file, opens it, and plays the music.

Carl records his bass line on a different track on the DAW and sends it back through email.

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Figure 12. Storyboard of music making. DAW: Digital Audio Workstation.

3.3 The experiential journey of collaborative music making

The journey below (Figure 13) visualises the early stages and activities of the music making process of bands. It uncovers how music ideas evolve into songs, which tools take part in this process, and how musicians' needs emerge and change throughout it. For simplification purposes, this journey map shows a linear process. However, these activities can take place in unstructured sequences, iteratively and in parallel.

STAGES	IDEATE	DOCUMENT	REVISE	BUILDUP

SONG BASE phase 1
melody
lyrics
chord progressions
song structure

INSTRUMENTAL ARRANGEMENT phase 2
guitar
vocals
bass
drums

ACTIVITIES

Getting inspired through daily life activities, reference tracks, samples, peers' work, or by playing music.

Brainstorming on loose music ideas, in the form of lyrics (i.e. a verse), melodies, chord progressions, or song structures to convey a theme or emotion.

Recording selected ideas or concepts from the ideation phase, such as a verse, a melody, a guitar riff) through audio or text.

Naming the recorded ideas into recognisable files, making reference to chords, lyrics, or conceptual descriptions (i.e. emotions or keywords)

Sharing ideas with bandmates, peers, or other contributors to the songwriting process.

Giving and receiving feedback or input to others' ideas in technical or emotional ways through text or audio.

Refining ideas through an iterative process of listening to recordings and modifying concepts.

Exploring different combinations of loose music ideas, until finding the right musical fit (i.e. guitar riffs with vocals and a particular melody and verse).

Building music prototypes, resulting from the combination of single ideas. This step can be done by multiple people who share a DAW file to record their part.

TOOLS

Music making
File sharing
Communication

♪ Music Instruments

♪ Voice memos or note taking tools

♪ DAWs

♪ DAWs

⚐ File sharing
Whatsapp, Gmail, WeTransfer, Dropbox

💬 Communication
Whatsapp, Gmail

COLLABORATION STYLES

A Single-led culture
B Duo-led culture
C Co-led culture

online
offline

A

B

C

27

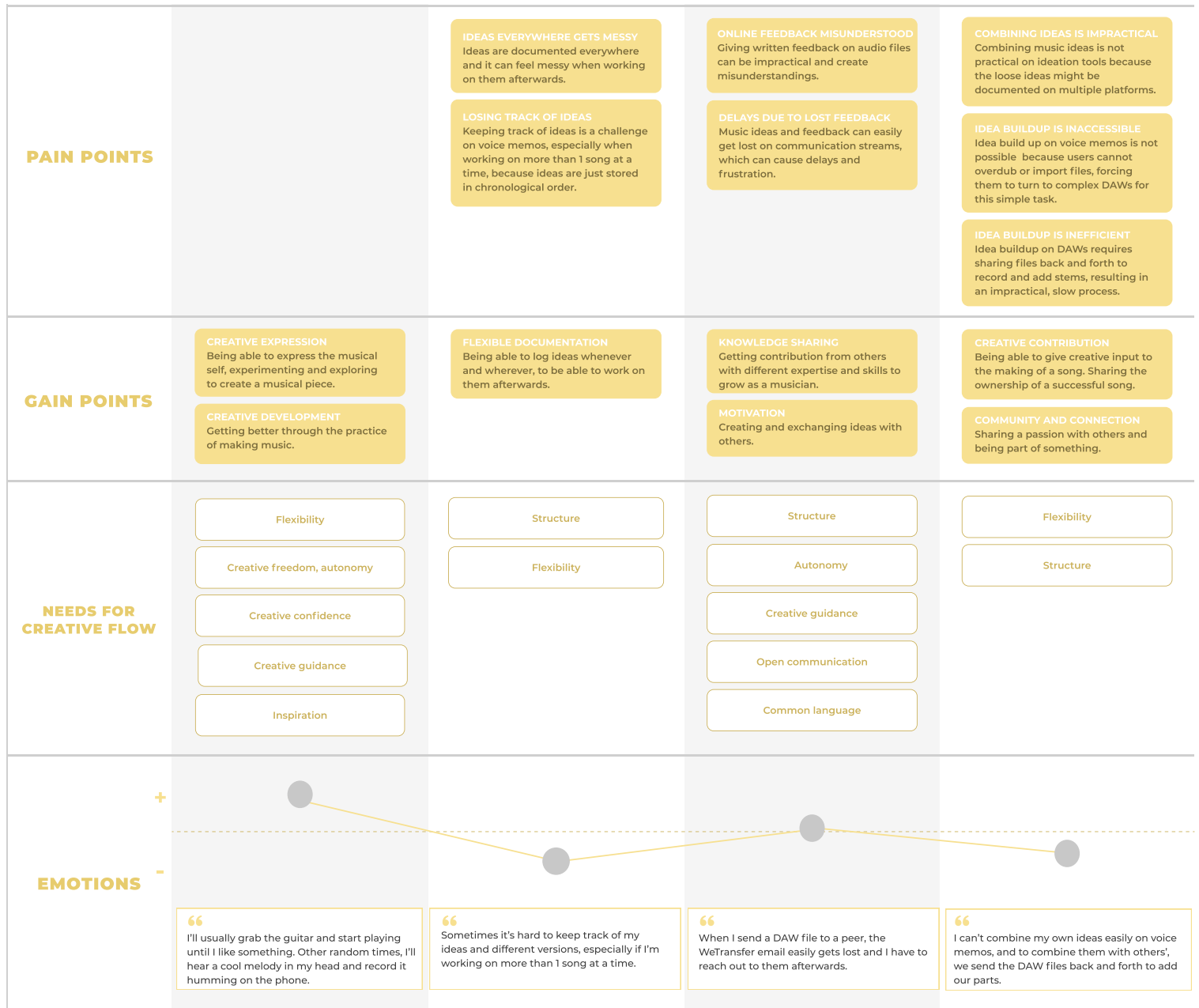|				
PAIN POINTS		**IDEAS EVERYWHERE GETS MESSY** Ideas are documented everywhere and it can feel messy when working on them afterwards. **LOSING TRACK OF IDEAS** Keeping track of ideas is a challenge on voice memos, especially when working on more than 1 song at a time, because ideas are just stored in chronological order.	**ONLINE FEEDBACK MISUNDERSTOOD** Giving written feedback on audio files can be impractical and create misunderstandings. **DELAYS DUE TO LOST FEEDBACK** Music ideas and feedback can easily get lost on communication streams, which can cause delays and frustration.	**COMBINING IDEAS IS IMPRACTICAL** Combining music ideas is not practical on ideation tools because the loose ideas might be documented on multiple platforms. **IDEA BUILDUP IS INACCESSIBLE** Idea build up on voice memos is not possible because users cannot overdub or import files, forcing them to turn to complex DAWs for this simple task. **IDEA BUILDUP IS INEFFICIENT** Idea buildup on DAWs requires sharing files back and forth to record and add stems, resulting in an impractical, slow process.
GAIN POINTS	**CREATIVE EXPRESSION** Being able to express the musical self, experimenting and exploring to create a musical piece. **CREATIVE DEVELOPMENT** Getting better through the practice of making music.	**FLEXIBLE DOCUMENTATION** Being able to log ideas whenever and wherever, to be able to work on them afterwards.	**KNOWLEDGE SHARING** Getting contribution from others with different expertise and skills to grow as a musician. **MOTIVATION** Creating and exchanging ideas with others.	**CREATIVE CONTRIBUTION** Being able to give creative input to the making of a song. Sharing the ownership of a successful song. **COMMUNITY AND CONNECTION** Sharing a passion with others and being part of something.
NEEDS FOR CREATIVE FLOW	Flexibility Creative freedom, autonomy Creative confidence Creative guidance Inspiration	Structure Flexibility	Structure Autonomy Creative guidance Open communication Common language	Flexibility Structure
EMOTIONS	"I'll usually grab the guitar and start playing until I like something. Other random times, I'll hear a cool melody in my head and record it humming on the phone.	"Sometimes it's hard to keep track of my ideas and different versions, especially if I'm working on more than 1 song at a time.	"When I send a DAW file to a peer, the WeTransfer email easily gets lost and I have to reach out to them afterwards.	"I can't combine my own ideas easily on voice memos, and to combine them with others', we send the DAW files back and forth to add our parts.

Figure 13. Experience journey map of making: ideation, documentation, revision, and buildup.

The main stages of music making are Ideate, Document, Revise, and Buildup. The following sections dive into each of these stages to unravel the richness of the journey above.

Ideate: Generating music ideas

Ideation is defined by the moments in which musicians come up with music ideas in the form of melodies, riffs, phrases, beats, and other elements. Musicians manifest their musical self in the form of sound, and foster their creativity through continuous practice (Engin et al., 2013). An in-depth description of the ideation stage can be found in the Appendix 7.

Key takeaways

Musicians create their initial ideas through a process of trial and error. At this stage, their need for creative freedom, autonomy and creative confidence are strongest. These drive the musician's self expression. They also seek creative guidance from others to develop as musicians.

Ideation activities are not tied to a particular space, rather the tools that are available to the musician at the ideation moments. For example, if a musician thinks of a catchy melody in the middle of the street, they might record it by humming into a recording app.

Factors such as the band setup, the immediate circumstances, motivation level, commitment, and inspiration, shape the music making process of every musician.

> **I wouldn't call them "sessions," more like "moments." Usually short bursts of creativity that last about five to ten minutes. Could take two to ten of these before I'm satisfied enough to call it a song.**
>
> **- ALEX, BAND LEADER**
> SINGLE-LED COLLABORATION, ONLINE AND OFFLINE

> **I can get inspiration from riding a bike, walking, talking with friends, or observing a beautiful situation. But to write good lyrics you need to sit down and work on them. I create my first verses with the guitar."**
>
> **- ROBERT, BAND LEADER**
> SINGLE-LED COLLABORATION, ONLINE

3.3.2

Document: Capturing music ideas

Musicians often document (record, register, log, file, catalogue, archive) their ideas on different tools (Figure 14). They do this at different moments and places, with the goal of sharing them or working on them later to turn them into songs. Further explanations of this stage can be found in the Appendix 8.

Key takeaways

In an unstructured ideation process, the diversity and accessibility of tools meets the need for flexibility. Nonetheless, the possibility to log ideas everywhere and anywhere compromises the need for structure that arises when working on the ideas later.

Tool choice is motivated by its purpose and context of use, resulting in ideas documented in different places. This is a major barrier during the ideation process because it's complex and inefficient to iterate on and combine ideas.

During a creative session, musicians will play their instruments and collect their selected bits of music by audio recording or writing them down. The most common music making tools during the early stages of music making are simple voice recording apps, and physical and digital notes.
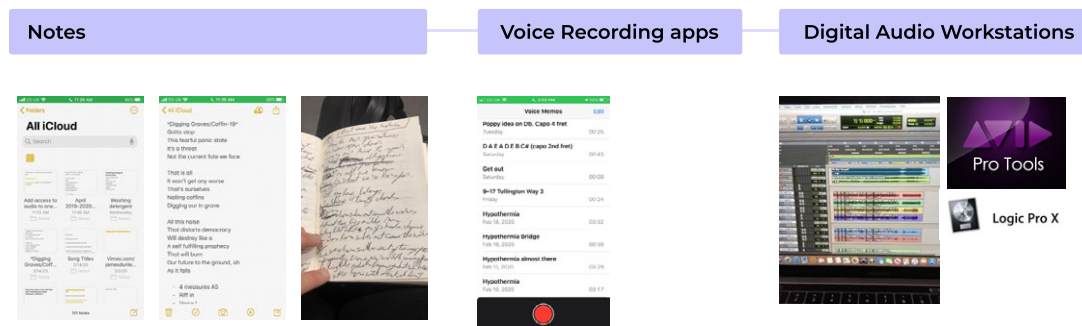
Notes	Voice Recording apps	Digital Audio Workstations

Figure 14. Commonly used documentation tools and samples from participants.

"

"It would be great if I could upload an mp3 somewhere and more easily record on top. I can't do that on voice memos, and I use them a lot. You can do that on Pro Tools, but it would be great to have a more simple tool"

- JULIAN, BAND LEADER
SINGLE-LED COLLABORATION,
ONLINE AND OFFLINE

Revise: Iterative feedback loops

Music making is an iterative process that involves revisiting ideas multiple times as the song evolves and ideas are combined. Revision involves sharing music ideas, giving and receiving feedback, and refining them. An in-depth description of this can be found in the Appendix 9.

Key takeaways

Collaboration is about constructive feedback, ranging from technical to emotional ways of expression. It has the purpose of shaping ideas towards a common vision of the song. The feedback on audio material is usually expressed verbally.

Bands who don't have the possibility to meet in person seek online solutions to give each other feedback on their work. Some common platforms for this are Whatsapp and email services, in which they share their audio files and send feedback in the form or audio or text (Figures 15-17).

Music making tools don't enable communication within their platform. Currently, social platforms are used to manage collaborations. Messaging and file sharing services are crucial to exchange music ideas and feedback. For this reason, the online revision process of bands remains innacurate and impractical.
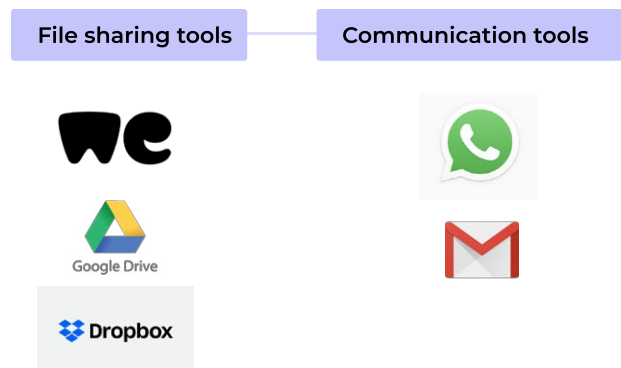

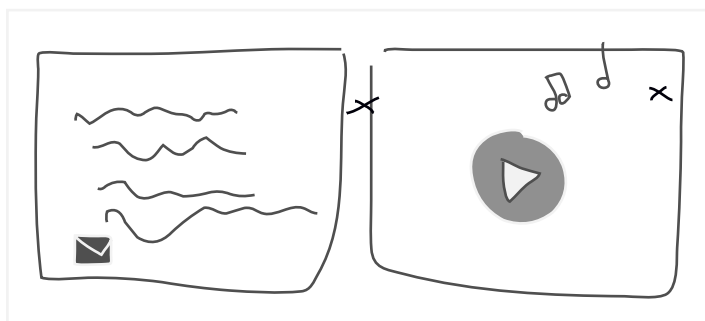Figure 15. Most commonly used tools for revision.

