Generating and Manipulating Sound
Tools for digital music production

Anton Löf
MFA Interaction Design
Umeå Institute of Design
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Abstract

Music making and technological development has always been connected. The digital revolution has made advanced music production, writing and distribution tools universally accessible. New intelligent tools built on machine learning are entering the market potentially changing how we create music and interact with creative content.

The aim of this thesis project has been to find alternatives to existing interaction models manifested in modern DAWs (Digital Audio Workstations). Ideas developed through rough sketches and simple prototypes—the outcome consists of three concept videos proposing changes to three moments in the workflow of songwriters and producers.

This thesis started with an idea of exploring the borderland between computer generated music and human creativity. Through desk research and interviews I learned that computational creativity exist and that there is a lot of different ways of defining creativity and art. Creating creative computers should not aim to replace humans creative abilities—it is rather about automating and creating tools that enhance our creative abilities.

To understand how songwriters and producers work the subject were investigated through semi-structured contextual interviews. The different ways of working and using tools were mapped out and potential opportunity areas were identified. This thesis have been a project that through sketching, mock-ups and simple prototypes questions how we use digital tools in music production. These concepts and sketches were continuously brought back to experts for feedback.

The outcome consists of three concepts. They are presented through three short videos. These videos are now shared with a bigger audience and will act as an conversation starter for people interested in tools for digital music production.

1. Automating parts of the songwriting process and create a collaborative workflow between a you and a computer, through a conversational user interface.

2. A pressure sensitive touch surface that let you manipulate sound. It is an adaptive system that automatically detects active controls in your DAW—it maps these active controls from your computer screen down to a touch pad.

3. The third concept changes the way you organise and look for sound files. It is a automatised process where a software helps you compare different sounds to each other. It takes away most labels and focuses on mapping sound according to its auditory profile.
Introduction

This project focuses on developing concepts and ideas for interacting with computer generated sound and explore new ways of working with sound in music production.

Music making and technological development has always been connected. The digital revolution has made advanced music production, writing and distribution tools universally accessible. New intelligent tools built on machine learning are entering the market potentially changing how we create music and interact with creative content.

The project started with the idea of creating tools that bridged the gap between advanced tools used today and new users. There seemed to be a need for tools manipulating computer generated material that would free you from technical constraints. There was two questions to answer.

1. When a computer generated music, how do you as a user or creator remain in control?
2. Is there new or better ways to create music and how can that, in the future, be influenced by artificial intelligence?

I wanted a project that through sketching, mock-ups and simple prototypes questions how we use digital tools in music production. I wanted to bring these concepts and sketches back to a few experts to get feedback on ideas and incorporate that feedback into the creative process.
Goal

To create and explore multiple concepts that offer alternatives to already existing ways of working with sound in music production. The concepts should focus on collaboration between man and machine and allow people to improvise. They should offer alternatives to already existing tools but focus on specific tasks rather than systems.

Wishes

I wish to explore the borderland between computer generated content and human creativity. In that process I hope to find ideas and concepts that somehow change the way we interact with computers and music today. I hope the outcome is ideas for interactions that can make people feel engaged in what they are creating and help them in their creative process.

Target group

The initial plan was to talk to experts but design for new music makers. After desk research and interviews the focus shifted. The projects target group was defined as people with music making experience that are active in the field—design for professional songwriters and producers.
Background

To make informed decisions and get to know more of the world of digital music, time was set aside for desk research. I will here try to give an overview of what I read about, what I learned and point out information that somehow have been influencing the process of this project.

Artificial creativity

The project started with a focus on artificial intelligence and how artificial creativity can change how we create music in the future. No timeframe was defined but the project tried to look at existing technology and trends. A better understanding of machine learning, artificial intelligence and computational creativity was achieved by reading about the subject.

One example of artificial creativity that comes up multiple times in literature was the algorithm based composer. Ryan Blitstein writes in his article Triumph of the Cyborg Composer (2010) about David Cope’s algorithm based composing program Emmy. It have caused quite a lot of debate—can computers be creative? Margaret Boden uses David Cope’s and Emmys work as an example in her anthology Creativity and Art: three roads to surprise (2011) of how we can judge art and creativity coming for machines. There is a lot of opinions and theories about what true creativity is and it is a topic I have—in many ways—been ignoring throughout this project. Something that stuck with me was however the idea that machines are not creative. They are made as a tool with a purpose of create something that we as humans interpret as beautiful. They have in that sense a purpose not in themselves but to create material that gets judge by a human. The human take the final decision and it is often in the performance of a music piece that the art happens—not when it gets written down. Creativity is about taking decisions and combining ideas in new ways.