Figure 16. Illustration of how a participant gives feedback with an email draft and audio file playing on a separate window.
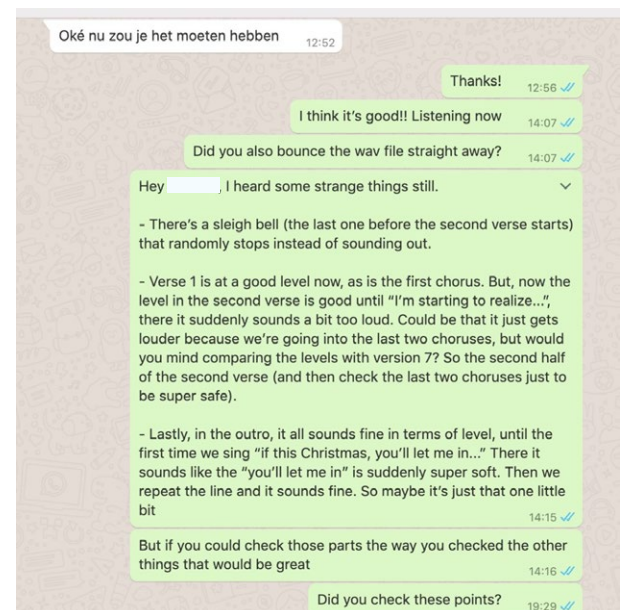

Figure 17. Sample of a musician giving feedback to their producer through Whatsapp.

Buildup: Bringing ideas together

Music ideas evolve into songs by creating combinations of the music building blocks until they find the right musical fit (Figure 18). Musicians combine their own ideas and pick up others' work to build upon. Further descriptions can be found in the Appendix 10.

Key takeaways

Music ideation tools have technical limitations for idea buildup (i.e. they are not collaborative, cannot import files, and cannot layer different files). Therefore musicians use digital audio workstations for this. This implies an inefficient,

tedious process of modifying and sharing of .wav or .mp3 files through email (Figure 2419). The use of these complex tools for simple tasks shows a tool gap between the songwriting and production stages.

From commitment to leaving the ego at the door, building up on each others' ideas through constructive behavior is part of respecting each others' artistic
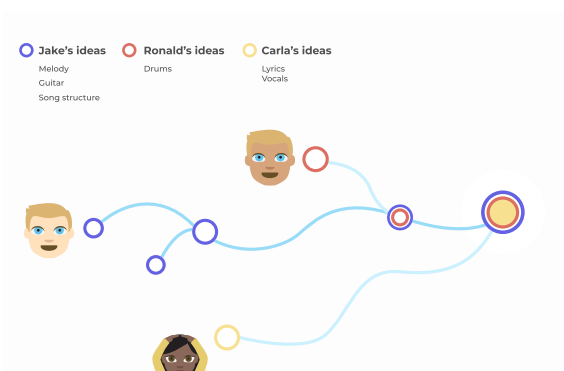

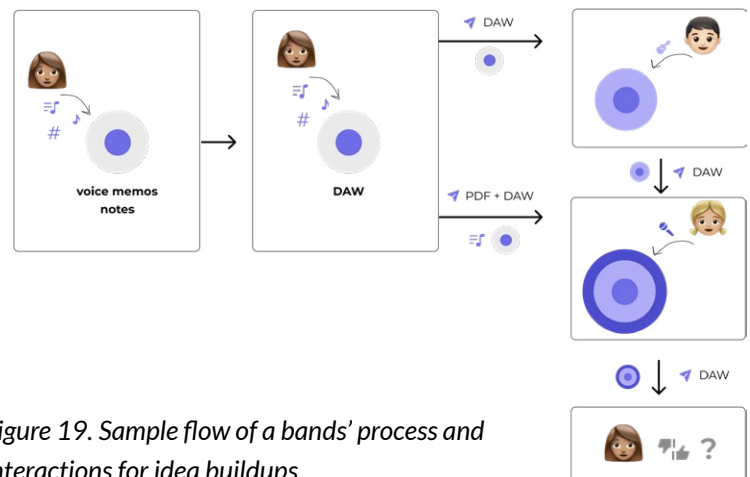Figure 18. Visualization of how music ideas are combined.

Figure 19. Sample flow of a bands' process and interactions for idea buildups.

> 66
>
> **The efficiency really went down when I left. We used to write songs every week. Now we write way less. If there were ways to work more smoothly it would be better. Now it's lagging and dragging a lot.**
>
> **- RONALD, BAND LEADER**
> DUO-LED COLLABORATION,
> ONLINE AND OFFLINE

Motivations behind tool use

Musicians use different tools to make music. Due to their diverse process, these range from audio recorders, to music production, file sharing and communication.

Three key qualities which drive musicians' decision to choose these tools are practicality, accessibility, and adaptability (Figure 250).

Practicality Is this tool convenient and easy to use?

Accessibility Is this tool free or easy to access?

Adaptability Can I use this tool for different purposes? Is it compatible with my other tools?
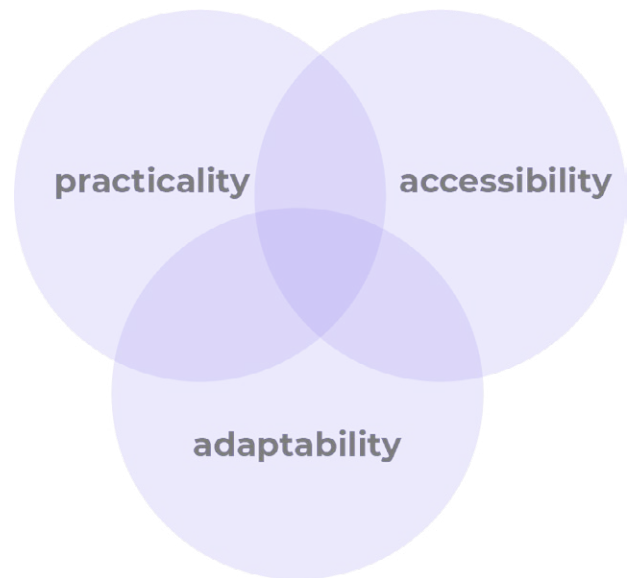
Figure 20. Key drivers for decision-making of musicians regarding tool use.

"

"Software recording... the vocalist doesn't like that at all. It's too much to do- It's a hassle, so she sends whatsapp singing the melody, that's so much more simple and easy to do remotely"

- ROBERT, BAND LEADER
DUO-LED COLLABORATION,
MOSTLY OFFLINE

"

"When I see these complex interfaces I feel like it's such a hassle and such an effort. I prefer not to use them"

- TARA, BAND LEADER
DUO-LED COLLABORATION,
MOSTLY OFFLINE

3.4 Market research

COMPETITOR ANALYSIS

Other tools were explored to understand how they support musicians and define a solution space for this project. Figure 21 shows an overview of the platforms that a musician may come across during their workflow. These were grouped into three areas: music making, project management, and social / networking. The solution to be designed would fall in the yellow area, where music making meets project management. A limitation of this overview is that it does not depict how these tools target different stages. This will be addressed through the following feature analysis, as this might play a role in proposing a differentiated solution.
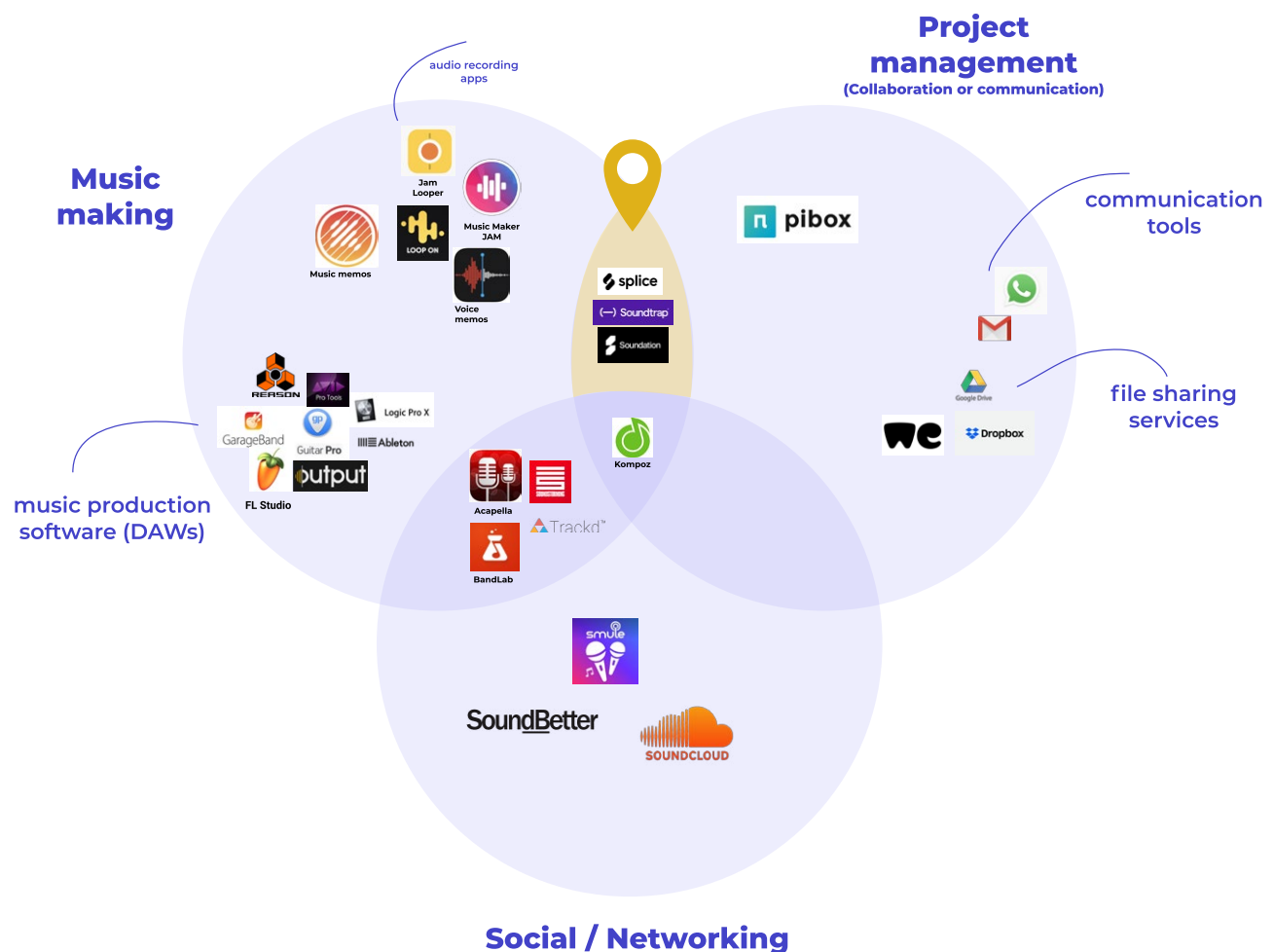

Figure 21. Competitive landscape of products or services that relate to music making.

FEATURE ANALYSIS

A feature analysis was carried out to further analyze a selection of cloud-based music making tools (Figure 22). These were not mentioned by any participant in the user research. This analysis provided further insight about how these tools intend to support different activities. The explored features were categorized into the stages of the journey described earlier. Further descriptions of these and other platforms can be found in the Appendix 11 to this report.

These platforms mostly offer a limited integration of features for 'Revision' and 'Buildup.' For example, in communication, creation of teams is not supported, and project management is restricted. On the other hand, Soundtrap and BandLab score highest on collaborative projects, but their features indicate high complexity for the 'Buildup' stage, through features like MIDI controller, software instruments, and sound libraries. These point out a transition towards Digital Audio Workstations (Appendix 11), which this research describes as too complex for early stages of ideation. The solution space will be then indicated in the benchmark in the next page.

	FEATURES	Soundtrap	BandLab	Kompoz	Trackd
IDEATE + DOCUMENT	Audio recording	●	●	●	●
	Audio editing	●	●	●	●
	Audio layering	●	●	●	●
	Audio upload	●	●	●	●
	Lyrics or chord input	●	●	●	●
	Video recording	●	●	●	●
	MIDI controller	●	●	●	●
	Software instruments	●	●	●	●
	Sound Libraries	●	●	●	●
REVISE + BUILDUP	Project management	●	●	●	●
	Collaborative projects	●	●	●	●
	Teams	●	●	●	●
	Peer feedback	●	●	●	●
	Communication	●	●	●	●
	New connections	●	●	●	●

● Existing capability   ● Limited capability   ● No capability

Figure 22. Feature analysis of cloud-based music making collaborative plaftofms.   35

BENCHMARK

Four relevant axes were established to compare tool typologies based on an expertise against generic focus, as well as collaborative against individual-oriented features. Based on this, the solution space was identified based on the user needs and pain points. This matrix is shown on Figure 23. The solution would fall under the 'Collaborative' and 'Expert' categories, which means that it will target music-related activities for a group of people.

*In the context of this study, collaborative tools in music should move away from the 'mastery' level because the variation in musicains' expertise in the same band might require lower levels of complexity.

Figure 23. 2x2 matrix of tool typologies.

3.5 Collaboration

Collaboration in music is motivated by both creative and personal factors. Collaboration lies in the interactions that take place to build up on ideas. It is is about how individual activities and ideas come together. Further explanations can be found in the Appendix 10.

Key takeaways

Musicians collaborate to share knowledge, contribute creatively to a song, and foster personal connections with others. Their differece in skills, experience and personalities are the reason why magic happens in collaborations (Dow & Settles, 2013).

Factors such as motivation, engagement, and personal priorities of band members influence the music making process. Work ethic, attitude, and commitment are described as the most important qualities in bandmates. (Marley Mac Media, 2019).

Communication is key to collaboration, and it can be hindered in the context of online collaborations, since band members cannot meet in person and the current tools present various limitations.

"

I usually will write the first parts of the song by myself or with the bass player. We don't involve the others because we have very different tastes. Later on, they will always bring something interesting to the song"

- JOHN, BAND LEADER

Duo-led collaboration

"

When it comes to choosing bandmates, I'd rather work with someone enthusiastic and committed than a music prodigy."

- RAUL, SOLO ARTIST

Single-led collaboration

"

My favorite part of making music is the community that is built around it, and seeing how my ideas evolve into songs with the contribution of others."

- ALEXA, SOLO ARTIST

Single-led collaboration

Why musicians collaborate

Prior studies about online creative collaborations show that people who collaborate "share less in common than we might think." They might have similar interests, but very different skill sets (Dow & Settles, 2013). In this research, there was a level of trust in the instrumental language and expertise of others. They communicated with others from their musical standpoint, and built upon their ideas to meet the common goal of writing a song.

On this note, having heterogeneous personalities in a group can also help achieve constructive and better quality results in a project, particularly through creative conflict (Dow & Settles, 2013). This was expressed by 5 out of 8 participants in this study, whose bands were composed of musicians with differing backgrounds, expertise, experience, and personalities. In other cases, creative conflict was avoided instead of embraced, since it led to the separation of their bands in the past.

Another reason why musicians collaborate for making music is the feeling of community and the personal connections that emerge through it. It's about fostering tight relationships through playing music. It's about sharing the ownership of a song, seeing their ideas come together into great songs.

CHOOSING THE DREAM TEAM

When choosing bandmates, all participants in the study referred to the importance of social interactions and individual values. They described work ethic, attitude, and commitment as more relevant than their differences in experience, music background or expertise.

On the other hand, studies suggest that musicians "struggle to organise, collaborate and communicate effectively" (Love & McGrath, 2017). This might mean that despite the efforts of band leaders to find their dream team of musicians, frictions may arise along the way. In the context of rock bands, Malm (2020) argues that tensions are the result of "conflicting visions of band identity and purpose." However, these creative conflicts can be fruitful at times.

Therefore this work does not intend to change musicians' attitudes, but instead to facilitate desired behaviors and activities to avoid pitfalls in collaboration. Current tools hinder musicians' ability to co-create and their willingness to collaborate with others. This project will then aim to make the individual and shared processes of music making more efficient. Where there is already commitment, motivation, and work ethic as a starting point, obstructive frictions will be diminished.

> **"**
>
> I used to work with a friend, but we clashed and I didn't want to deal with this. He had a more classical view of rock. vNow I write all my songs, and sometimes I get other musicians for the production"
>
> **- ADRIAN, SOLO ARTIST**
>
> Single-led collaboration

3.5.2

Collaboration cultures

Bands have their own approach to collaboration and this is usually tied to the vision of the band leader. A culture is formed through the interplay of bandmates' personalities and creative contribution, and defined by their interactions in the process of writing a song. Figure 24 visually represents the three cultures explored through this research.

COLLABORATION STYLES

A Single-led culture
B Duo-led culture
C Co-led culture

online

offline

Figure 24. Visualization of three typologies of collaboration cultures.

SINGLE-LED CULTURE

This type of collaboration in music making relates to the bands whose process is carried out by mostly one person, usually the band leader. They mostly have a strong vision for the song and the band's direction, and will write the songs. The band will come in to play their part in the arrangement, and contribute according to the creative freedom provided by the band leader.

DUO-LED CULTURE

In a duo-led culture, two people will guide most of the process. They will collaborate with each other to write different parts of the song concept and, at times, the arrangement as well. They will engage with the rest of the band members for later phases (such as recording the arrangement or feedback).

CO-LED CULTURE

Co-led cultures are usually those in which all band members engage in the music making process from start to end. The roles get mixed and creative freedom is high. This collaaboration takes place predominantly offline, in a rehearsal room or physical space where band members have access to instruments (such as a house).

Personal relationships in collaborations

Personal and creative values shape music collaborations. Figure 25 presents the most prominent values that resulted from this research. These are crucial for successful collaborations to take place, as they shape musicians' work ethic.

Creative level	Personal level
Creative freedom	Transparency
Commitment	Honesty
Motivation	Engagement
Shared ownership	Priorities

Figure 25. Values of collaboration in music

TRANSPARENCY AND HONESTY

Expressing one's opinion, communicating openly, and setting expectations with other members.

ENGAGEMENT AND MOTIVATION

Showing dedication to the band, being engaged with others' work, having a proactive attitude and enthusiasm to move forward together.

COMMITMENT, SHARED OWNERSHIP, AND PRIORITIES

Respecting the others' boundaries, acknowledging the priorities of bandmates, taking responsibility for the project, and showing commitment to a role.

3.6 Needs in tension

Musicians' pain points in music making can be understood from the imbalance of underlying tensions. These are expressed in four different levels: me versus we, autonomy versus guidance, order versus chaos, and emotion versus theory. These tensions can manifest as dilemmas or frictions resulting from unmet or imbalanced needs.

ME VS WE

In a band, the ego causes creative conflict. This arises in collaboration, where people work together towards a common vision and goal: creating a song. Musicians need to express their creativity, as well as respect others' ideas. This tension results from dilemmas between individual and shared needs and values.

"at any given time somebody could write an amazing part that you have to play, and that could've been better than anything you could've thought of, and the result is always the best song possible. And that's what's most important."

(Dyo, 2009)

- Commitment is required for successful collaborations, but personal priorities conflict as each musician has their external activities.

- Musician have to come together towards a common vision. They should embrace others' creative expression to serve the song. It's about leaving the ego at the door.

EMOTION VS THEORY

In music, people should convey emotions through theory. This tension gives place in moments of feedback. For example, musicians have a unique 'feeling' towards music and their personal artistic vision. They must express verbally what should be represented musically. Differences in expertise or musical language preferences might generate this tension.

AUTONOMY VS GUIDANCE

Band collaboration cultures in a band might limit musicians' self expression . Creative conflict may arise from differing opinions about how songs should take shape (Keith, 2008). This manifests mostly in revision activities. A musician faces this dilemma when asking for feedback. Creative flow is then achieved through a balance between creative guidance and creative freedom. These are some contexts in which this tension occurs:

- When there is need for autonomy and creative confidence, versus the need for guidance and input from others. It's about learning to trust the creative gut, yet remaining open to reach out for others' opinion and be inspired through external references.

- It relates to how the band leader takes the role of the songwriter, but the rest of the members create the instrumental arrangement with a varying level of guidance from the leader.

ORDER VS CHAOS

When order and chaos are in tune, creativity flows. Previous studies have shown that creativity lies in chaos (Keith, 2008), and collaboration requires order. The journey shows the interplay of these needs across activities. Even though music composition is loosely structured, and musicians are naturally disorganized, their collaborative workflows requires structure. There is a need for tools to support these (Love & McGrath, 2017).

Need for flexibility

- The composition process is personal and calls for dynamic ways of expression.

- Ideas evolve constantly as they are refined and combined.

Need for structure

- Musicians need to keep track of the versions of their ideas.

- Musicians can work on various ideas simultaneously.

3.7 Discussion: Why technology fails

"Interestingly, many of the core processes that a musician goes through do not relate to either production or performance of music." (Love and McGrath, 2017)

Music making is an iterative process in which musicians' needs change in every stage of their workflow. This research investigated how bandmates make music together, looking closely at their activities, tools, and collaboration.

Collaborative music making is complex because it requires a series of asynchronous and distributed activities, involving a broad range of tools and frequent social interactions. This study showed that today's music making tools fail to offer musicians holistic support, particularly in the early stages. On one hand, they neglect the collaborative nature of this practice. They also do not address different contexts of use and the needs that come along. User research demonstrated how and why musicians use alternative tools to fulfill their needs for communication and file sharing. However, one of their key goals remains disregarded: how to build up ideas quickly and efficiently.

Current tools explored through market research and netnography do not reflect a user-centered design approach, as they are oblivious of essential use cases. Within current practices, it is hard for musicians to combine, organize, and discuss their music during initial ideation. Remote collaboration becomes particularly inefficient, the motivation of bandmates reduced, and the process delayed – or even discontinued. This research shows that these are the key areas of failure of these tools:

1. They fail to support organizational activities

Current music making tools disregard key elements related to management and structure (Benford et al., 2016). These include activity tracking and project planning (i.e. deadlines or member contributions). They take music as a creative endeavour, yet ignore its organizational aspect.

2. They fail to enable communication

Current tools neglect communication features, and musicians have to reach out to alternative tools to fulfill this need, such as Whatsapp or email. Since their communication is usually accompanied by the work they produce, they have to use file sharing tools to send audio files. This study showed how musicians need to communicate in order to build up on each others' ideas. Without this aspect enabled by their tools, their collaborations are far from success.

3. They fail to support key contexts of use

This study showed that musicians seek simple recording tools such as voice memos to document their ideas in early stages of music making. They choose these tools for their accessibility, adaptability, and convenience; as compared to the complexity of DAWs. However, these simple tools rarely enable collaborative ideation. This hinders musicians from expressing their musical self, neglecting their need to combine ideas, get feedback, and build together with others.

Summing up

It was found that bands in remote setups have more issues to make music because their tools do not support online collaboration in an organic way. In fact, "The lack of support for musicians working in remotely secluded settings presents an additional set of problems to be solved in future research" (Benford et al., 2016). Through a user-centered design approach, the next phases of this project aim to develop a collaborative music making tool which would incorporate musicians' needs and values at its core. The next chapter will describe the key elements that will serve as a starting point to design: the problem definition, design goal, target group, user personas, and design principles.

CHAPTER 4

Definition

- Overview of problem definition, target group, design goal, and personas

- Design principles from research

4.1 Overview

As a result of the research findings, this section shows an overview of the problem definition, target group, and design goal, followed by the personas that were created to inspire the ideation phase.

4.1.1

Problem definition

Currently used music making tools fail to offer a holistic, end-to-end support to the collaborative practices of music bands. They don't enable a smooth and efficient idea buildup during the initial activities of music making, which results in inefficient processes and reduced member motivation. This can hinder the band's progress, especially in the context of remote collaborations.

4.1.2

Target group

Duo-led remote rock bands whose music making process is tied to online activities and don't have the possibility to meet in person for this purpose (Figure 26).

Figure 26. Representation of duo-led collaboration

4.1.3

Design goal

To design a mobile application in which members of a remote rock band can collaborate online in a synchronized, yet distributed way to combine and build up on each others' ideas, to conceptualize their songs.

Target group description

The selected target group represents duo-led rock bands in remote setups (Figure 27). These involve high collaboration between the band leader and the co-writer, and further contribution from other bandmates. The remote setup is an interesting context to design for since they have limited possibilities to meet in person. In the user research, in-person encounters seemed to resolve some pain points related to revision activities. Remote bands expressed these as not only more challenging, but were also not aware of any solutions.

Figure 27. Illustration of remote rock bands.

User personas

As an inspirational tool for ideation, two personas were created as a representation of key players in the process. The first persona, Alex (Figure 258), is the band leader and guitar player. Danny (Figure 269 on next page), the second persona, is the vocalist and co-writer. Danny partly represents the needs and goals of the other band members that come in later in the process as well.

"

Music is my passion, and I am very invested and dedicated to it. You need to work hard to make good music"

Meet Alex

👤 28 y/old
📍 Brazil
⭐ Musician and photographer

A self-taught guitar player and band leader of the indie rock band Lake Rose. Passionate and dedicated to music, makes an effort to keep the band members engaged and aligned to create new music. They all live in different countries and are currently writing their 3rd album, aimed to be released in about 6 months.

⚠ **Needs for creative flow**

Structure

Flexibility

Autonomy

Common language

Open communication

♥ **Values of collaboration**

Commitment

Motivation

Transparency

Shared ownership

Community

♪ **Favorite bands**

Arctic Monkeys, Alt-J, The Killers

🗒 **Toolkit for music making**

◎ **Goals**

To make great music with others they can relate to and work well with

To work closely with Tina, the vocalist, to create song concepts together

To keep track of the bands' progress and a good pace

To enable creative contribution from other band members to create music that matches their vision

☹ **Frustrations**

The work is lagging in an online setting and there is no tools to work smoothly. Different band members show different levels of commitment and engagement.

It is not efficient or practical to combine and build up ideas with the vocalist.

It's hard to keep track of different ideas to work with them afterwards.

Figure 28. User persona for band leader.

"

**Music is
what moves
me, and
sharing it
with others
enlightens
my days.**

Meet Danny

- 35 y/old
- London
- Singer and high school teacher

Professional singer and vocalist of the indie rock band Lake Rose. Driven by the feeling of community of making music with others, excited to contribute to write great songs. Co-writes the new album by working closely with Alex, the band leader. Enjoys sharing their ideas with others to get feedback and guidance to become a better musician.

⚠ Needs for creative flow

Creative guidance

Autonomy

Open communication

Structure

Flexibility

💙 Values of collaboration

Commitment

Motivation

Transparency

Shared ownership

Community

♪ Favorite bands

The Kooks, Cage the Elephant, Foals

📝 Toolkit for music making

◎ Goals

To make great music with others and feel connected through a shared passion

To collaborate with Alex, the bandleader, to contribute to the songwriting

To share ideas with Alex or other bandmates to get feeback and improve them

☹ Frustrations

It is not efficient or practical to combine and build up ideas with bandmates. Doesn't like to work with complex DAWs.

It's hard to keep track of different ideas to work with them afterwards.

It's not practical to share ideas and receive accurate feedback on them.

Figure 29. User persona for co-writer and bandmates

4.2 Design principles

A series of design principles from literature and user research will be taken as a starting point for the development phase in the next chapter.

4.2.1
Experience design principles

Jamming alone, together

The music making experience should be designed for the use cases of individual ideation, idea sharing, and idea buildups. This principle will foster creative freedom in collaboration.

Structure and flexibility

A higher degree of organization and structure is required when bands collaborate remotely (Calefato et al., 2018). Nonetheless, music making requires flexibility, improvisation, and chaos. This design principle aims to give order to ideas within a creative mess.

Transparency and shared ownership

This design principle originates in the values of collaboration discovered through user research. It aims to offer bandmates visibility on other's work, allow for discussion, and acknowledge musicians' creative contribution.

4.2.2
Principles of usability

Practicality

User research showed that musicians seek convenient, easily accessible tools to record their ideas in early stages. Love and McGrath (2017) indicate that time-essential tools enable musicians to carry out key activities quickly, such as recording a melody.

Adaptability

A music making tool should take into account the dynamic workflows of musicians, particularly when designing for collaboration. As stated by Love and McGrath (2017), "this presents an interesting challenge in designing a tool that fits multiple purposes in a holistic way and helps to mitigate transitioning between stages in individual workflows."

Simplicity

The learning curve should be considered when designing a tool for musicians (Love & McGrath, 2017). A certain degree of knowledge will be assumed. According to Flores, Miletto, Pimenta, Rutily, and Santagada (2007), "musicians also have theoretical and practical knowledge about musical instruments (...) and know the technical issues related to how to play them." However, the user research suggests that not all musicians have the knowledge required for DAWs, therefore the interactions on the interface should be intuitive and with a low threshold to combine ideas.

Development

- Conceptualization (creative sessions, core experiences, inspirational sketching, and initial concepts)

- Concept evaluation and selection

- Discussion

FEELING THROUGH SOUND

"

I don't see sound. My conection with music emotionally is actually hearing the clean sound of the chords, tones, progression, groove and runs.

Even during live practice or jam sessions, I will wear headphones and close my ears to hear and feel what the other person is playing."

- KEVIN, BAND LEADER

5.1 Conceptualization

Ideation and evaluation activities translated the research findings into a design solution. Through an iterative process of ideation, prototyping, and testing, concepts were constantly validated with musicians. This resulted in a design that would meet user needs and values through its core experiences and user interactions.