I did spend time trying to get a better understanding of machine learning in general. To do this I got hold of Pedro Domingos, The Master Algorithm (2015). A popular science book describing the different theories about machine learning and the quest for a self learning algorithm. This gave a broad but very shallow understanding of the field. It did however help to prepare for interviewing Stefan (summary of the interview with Stefan further on in the report) and ask relevant questions during our conversation. In his book Domingos speculates about the future value of human activity and what will happen when more and more things get automated. What if a neural network took your job?

“The best way to lose your job is to automate it yourself. Then you’ll have time for all the parts of it that you didn’t before and that a computer won’t be able to do any time soon. […] If a computer has learned to do your job, don’t try to compete with it; harness it. […] Data and intuition are like horse and rider, and you don’t try to outrun a horse; you ride it” Domingos (2015).

A blog post by F. Brinkkemper—Analysing six deep learning tools for music generation—also helped to getting an overview of experimental tools and how they work. This lead me to the discovery of a London based startup called Jukedeck (n.d.). Jukedeck uses neural networks to generate basic music based on a couple of settings chosen by you as a user. You can there easily generate royalty free music for online videos. It was the first free and easy to use service I found and used during the project.

There are a couple of more examples of computational creativity I found useful. I used these examples while talking to experts about the field of music and its technological development. A company called Intelligent Music Systems are composing and performing in-game music in real time as the game is played. Creating transitions between key themes making the experience more seamless (IMS, 2016). Companies like Izotope are trying to involve machine learning to detect patterns and use existing data of what sounds ‘good’ to help you in your creative process. Mainly through custom—automatically generated presets (Izotope, n.d). Georgia Institute of Technology have experiments showing robotic musicians...
The mouse is therefore one of our music-making tools. The tools of music-making include anything and everything that is used for a musical purpose. (Mooney, 2010)

The project started out with the goal of creating tools for digital music production. An early step was to get a general overview. Many tools used might seem obvious, like music instruments, note writing or microphones for recording. The sheer number of different tools, instruments and gear can be overwhelming. There is constantly new tools being developed—Mooney tries to describe the complexity.

“Nowadays, sequencers and notation software packages, microphones and recording devices, synthesizers, effects processors, and networked technologies (to name a few) are used alongside earlier tools. Throughout history the canon of tools used to compose and perform music has been continuously expanding.” Mooney (2010).

The decision was taken to focus on a basic setup by defining what is the minimum amount of gear you need to record and create music in a digital environment. Not for performing—which would require me to create an instrument—but to capture and manipulate sound files in desirable way. I quickly came across blog posts and articles describing what you need to make music. A common setup—that later was confirmed in interviews—was: headphones and/or speakers, a microphone and/or MIDI device. A sound card for better and more audio signals. You also need a computer running a Digital Audio Workstation (DAW) software. This could in practice just be a standard laptop. It has speakers, a sound card, microphone and the ability to run softwares. Everything from there is more about increasing comfort level or improving the quality of the production.

Instruments

Instruments are in many ways tools for music making. An instrument is an object that produces musical sounds and often allows musician to express themselves musically in real time. Medeiros, Calegario, Cabral and Ramalho (2014) writes about the challenges of designing new interfaces for musical expression. The authors describes one of the major issues—to create an instrument that gets widely adopted by musicians. Digital interfaces for music creation have more freedom than traditional instruments—they can separate input and output effects. This makes it challenging to create an intuitive instruments that can communicate a performance to an audience. The authors called the musical instrument “...more than just the artefact. It invokes the cultural elements that surrounds it. Thus, it is important to understand not only the conjuncture in which the instrument is inserted, but the strategies of adhesion.” Making an instrument is about more than creating an artefact—it can only be judged base on its impact on music itself.

Tools

“The quill and parchment that Bach used to notate The Well-Tempered Clavier are tools of music-making as well as the clavier itself. To draw a modern-day comparison, when interacting with music software we use a mouse.

Improvising together with human musicians (Georgia Institute of Technology, 2010). Some claiming that the musical Turing test (Turing test, n.d.) was passed a long time ago (Buskirk, 2008). Google a.i experiment have published similar experiments and also have two examples of algorithms listening and categorising sound. (a.i experiments, n.d.).

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Mooney (2010) describes music making tools as frameworks that have affordances. They can either be physical, for example an instrument, or conceptual. Composers or performers engage multiple frameworks to create music and that by doing so brings the affordances of different frameworks into play. These frameworks will influence the final result. “… all frameworks invite the user to work in particular ways and, therefore, every framework will make its influence known, to some extent, in the creative output. One can ‘hear’ the affordances of the frameworks used to compose and perform the music.”

David Byrne describes in his book about popular music—How music works (2012) how “the platform shapes the art”. Disco music is made for a discotheque and it is very hard to escape restrictions and work outside of a given context. It is important to remember the restrictions and biases that exist.

“How music works, or doesn’t work, is determined not just by what it is in isolation but in large part by what surrounds it, where you hear it and when you hear it. How it’s performed, how it’s sold and distributed, how it’s recorded, who performs it, whom you hear it with, and, of course, finally, what it sounds like: these are the things that determine not only if a piece of music works—if it successfully achieves what it sets out to accomplish—but what it is.” Byrne (2012)

Software used within the music making industries are in many ways highly specialised. They give you detailed control over recorded material, let you generate computer made sounds and sample already existing tunes. Abrams et al. (2002) argues that most music tools are borrowing heavily from computer science, much is expressed in technical terms and often in different terms than in classical music theory and practices. This detachment from the intuitive musical concepts and from the musical experience itself, places an cognitive burden on musicians, composers and producers.

The DAW

A big part of how many independent music makers work today is based on what tools they use. One very important part of that is the DAW (Digital Audio Workstation). The DAW is in many ways what a recording studio used to be, now in a digital format. Bell, Hein and Ratcliffe (2015) writes that the modern DAW is no longer just a collection of tools to document a performance.

“It is a creation tool in its own right [...] Most DAWs include a robust suite of instruments, the capabilities to ‘score’ and record them, and the tools to mix and process the results. By the same token, the teams of specialists required to operate an analog studio are rapidly being supplanted by producers working alone, in pairs or in small groups.” Bell et al. (2015).
The DAW has been around for quite some time. In the analog era, there was a distinction between performance and recording. In today’s digital landscape “performance, recording and composition have largely collapsed into a single act.” Bell et al. (2015)

With heavy digital presence tools keeps getting more and more accessible for anyone with a computer and a lot of professional music is now produced independently (Associated Press, 2011). Something that used to be done by large record labels are now made by single individuals working alone. One person now has to be an expert in multiple tools to be able to share their music.

To get a better understanding of the landscape different DAWs were mapped out based on online reviews. Alternative tools that were added and placed into relationship with DAWs (see figure 2 and figure 3).
Background summary

I started with an idea of exploring the borderland between computer generated music and human creativity. I learned that computational creativity exist and that there is a lot of different ways of defining creativity and art. Creating creative computers should not aim to replace humans creative abilities. It is rather about automating and creating tools that enhance our creative abilities. I found examples of different tools and learned that whatever you create—the tool will influence the outcome. Instrument are in many ways tools for musical expression. To design an instrument brings its own challenges and a project focusing on creating an expressive instrument would have to consider performance, how it relates to an audience and the impact it could have on developing music in itself.

A basic setup was defined to represent a general way of working with digital music. While doing so I explored the landscape of tools in general and learned that the digital softwares referred to as DAWs are hugely important to the process. Steps of the classical music making process that used to be divided has in many ways merged together. Much of the work now happens in front of a computer and are performed by single individuals or small groups.
Complex

Instruments Tools

DAW's

Synthesizer

MIDI Tools

Sampling Tools

Band in a box

Garageband

Mobile Apps

Auxy

Medly

Jukedeck

Touchpiano

Turntable

Block Dust

Orbit

Web

Google AI

108

Keezy

Garageband

Sibelius

Flat.io

Note Writing

Microphone

Jukedeck

Pen & Paper

Fig. 3

Mapping tools-instruments
Interviews

To get an understanding of how professionals use digital music making tools the decision to do user studies through contextual interviews was taken. The interviews were mainly expert interviews and focused on finding creative people with a technical relationship to music production. All interviews were semi-structured and focused on meeting people in their environment and ask about their work process. They were also asked to describe the tools they were using. Here follows a short summary of each interview.

Alexander | Songwriter, producer and musician

Alexander is an young songwriter and musician based in Gothenburg. He has a background studying songwriting and is now in the process of creating ten original songs for a licensing company. I met Alexander for a couple of hours in his studio. Alexander has a common setup of tools. He sits alone in a room built to deflect and absorb sound, this is giving him a good environment for playing and recording music. He plays most instruments by himself and sings on most of his songs. On the walls there are a couple of different electrical and acoustic guitars. He has a powerful computer running Apple’s Logic Pro X (DAW) and an external sound card that helps him to get a better sound quality. A microphone and a MIDI keyboard. On the floor an old skateboard and rug. There is quite a lot of cables but all neatly organised.