5.1.1

Creative sessions

As a starting point for this phase, two online creative sessions were hosted with designers through Miro (an online, collaborative whiteboard tool shown on Figure 30). Through the first session, an interaction vision was created. The second session built up on the first session results to ideate on how to's related to the vision. The description, plan, results, and reflection of these sessions are in the Appendix 12. These sessions resulted in a series of design directions which were further translated into experiences and concepts.
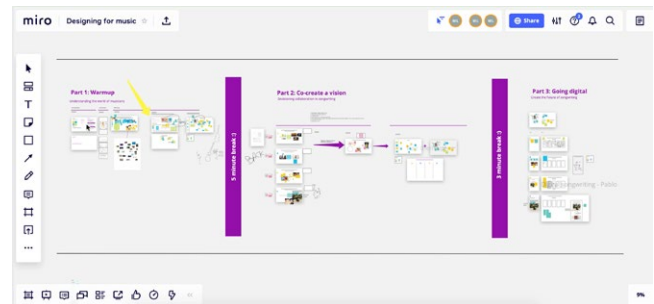

Figure 30. Miro board after first creative session

5.1.2

Core experiences

Three core experiences (Figure 31) were determined through brainstorming and clustering exercises with content from the creative sessions (Appendix 12). These were used as a framework to convey the design solution.

Core experience 1 IDEA BUILDUPS	Core experience 2 SPACES	Core experience 3 ENGAGEMENT
Recording and sharing music ideas, and others can build up on their work.	Cataloguing ideas and archiving them in personalised, shared spaces.	Communicating to exchange knowledge, constantly improve ideas, and make decisions.

Figure 31. Three core experiences for music-making.

5.1.3

Inspirational skecthing

DESCRIPTION

In parallel to the conceptualization, an inspirational sketching exercise was carried out to 'redesign' a selection of products as collaborative music interfaces.

PURPOSE

The purpose was to seek external inspiration from references which were not necessarily tied to the music context. Not all were intended for music, but integrated qualities related to the design goal, such as online collaboration, project management, file organization, or social media. These could inspire interaction qualities, user flows, and the information architecture of the digital solution.

Figure 32 show the sketches created. Screenshots of the interfaces were taken and imported into ProCreate, a digital sketching interface used on the Ipad with the Apple Pencil.
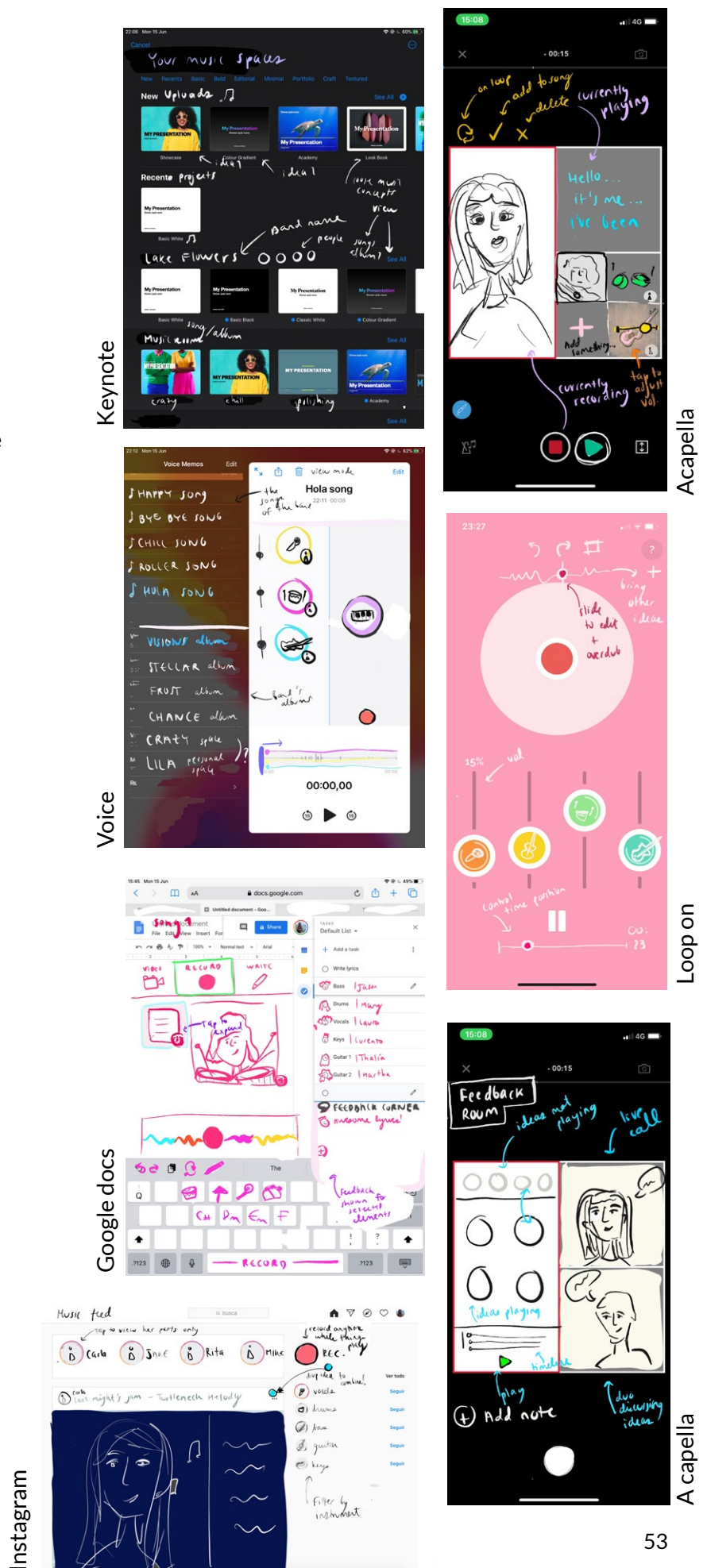
Figure 32. Redesigned interfaces for inspirational sketching exercise.

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5.1.4

Initial concepts

The activities previously described converged to the following 5 concepts:

1   **Dancefloor concept**

This concept consists of different 'dance stations' for ideas. The musician can drag and drop ideas to the dance floor to play along. A different space holds tracks in mute. There is also a 'practice room', where musicians can record their track while the other tracks are playing. They can then review it and iterate before moving them to the 'dancefloor.' This would allow a musician to build up on others' ideas with flexibility, autonomy, and structure (Figure 33).
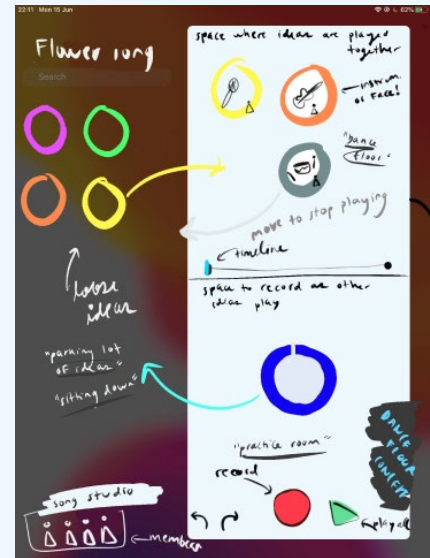

Figure 33. Dancefloor concept sketch

2   **Music whiteboard concept**

This proposes a flexible, collaborative music 'canvas' where musicians place multimedia elements to make music. They can contribute to the canvas in whatever format they wish, from writing, to audio recording, photos, or video. This might enable flexible expression and the feeling of 'being in the same room' (Figure 34).
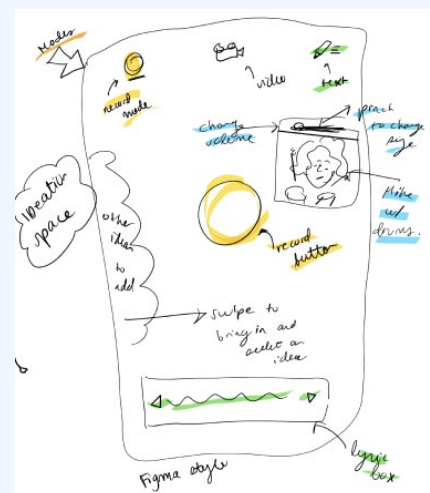

Figure 34. Music whiteboard concept sketch

3   **Music feed concept**

This is a social concept in which musicians have a 'band feed' to constantly sharing their own music ideas in different formats. Others can react or build up on them by layering additional recordings. Then they can play all recordings at the same time (Figure 35).
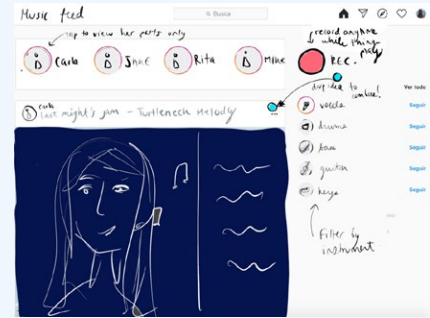

Figure 35. Music feed concept sketch

4   **Moodboard sessions concept**

This represents a synchronous, online approach to music making. It would enable in-app video sessions with certain band members to add ideas or discuss (Figure 36).
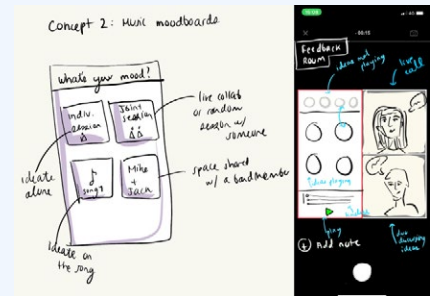

Figure 36. Moodboard sessions concept sketch.

5   **Music spaces concept**

This concept involves music spaces to catalogue recordings, comparable to folders. Musicians can create personalised spaces for instance for random riffs or finished songs. These are collaborative and can provide visibility to other bandmates and encourage further contribution (Figure 37).

Figure 37. Music spaces concept sketch

5.2 Concept evaluation and selection

The five concepts described address different core experiences, and some are complementary to each other. The concept qualities are of interest for the evaluation and selection, and not only the concepts themselves.

5.2.1

Concept walktrhoughs

The five concepts were shown to five musicians from the target group as informal walkthroughs of the sketches through video calls (Figure 38). Musicians were asked to express their impressions about these concepts, which helped understand how they envisioned the purpose and value of each, as well as the most relevant features in relation to the design goal.

5.2.2

Harris Profile

METHOD

As a complementary activity to select a final concept, the Harris profile selection method was applied. Based on the design requirements and desired interaction qualities, a series of criteria were established. These were used to evaluate the concepts through a graphic representation of their strengths and weaknesses, by rating them on a grid. The grid was created so that the most relevant criteria were listed first. (Figure 39).

RESULTS

The 'Dance Floor' and 'Whiteboard' concepts scored best in this evaluation (Appendix 12). These final concept directions were prototyped through low fidelity wireframes, with the goal of showing them other musicians.

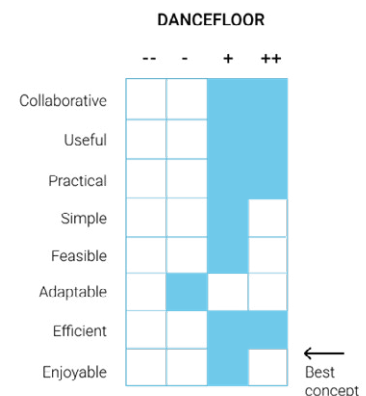Figure 38. Concept walkthrough with a participant.

Figure 39. Sample of Harris profile grid with concept evaluation criteria.

5.2.3

Two final concepts

CONCEPT A: DANCEFLOOR

This concept direction, shown in Figure 40, proposes a collaborative, shared space for simple audio layering to enable bandmates to co-create song concepts before passing to a pre-production stage on more complex interfaces.

Key features

Audio recording, simple audio editing, audio layering, project sharing, audio upload

CONCEPT A

This is a collaborative music making app in which you can layer your music ideas on your bandmates' recordings. For example, you can record yourself playing the guitar, and then Jake can record his guitar on top.
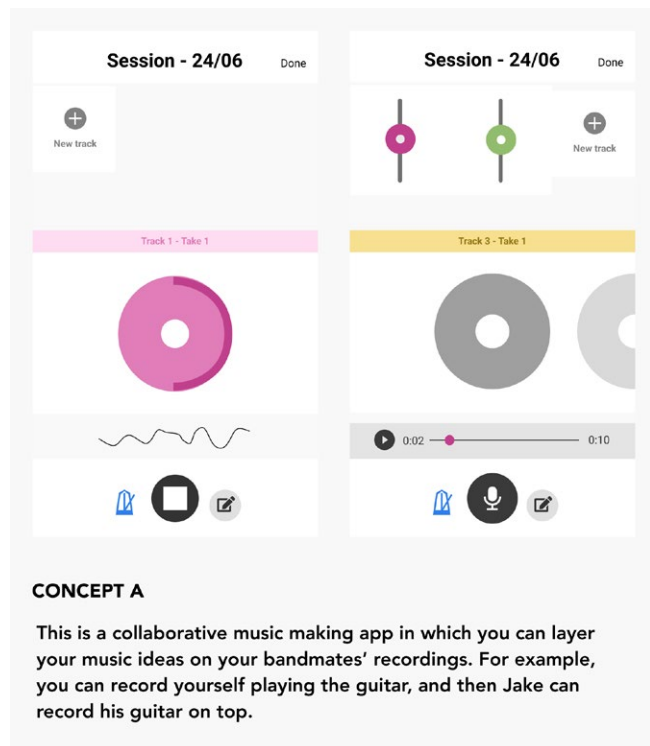
Figure 40. Dancefloor concept A key screens and description.

CONCEPT B: WHITEBOARD

This concept direction, shown in Figure 41, focuses on a collaborative, shared space to record music ideas in various formats (video, audio, or text).

Key features

Audio recording, video recording, simple audio editing, idea layering, project sharing, audio uploads, adding/viewing lyrics or chords
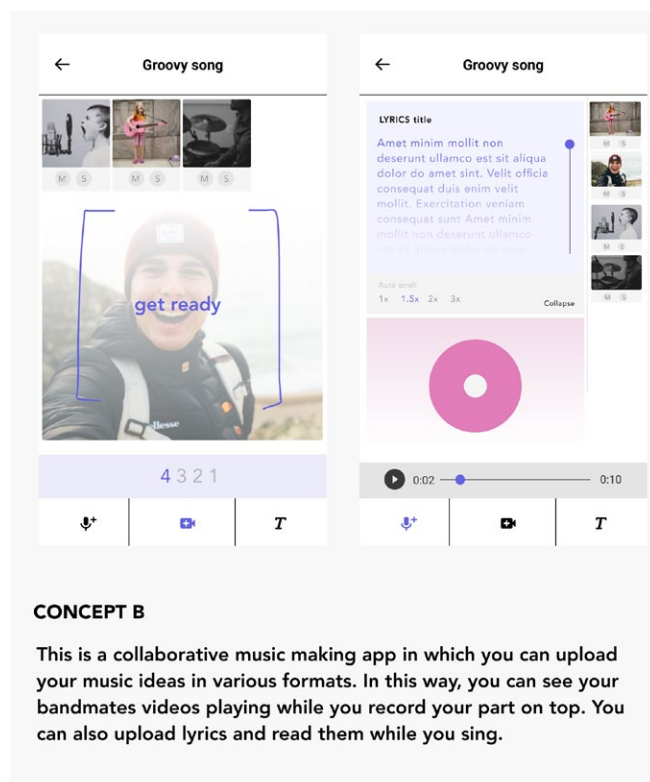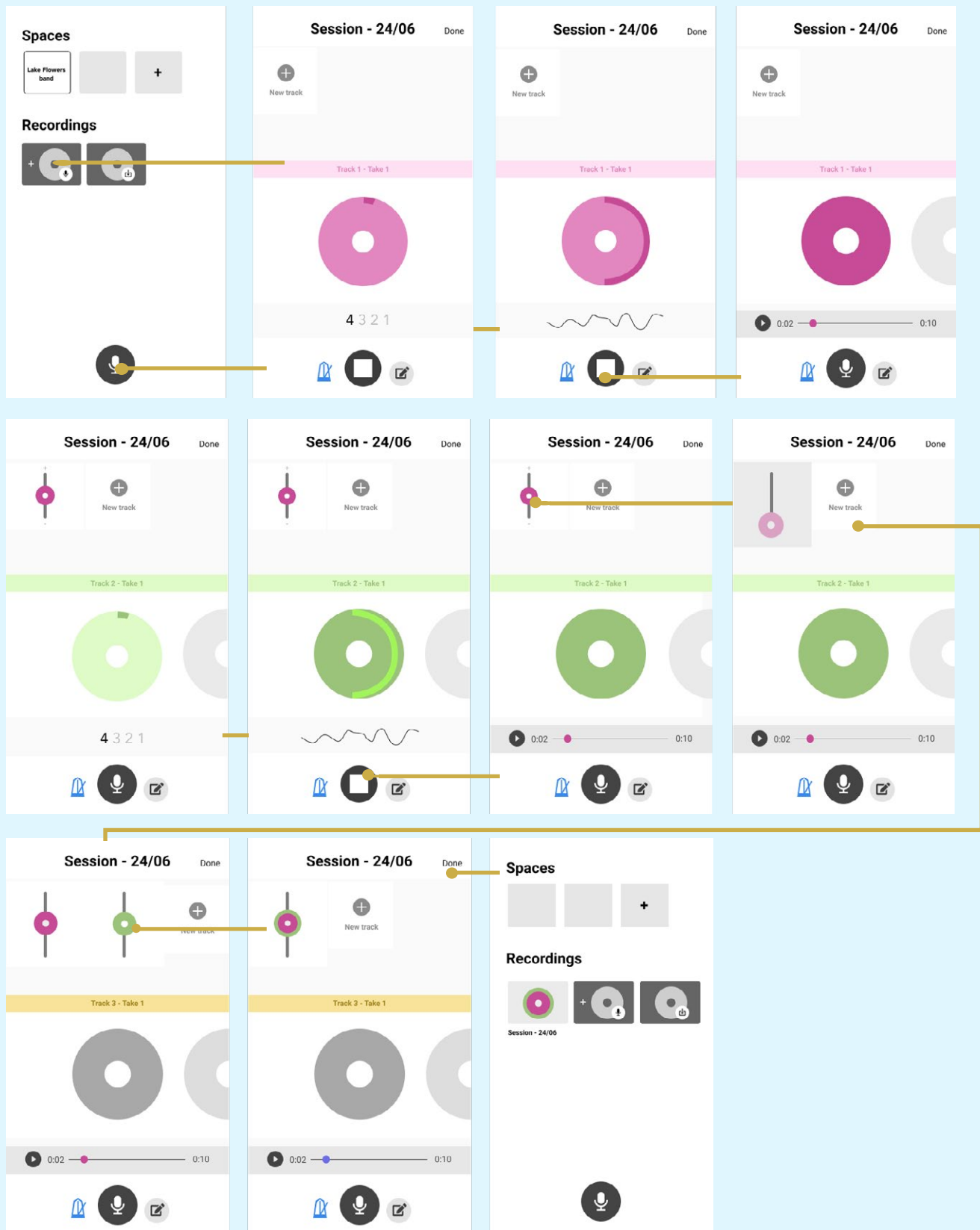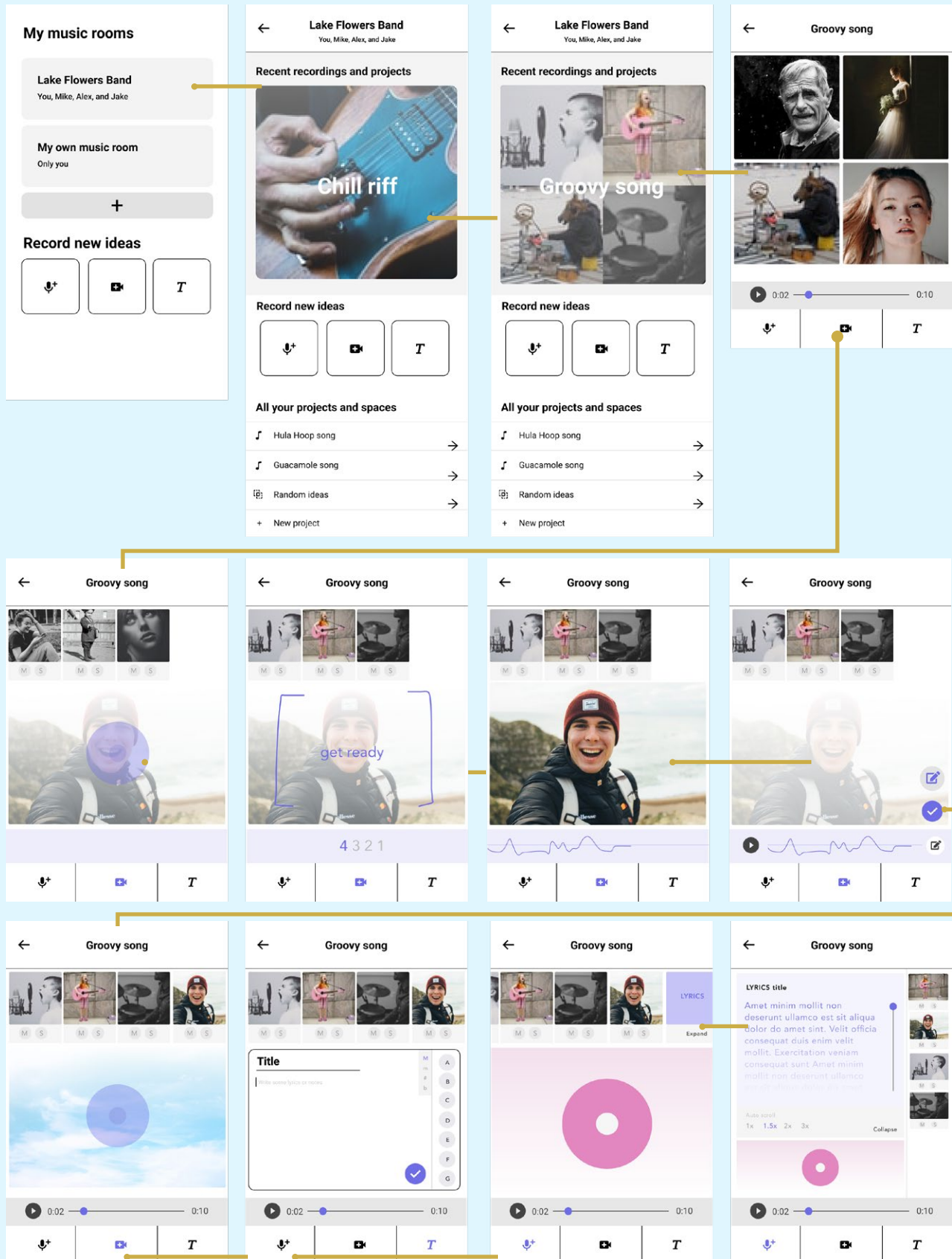

CONCEPT B

This is a collaborative music making app in which you can upload your music ideas in various formats. In this way, you can see your bandmates videos playing while you record your part on top. You can also upload lyrics and read them while you sing.

Figure 41. Whiteboard concept B key screens and description.

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Dancefloor Concept A - wireframes

Whiteboard Concept B - wireframes

Concept validation

The two final concepts were tested as walkthroughs with three musicians from the target group (Figure 42), to later converge to a final concept direction to develop. The goal of this evaluation was to compare and understand the perceived value of different formats for musical expression (audio, video or text) within the music making process of these bands.

To gather further insights about the acceptance of these concepts, key wireframes were shown to eight musicians in remote bands through a Google form. It included basic questions to gather qualitative data about their perception of these concepts through likert scales of product qualities and short answer questions (Appendix 12). To get a better understanding of their reasoning and motivations, a short interview was carried out through Whatsapp chat.
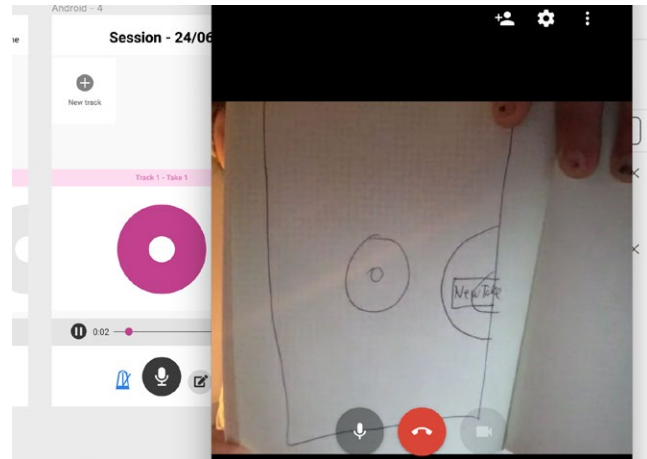

Figure 42. Concept walkthrough with participant.

Key findings

- Audio-only experiences might be more practical and simple, since they speak the language of musicians. When building up ideas, they wish to focus on their own instrument while synchronising to their bandmates' music through sound.

- Video experiences might be more enjoyable and fun, which could increase bandmate motivation. However, they might compromise the musicians' focus required for the creative process, the learning time, and the technical performance of the product.This media format could be valuable for secondary use cases, such as social interactions and feedback.

- Adaptability in musical expression is valuable for musicians. Text inputs could add functional value by enabling them to add and read lyrics / chords while recording.

5.3 Discussion

As a result from the tests and interviews, the audio-only concep was perceived as more useful, practical and simple. Even though the whiteboard concept was perceived as more fun, social, and original, these are not the primary qualities aimed for this project. Even though these qualities were attributed to the possibility to record video, this functionality was associated with lower practicality, a higher learning curve, and a distraction for the creative process.

From interviews, it was learned that the potential value of video recording was in feeling connected to others, for instance in a jam session, or for practical matters of demonstrating technicalities when playing. It was not described as helpful for building up ideas. In fact, 3 out of 9 participants emphasized that they felt connected to their bandmates through listening to their music, which they cannot see but gives them a valuable, sensorial experience. They mentioned that they had to focus on their own performance to add to others. Listening to others' music required part of their attention, but looking at them could be distracting or unnecessary to record.

This is a valuable insight and a decisive factor to choose to 'keep it simple' and not integrate video at first. Nonetheless, possibilities of conveying the feeling of relatedness will be explored, since the video concept was perceived as more enjoyable in this sense.

Both of these concepts aimed to enable musicians to build up ideas. They share the same goal, yet through different means and experiences. Even though the dancefloor concept was preferred by 70% of participants, the most relevant features from each concept were determined through open ended questions and further interviews. These qualities and considerations will be integrated to a final concept design, which will be described in the next chapter.

CHAPTER 6
Final design

- Introduction

- Introducing Syntonize

- Core experiences

- Applying design principles

- The music making journey with Syntonize

- Final concept evaluation

- Limitations

6.1 Introduction

The final design solution presented in this chapter originates from the research findings of this study. Syntonize is the result of an iterative process of prototyping and testing several concepts with musicians. It integrates the learnings acquired during the development phase described in the previous chapter, and has evolved into a simple, collaborative music making app which meets the needs and values of musicians in a remote rock band in early stages of songwriting.

Process overview

Figure 43 shows an overview of the final concept design. The full concept evolution is further described in the Appendix 13.

1   User flows and app structure
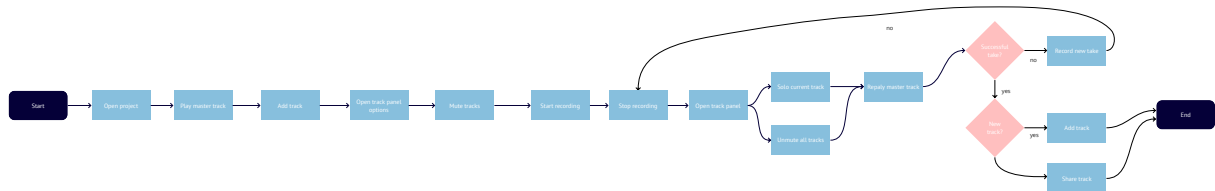
2   Structural wireframes
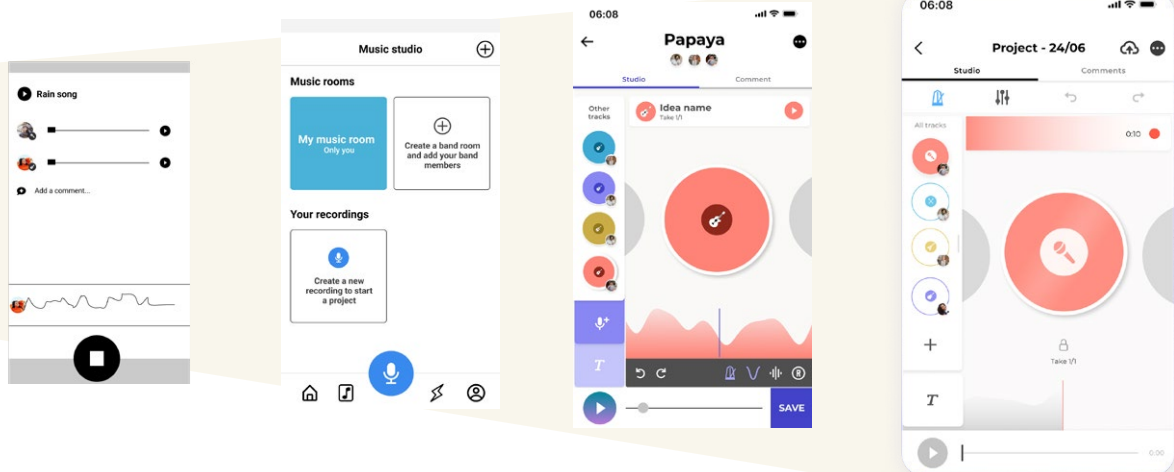

3 Visual design evolution

Figure 43. Example of the evolution from user flows to digital design development

6.2 Introducing Syntonize

Syntonize is a simple music making app in which remote bands can create teams to easily record, combine, and manage their music. Figure 44 shows key experiences of this final concept. Designed to facilitate remote collaboration in early stages of music making, Syntonize enables bandmates to constantly share their ideas and pick up on each others' work. It aims for a smooth idea buildup, transforming this process into a more engaging one.
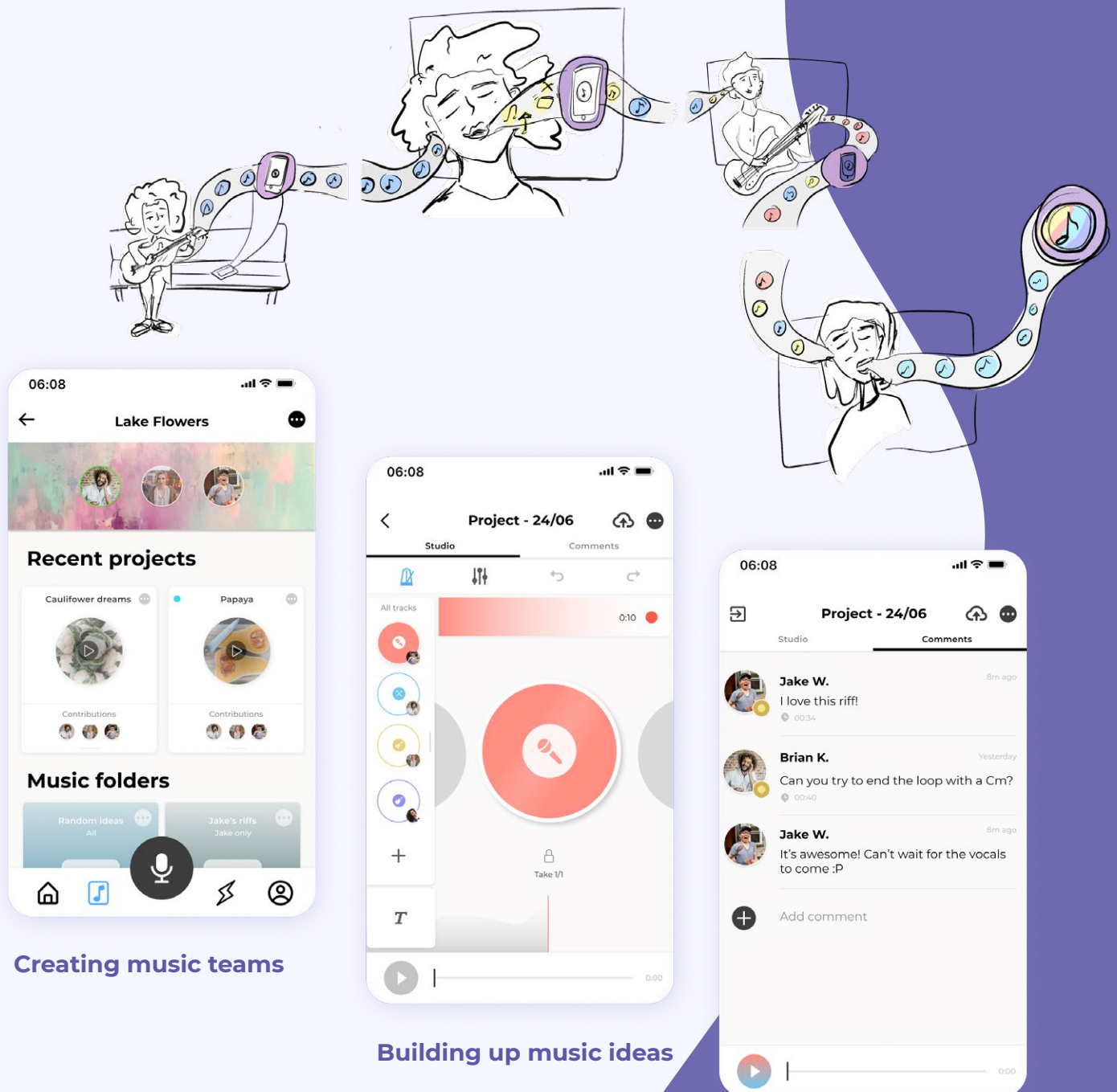

Creating music teams

Building up music ideas

Engaging with bandmates

Figure 44. Syntonize key experiences.

Making music with Syntonize - A storyboard
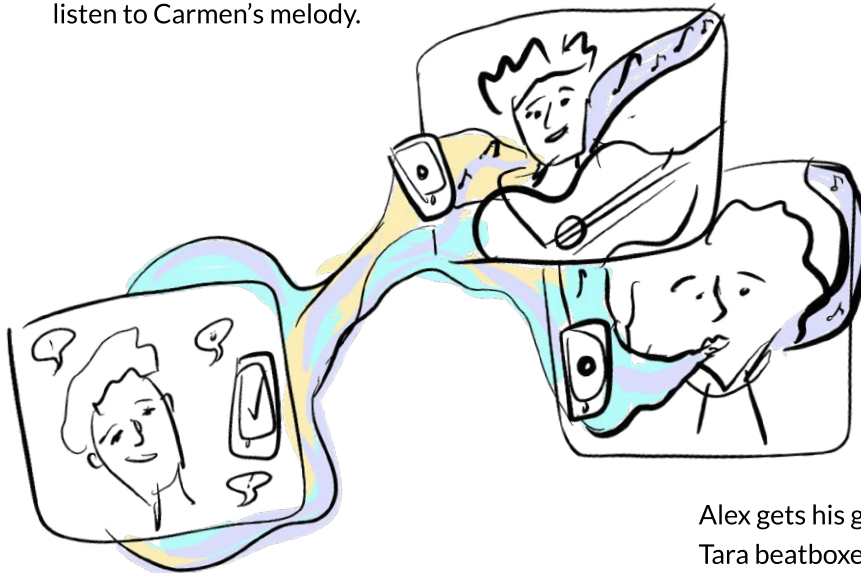
Carmen is on her way to the park and thinks of a melody.

She takes out her phone and records it on Syntonize.

Danny, Alex, and Tara get notified by Syntonize and listen to Carmen's melody.

Figure 45. Syntonize storyboard

Alex gets his guitar and plays along. Tara beatboxes to simulate the drums.

Danny drops a comment to tell Carmen to create some harmonies too.

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6.3 Syntonize's core experiences

6.3.1

Idea buildup

The main core experience consists of a basic, shared music studio, where ideas from different band members can be recorded and easily combined into a song concept (Figure 6). Figure 47 shows a basic flow of how this takes place, as well as an overview of the key functionalities that make up this experience.
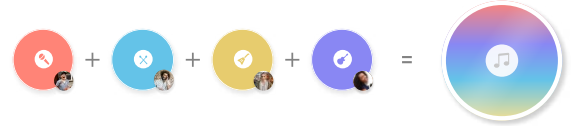
Figure 46. Tracks from different bandmates come together to create a song.
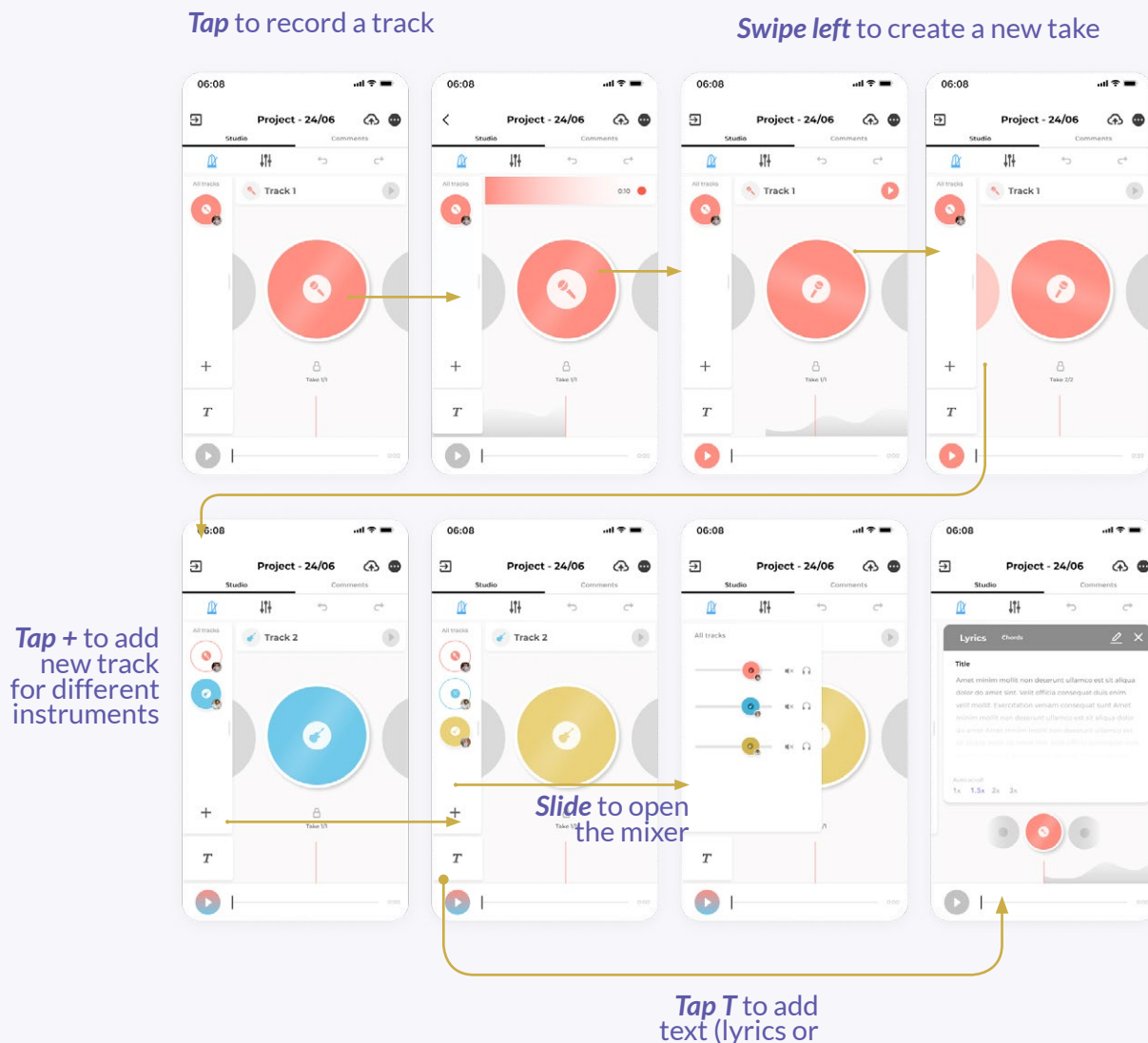
Figure 47. Buildup experience general flow.

67

Teams experience

Bandmates can create shared workspaces to log and organize their ideas and projects. This experience eases the flow of ideas, facilitates collaboration, and increases creative contribution from members. They can create projects or folders within a team to have better control over their workflow. Figures 48-50 show relevant elements of this experience.

Figure 48. Photos of bandmates might make the experience feel personal and engaging.
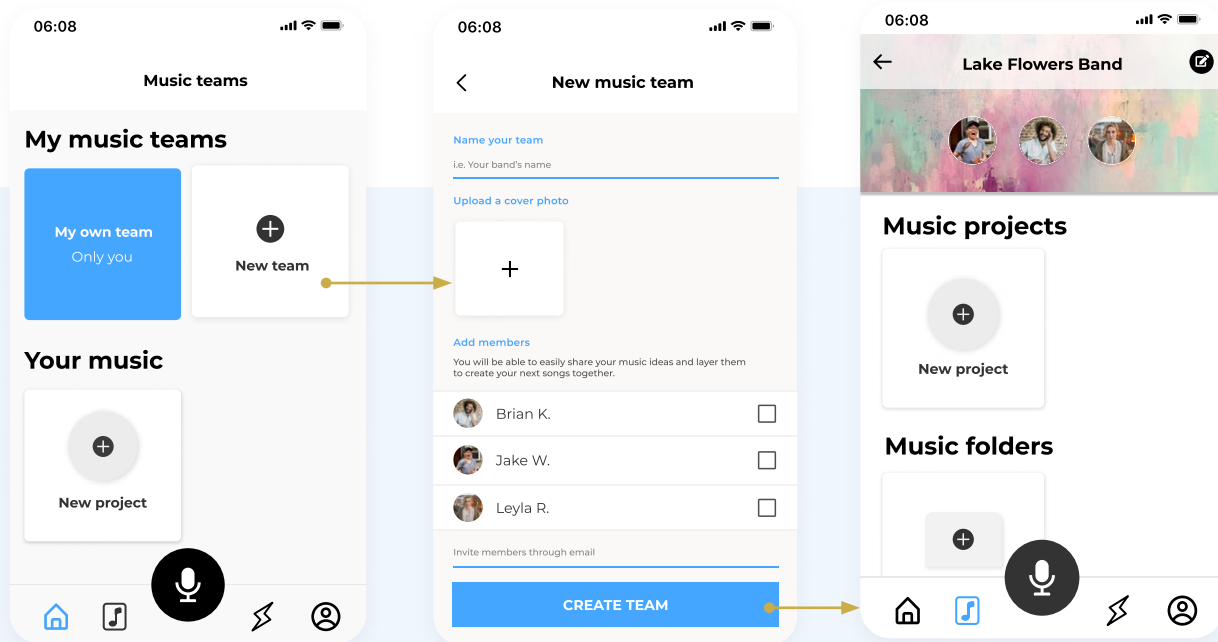
Figure 49. Basic flow to introduce the teams experience.
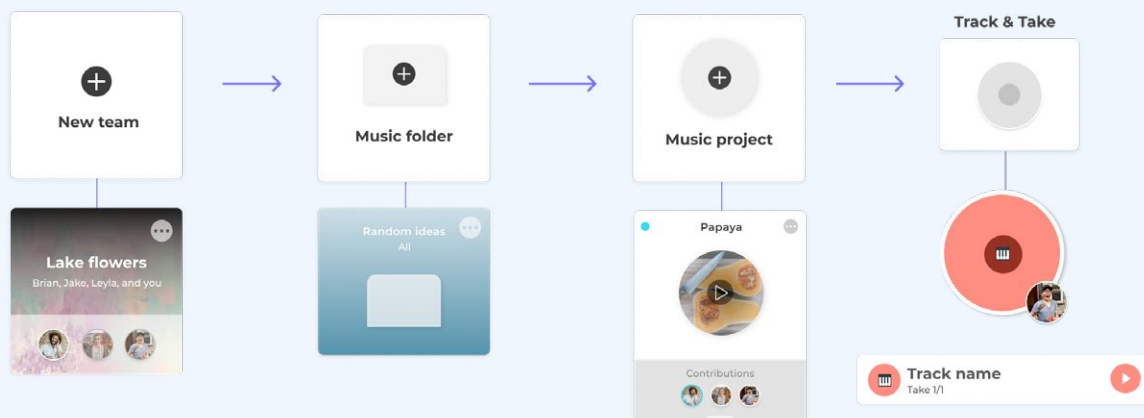
Figure 50. Structural elements for the music making workflow.

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Engagement experience

Bandmates can interact frequently about their work in a communication space inside the recording studio (Figure 51). They receive real-time updates as projects are updated, so they can listen to others' ideas and contribute (Figure 52). Finally, they can access an activity overview to can understand what others have been working on (Figure 53). The intended effect is to offer more visibility and transparency on others' work, and in this way increase their motivation to make music remotely.

Figure 51. Communication space within the recording studio.

Figure 52. Notifications for real-time updates.
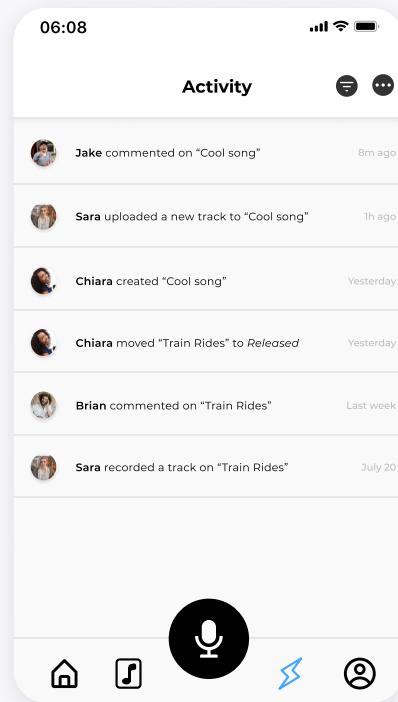
Figure 53. Activity overview

6.3 Applying design principles

The following is an overview of how the design principles from research are reflected in Syntonize.

6.3.1

Experience design principles

Jamming alone, together

Musicians can individually and asynchronously record music ideas. These are be automatically shared with their bandmates, who are then encouraged to contribute to the project.
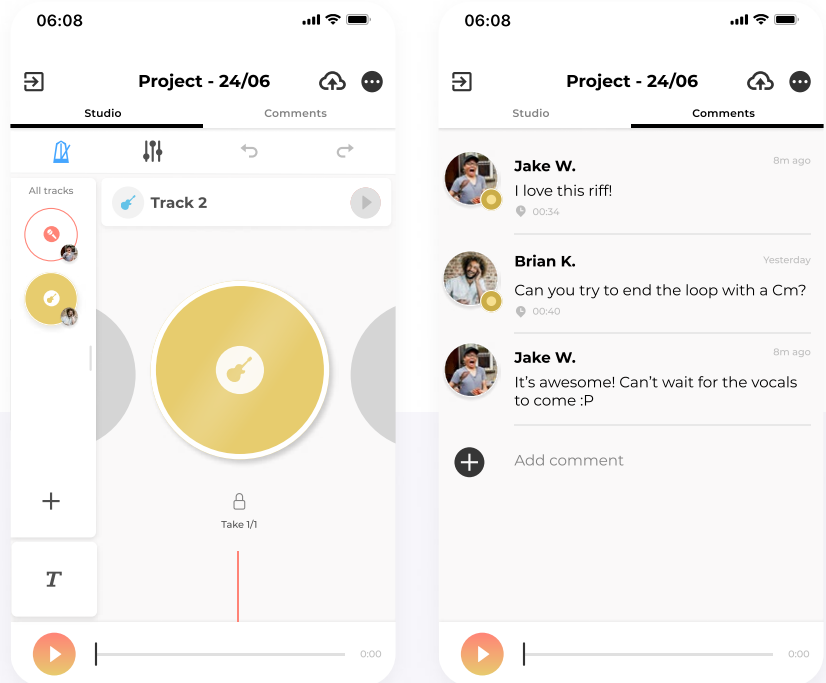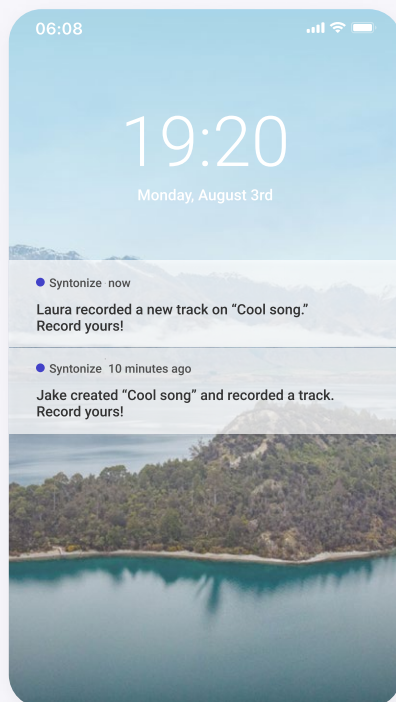
Structure and flexibility

These play a role in multiple dynamics within the app. For instance, musicians can quickly record music ideas in tap of a button without any extra steps. Later they can stack them in folders by dragging and dropping.

Transparency and shared ownership

The visibility of others' contribution and activity fosters these values. They are also reflected through the communication features, which enable bandmates to talk about their work.

6.3.2

Usability principles

Practicality

Musicians can easily create song prototypes anywhere, since Syntonize is a mobile application that they can carry in their pocket.

Simplicity

Syntonize dismisses any secondary functionalities to make music, such as sound libraries or . It targets early stage activities in which musicians can easily collaborate on the same project.

Adaptability

Syntonize adapts to changing contexts of use through shared projects, communication functionalities, and music teams. This gives musicians a flexible range of generic features within a specific domain.

6.4 The music making journey with Syntonize

Figure 54 below shows the envisioned journey of making music with Syntonize, based on the one created from research. This shows the early stage activities of music making, before pre-production and production. Ideally, Digital Audio Workstations would not be necessary at this point, nor communication or file sharing tools. These would come in later in the process (not represented in this journey), once the band would have conceptualized the song.

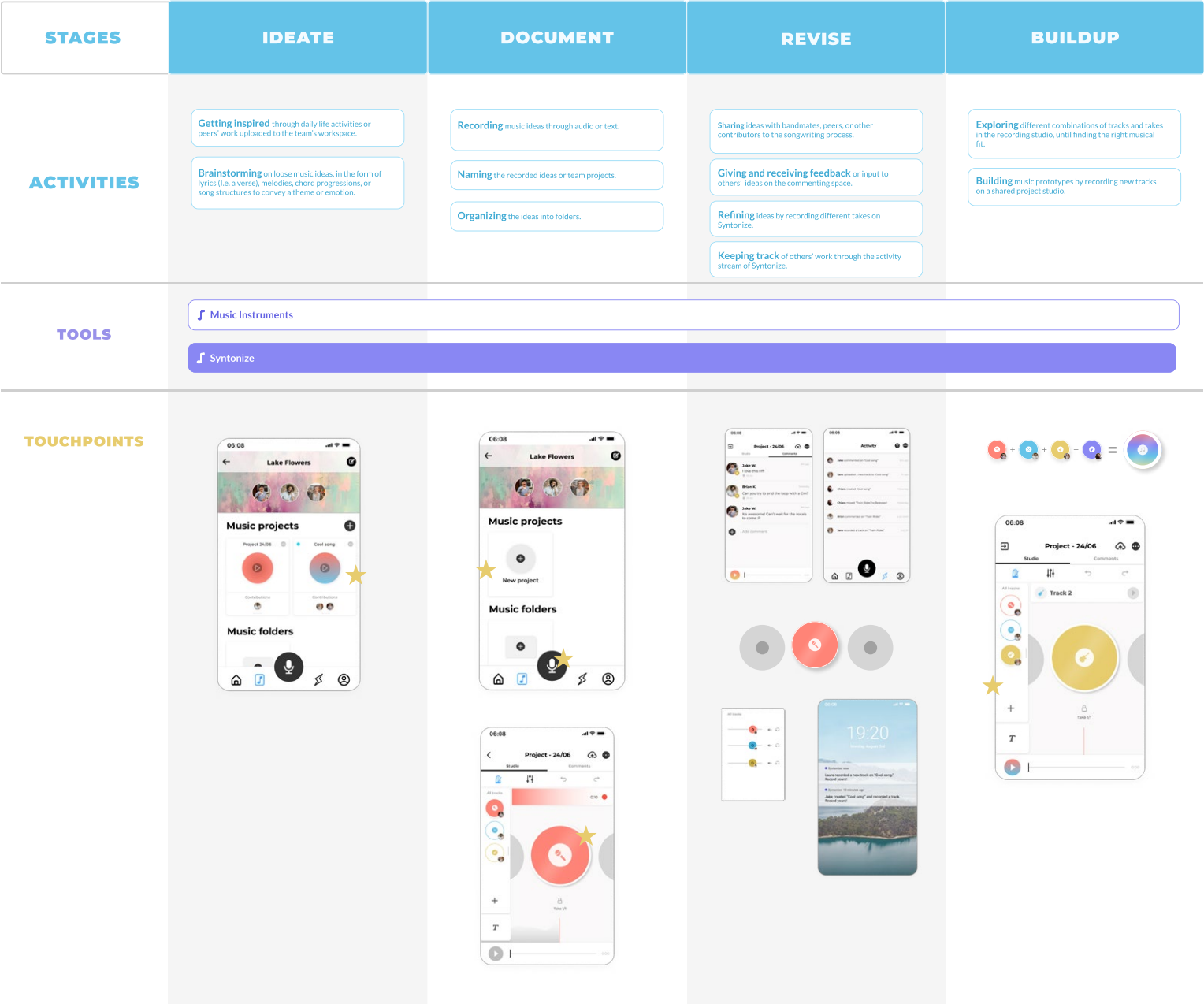| STAGES	IDEATE	DOCUMENT	REVISE	BUILDUP
ACTIVITIES	**Getting inspired** through daily life activities or peers' work uploaded to the team's workspace. **Brainstorming** on loose music ideas, in the form of lyrics (i.e. a verse), melodies, chord progressions, or song structures to convey a theme or emotion.	**Recording** music ideas through audio or text. **Naming** the recorded ideas or team projects. **Organizing** the ideas into folders.	**Sharing** ideas with bandmates, peers, or other contributors to the songwriting process. **Giving and receiving feedback** or input to others' ideas on the commenting space. **Refining** ideas by recording different takes on Syntonize. **Keeping track** of others' work through the activity stream of Syntonize.	**Exploring** different combinations of tracks and takes in the recording studio, until finding the right musical fit. **Building** music prototypes by recording new tracks on a shared project studio.
TOOLS	♪ Music Instruments			
	♪ Syntonize			

Figure 54. Envisioned music making journey of a band using Syntonize.

6.4 Final concept evaluation

Evaluation plan

The final testing was framed to evaluate the design concept around the core experience of idea buildup.

Research goals

1. Understand the global comprehension of the product

2. Understand users' perception and needs related to the idea build up experience.

3. Understand the users' perception in terms of practicality and usefulness, as well as other perceived qualities.

3. Understand the desirability of Syntonize given the users' currently used tools and their music making practices.

Impact

1. Uncover any major areas of improvement related to the core experiences (build up, bandmate engagement, and music spaces)

2. Understand how the product would address user needs for creative flow along the music making journey (flexibility, structure, autonomy), and uncover key usability issues.

3. Understand how this product could support bands' remote music making practices

4. Guide the product roadmap and business plan for future development

Method

The evaluation consisted of 1:1 sessions with a combination of a general walkthrough of

vthe concept and usability testing of the core experience. These were conducted remotely through Lookback.io, with four participants from the target group, using an interactive prototype made on ProtoPie. This prototyping tool allowed for audio interactions and a more advanced development of the UI interactions. A think aloud protocol was performed along with a semi-structured interview (Appendix 13). The tests were set up as shown in Figure 55. The sessions recorded the video, voice, and prototype screen of each participant. Notes were taken during each interview.

Scan to use prototype
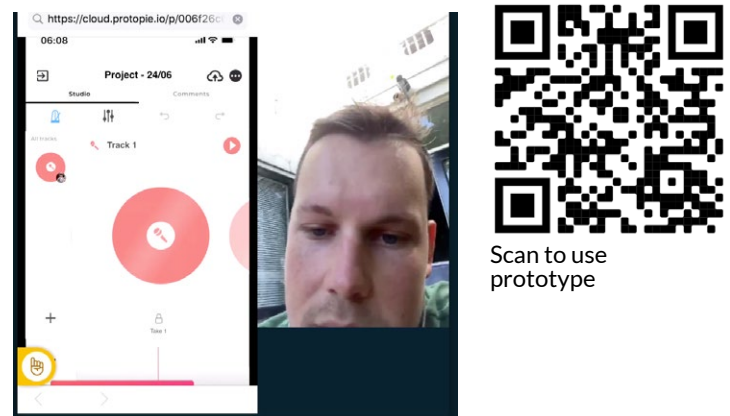
Figure 55. Photo of participant interacting with the prototype through Lookback.io

Analysis

To evaluate the comprehension of the product, a task performance sheet was created and filled in by the researcher for every participant. This was useful to identify and prioritize tactical fixes to be implemented. To evaluate Syntonize in terms of user needs, qualities, and desirability, a focused thematic analysis was performed (Appendix 13).

6.4.2

Key insights from final evaluation

Syntonize offers a simple, quick and efficient way to make music remotely by enabling musicians to easily record, share ideas, and build up on them through the right balance between order and flexibility.

Syntonize creates a distinctive communication experience for music making, allowing for precise feedback, project management, and frequent interaction. This could improve remote collaboration and potentially replace the need for file sharing and communication tools in early stages of ideation.

Making music with Syntonize is personal, efficient and experimental. It recreates the band atmosphere, making bandmates feel encouraged to make music. This is conveyed through elements such as bandmate photos, shared projects, in-app communication, and the member activity section.

"

You really found a niche. Garageband is a hassle. And this is what voice memos needs to be. I would definitely use this with my band. I would really use it."

- ALEX, BAND LEADER

"

Being able to communicate with your band members through this software is a distinctive characteristic of this app. You don't have such things on the DAWs."

- ARIANA, BAND LEADER

"

The sharing part and collaborating, it's super useful - you don't have to send memos and record on top of each other. It would allow us to way quicker work on things"

- JOHN, BAND LEADER

"

"We would be making way more music"

- MARTA, INSTRUMENTAL ARRANGER

Usability results - Task completion overview

Completed on 1st try

Creating a new project	Play someone's track	Add a track
New project		+

Completed after 2-3 tries

Replay a track   Pause recording   Play master track

Completed and understood after explanation

Create a take   Mixer   Add collaborator   Import track

Manage visibility
Project details
Move a track or a take
Share current track
Download project

Completed without understanding despite explanation

Lock track

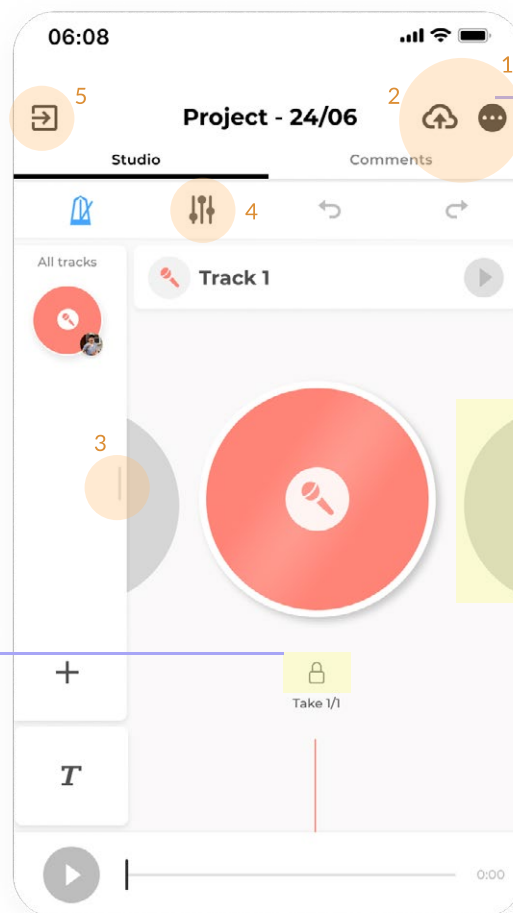*Figure 56. Task completion overview for final Syntonize evaluation.*

*View completion task tables on Appendix 13.

Product design recommendations

> ## Comprehension level - Usability and user experience

Minor usability fixes

1. How to a collaborator
2. How to import an idea
3. How to open the mixer
4. How to enable the effects
5. Exiting or saving a project

Privacy

Having control over the privacy of the work while it is being done. Having more transparency about who is seeing my work, when my work is saved, who can edit my work or not.

Lock function

The lock icon has connotations of privacy and preventing others from editing the work. It was not understood as a selection tool to establish the final take. This was a usability issue and not conceptual.

Takes

The interaction to create new takes on the same track was not understood by any of the participants. All of them emphasized the relevance of this functionality, but suggested changing the way of displaying them. The issue here is related to usability and not conceptual.

Figure 57. Recommendations for product design based on usability and user experience.

## Perception and needs - Rethinking experiences
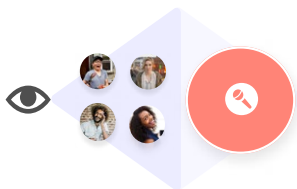
Sharing flow

It would be valuable to integrate project management features, so that bandmates could have a better notion and control over what is going on and what is expected from them. It is suggested to understand what (and why) is the ratio of recorded vs shared ideas, and what is the ratio of shared ideas that are built upon could help establish a flow for the app.

When do people want to share their ideas?

How many ideas will be in the team folder, how might we provide order to this? Will it get too overwhelming?
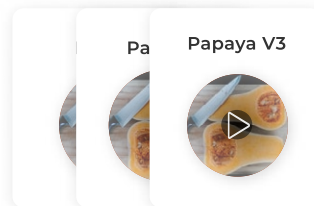
Project versions

Saving or exporting different versions of a song could be valuable for some bands. It is worth researching why versions of the same work exist, what is the use, purpose, and value of this.

How might this be integrated in an easy and simple way?

What are the implications of producing numerous variations of the same work?

How might external references (i.e. Github community) inspire a solution for this?
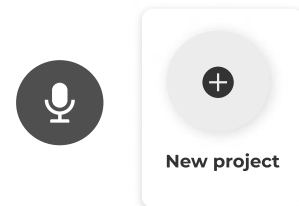
Spontaneous recordings

One of the key needs of musicians is to get an idea down. It would be valuable to understand the expectations of the user flow when documenting an individual idea quickly versus creating a project.

What is the perception of musicians of different calls to action to record or create projects?

How does this affect the way others will build up on their ideas?

Recommmendations for further product development

- To explore voice interactions and gestures, since musicians are carrying an instrument while recording

- Develop compatibility to plug in instruments (such as electric guitar or bass)

- Develop the social engagement to enhance feeling of community, without reducing simplicity or compromising the buildup experience

- Develop further the communication experience: Evaluate the possibility of integrating video and audio as a form of feedback

- Develop a desktop app, and explore user flows in compatibility with other music making tools

6.5 Limitations

The final solution, Syntonize, responds to the design goal and aligns with the needs and values of musicians from the research. Nonetheless, it presents some limitations which can be addressed in the next steps of this project.

Limited music edition

Musicians can very easily record and collaborate on their music. However, a limitation lies at the cost of its simplistic nature.

Since it focuses on minimal requirements for basic music edition, it is not possible for bands to take their simple song mockups further.

For example, there are no sound libraries, advanced audio effects, virtual instruments, nor MIDI compatibility. Musicians would have to move on to DAWs for production purposes. This limitation might be a dealbraker for electronic music makers (hence the target group of rock bands, who do not require these features). In the case of rock bands, their music would be in a very rough state. Syntonize is intended to be used for early stage activities, as this research showed that musicians choose to use simple recording tools. Nonetheless, this concept integrates a feature to import audio and is then compatible with other tools; they can record their tracks elsewhere and import them to the shared studio. It does not aim to replace DAWs, but make musicians' early workflows easier.

Recommendation It would be interesting to research further what is considered the minimum viable music making requirements, and how these change across different bands, instruments, and genres.

Limited communication possibilities

The communication experience of Syntonize was appreciated by all participants during the final test. However, several participants pointed out the opportunity to develop further the interactions for offering accurate feedback while the work is being done. Syntonize's value proposition lies in the easy buildup of ideas. According to participants, this experience opens opportunities for increased communication.

Recommendation The communication experience was not the main focus of development for the final phase, and therefore should be further developed as a prioritary next step.

Integration for electric guitar and bass

It was found through the final evaluation that for electric guitars and bass, it would be valuable to have a connector converter for the phone (such as an iRig). This would provide better audio quality. Currently the only way to record bass or electric guitar on Syntonize is by plugging them to an external amplifier and recording the sound. Another way is to import the audio recorded on an external software.

Recommendation To perform more research on the need for compatibility with such products. It is worth understanding if this is a priority for a minimum viable product or not.

Conclusions

- Discussion: Designing tools for creativity

- Refection on the process

- Final conclusions

7.1 Conclusion on Syntonize

This research explored the music making practices of musicians in a band, uncovering their needs to carry out successful collaborations. It focused on three key areas: the activities of music making, the supporting tools, and the dynamics of collaboration. It provided an answer to the following research questions:

What is the music making process of music bands?

Through an iterative, personal, and chaotic process, musicians perform a series of activities to create music. This study uncovers this journey in four stages, though not chronological: ideate, document, revise, and buildup. This process involves generating ideas, recording selected bits of music, sharing them to get feedback, and combining them with others. It was discovered that musicians' needs change across activities. Through an interplay between order and chaos, autonomy and guidance, individualism and collectivism, and emotion and theory, musicians reach their creative flow.

How and why are different tools involved in the music making activities of bands?

A broad range of tools are involved in music making: from voice recording apps to note taking, communication, and file sharing tools. These are used to document music ideas, share them with others, get feedback, manage projects, and bring ideas together. It was found that musicians select their tools based on their accessibility, practicality, and adaptability to a context of use. A main finding was that current tools are not suitable for idea buildups during early stages of ideation, and this makes their process less efficient.

How do band members collaborate to make music?

Even though musicians come together to contribute to a shared musical piece, it is their personal relationships which fuel their collaboration. On one hand, bandmates interact frequently to share their ideas, give and receive feedback, and build up on their music. This study also showed the importance of communication, values, and work ethic to carry out successful collaborations. Personal connections become a top priority when choosing bandmates. This research presented three types of collaboration cultures (co-led, duo-led, and single-led), and the tensions that result in creative conflict. Finally, it was found that the pain points of collaboration are more intense in remote rock bands, which is why this was chosen as a target group.

This work unraveled the complexity of the workflows of musicians, which lie amidst their individual musical expression, the constant exchange of their ideas, and the evolution of their personal relationships, with the goal of contributing to a shared musical piece. Today's music making tools, while enabling musicians to perform creative tasks, might delay or even inhibit their collaboration because communication is not supported. This prompts musicians to use alternative file sharing and communication tools, resulting in a blocked creative flow and the band's progress reduced.

The chaotic and personal process of musicians already makes it challenging to communicate appropriately, and this becomes more relevant with the increasing trend of online collaborations. Musicians will not only collaborate remotely, but they might also collaborate with people they have never met. It is then increasingly challenging to establish communication streams that allow for personal relationships and bonds to emerge in this context.

In a bid to address these issues, a solution was designed: Syntonize is a simple music making mobile app concept that enables musicians in a band to easily collaborate on early stages of their creative process. They can create music teams with their bandmates, as well as shared music projects where they can easily record and combine their tracks. They can also communicate about their music, whether it is for precise feedback on their work, or general project management. Syntonize nurtures organic innovation in bands by making songwriting feel easy and natural in an online setting.

7.2 Project contribution and recommendations

7.2.1

On designing tools for creativity

The following research question inspired this work: How might technology support creative practices?

Creative tools should embrace practices in a holistic way, with human interactions at its core. They should enable communication in order to improve collaborative work.

To address the initial goal of this project, a proof-of-concept for a music making mobile app was designed by involving musicians along the process. Through the buildup, engagement, and teams experiences of Syntonize, musicians envisioned an improved remote collaboration. Their major pain points would potentially be alleviated through an

efficient, useful, simple, and engaging workflow. On the final assessment, musicians interacted with a prototype of the concept. They described Syntonize as a simple tool that would enable them to quickly record and easily share their ideas with their bandmates, as well as build up on them. They emphasized the relevance of communication. Even though this feature was not tested in depth, it raised the most interest and positive reactions from participants. They were enthusiastic about the band atmosphere being recreated, which would encourage and empower them to make more music.

To improve collaboration, it is important to enable people to create individually, easily build on each others' work, provide each other feedback, and manage their projects. These factors are consequently tied to member motivation, efficiency and thus the quality of the work produced.

In creative collaborations, communication is as important as performing individual tasks, since the work of contributors must come together. In the case of music, communication involves auditive, textual, and visual ways of expression, often tied to particular elements of the music. This means that generic communication platforms might not be enough.

7.2.2

Recommendations for further research

- To investigate further the needs for communication of bandmates in online settings, particularly for the purpose of feedback and project management. It would be interesting to compare this to bands who make music in person.

- To investigate how collaboration unfolds in other creative fields, such as design, as, for instance,

co-creation might call for specific needs of communication.

- To perform research on future trends of collaboration in music, whether musicians will carry out one time collaborations or if bands will persist. How will the concept of a band change through online contact? This would help understand how personal relationships would evolve, and thus identify needs for different collaboration setups.

- To expand the scope of this study and involve music bands of different genres, such as pop or electronic music, as they might be more familiar with digital tools for music making.

7.3 Reflections and limitations

7.3.1

100% remote

This project was carried out 100% remote due to the COVID-19 pandemic and social distancing restrictions.

This allowed to broaden the scope of the research and involve musicians from different parts of the world. This also enabled me to explore remote research methods that would help me get closer to musicians' practices. Perhaps without social distancing I would not have been able to acquire the same learnings. In fact, being able to contact them often through social platforms such as Whatsapp, they were not only highly available, but also able to show me their music making tools, and send more photos or audios of their music. We carried out a purely digital relationship which might have had a positive snowball effect.

A possible limitation of this research in this global circumstance is that some participants were not

writing music during this time, as their events were cancelled and they could not meet their band. This had several implications which can be seen as limitations as well as opportunities. On one hand, some musicians were writing less and I was not able to capture their practices real time. In fact, I had initially planned a diary study and changed the method to suit the circumstance. However, not being able to meet in person gave real-time and rich insights about their experience and pain points when using music making tools to collaborate online. This helped frame the design goal and create a solution that would be suitable for their practices within a new context to come.

7.3.2

On research methods, from music to design

What can be learned from musicians in the field of design research? The attitudes and behaviors of musicians towards music making suggest that exploratory research methods might be suitable to create an empathic research through researcher-participant relationships. For example, musicians embrace improvisation, as a researcher should embrace the improvisation in their research with musicians. One of musicians' key values is the freedom for creativity. This principle was followed in this research. By looking closely into the musician's world, it was perceived how they would want to open that world to others. Musicians are passionate about their work and appreciate genuine interest in their creativity. View appendix 13 for a reflection on user personas.

7.2.3
Limitations

Understanding rock bands

A potential limitation of this study is that bands work very different internally from others (Malm, 2020). This means that the findings of this study might be constrained to the bands involved, and the solution fitting a reduced audience. Further research is recommended to understand the main differences across rock band setups.

In addition, all participants who were part of the initial user research were band leaders. Even though this was not planned and was part of a finding of the research, this means that the data collected might have a bias about the process.

The intention to create an intimate space with participants implied that not all conversations were recorded, and that the communication tools were not consistent, which might have led to the loss of information. However, it allowed for constant communication with participants and thus a deep understanding of their workflow.

Participant segmentation

In parallel to the development phase, music making tools available in the market were explored. Some of these have integrated collaborative features. However, none of the participants in this study used these. Therefore the results might be biased. It would be valuable to evaluate the design solution with people who are familiar with recent collaborative music making tools. The music making journey of these people might raise different needs, activities, and pain points. It is suggested to understand how they started to use these tools and what impact they have had in their workflow.

Limited research on the target group

On the other hand, this design solution targets remote rock bands. However, the segment was defined after performing user research with a variety of collaboration cultures. The needs and values described might be generalized, and others overlooked. It is suggested to investigate further with remote rock bands, particularly those who carry out successful collaborations. They might be past the pain points of early stages of adaptation, and perhaps shed some light to innovative ways of collaborating.

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