Alexander describes his work process as 'pretty straightforward’. He has a couple of tools and instruments he is comfortable with and that he wants to continue working with. He likes how he does things but he does get very tired of his own voice. Working alone can sometimes be frustrating so that is why he often tries to collaborate with someone. Sometimes he even hires someone else to sing in his songs. Just so he does not have to listen to his own voice all day.

To write a song Alexander just 'starts somewhere’. Maybe it is a chord progression, a melody or some lyrics. He then starts to improvise and experiment with sound.

Joel | Producer and sound engineer

"When I started I was very concerned using the right tools but the more I work I realise it’s about making something different and interesting. On this track we use the laptop microphone to record the song. Shitty sound but it makes it different from other productions.”

Joel is a producer and sound engineer based in Stockholm. Most of his time is spent alone in a basement storage unit converted to music studio. Joel often works together with an artist and songwriter called Emma. She will usually come to him with a demo of a song. Joel job is to rework
the material into a finished product. He talks about the importance of listening to what you are doing—it is about finding something that sounds unique and interesting. That demands that you take a step back and tries to analyse what you have.

Joel also mentions the importance of improvisation and collaboration. He is not good at himself but he can take creative decisions by listening to the material and work on the recorded clips he and Emma creates together. His expertise is to take a song from demo to ‘professional’ level by using his knowledge about technology and music. Much of my interview with Joel focused on the tools he uses, he explained how he constructs songs and how he quickly gets bored with what he creates only by himself. He constantly talks about finding that sound that is different.

**Martin | Percussionists and music teacher**

Martin was the first one I talked to that was a professional musician but beginner when it comes to using digital music tools. His main occupations is as a music teacher in a town called Uddevalla where he tries to involve digital tools in his daily work with students. Martin recommends an app called The Amazing Slow Downer to his students that lets them slow down songs and try to pick out drum patterns by themselves. Martin also uses Apple Logic Pro X (DAW) to record drum patterns that he then exports and email to his students to practice. He usually does that through the digital drum sets he has at the school.

I talked a lot about MIDI tools and different kinds of hybrid instruments with Martin. He believes that the possibility to play on a ‘regular’ acoustic drum set with added digital elements could be really interesting. Mainly to explore different sounds you then can play in a live setting. It might help bridge the gap that often exist between recorded music and the live performances.

Martins wife and friends is also musicians and often sits at home creating songs and record performances. Sometimes they will ask Martin to work on the percussion or accompany them. He could do it acoustically but prefers to do it by cutting and programming loops in Logic Pro X. He enjoys the process of exploring and playing with the software even if he struggles with the technical nature of the applications.

**Johannes | Music-Technician and writer**

“People in this business tend to have a lot of opinions of how things should be done but all that is just bullshit! Listen to the music. Does it sound good? If yes, great. If no, then change it”

Johannes is a Umeå based music-technician that works with recording, editing and mixing live acts for either radio or cd production. The ensembles he works with are often classical music groups. So it is a traditional workflow of recording multiple takes of a piece and then trying to edit together the best possible version. Often in collaboration with a producer.

Johannes is also a writer in Monitor, a Swedish magazine for audio professional. He therefore have good insights in the business and a lot of opinions. He described how different people—mainly engineers—have different approaches to the tools and software they use. Plugins are common and popular and some copy famous producers settings for certain sounds. This give you the option to apply ‘color’ to your tracks by one single control that might be more descriptive. For example: make the sound heavier. You can not affect how it is made just the amount of effect. And some people love that while others want minute control over everything and are always sitting in some kind of ‘super-expert-advanced-mode’. They want to see and understanding every aspect of the process.

Johannes has a traditional work process similar to how it ‘used to work’ where you have a live act that you try to capture in digital format. It is much more focus on recording multiple performances of a piece and then edit together the best version. Johannes put heavy focus on actually listening to what you are doing and take decisions based on what you can hear. The tools are not important—the end result is.
Stefan | Researcher focusing on creativity & machine learning

“The danger and worry with automation and machine learning within the creative businesses is of course that it will lead to less work for people. It does however open up for the possibility of people just doing more interesting work. We should use computers to help us with mundane repetitive tasks. That’s what they are good at.”

I had a short phone conversation with Stefan. A Dutch researcher that founded the an organisation focusing on how machine learning and computational creativity can influence and help creative businesses. One of the things was the discussion about the dangers and possibility of automation. Stefan says that many fear that more advanced computer algorithms will take over even creative work and leave less work for humans to perform. The advantages of that is of course that it opens up for the possibilities to spend time doing more interesting work.

Stefan also talked about how machine learning was the next step but that the technology so far been focused on other areas. There is not enough money in the creative field for it to happen right now. It will probably take a couple of years.

Tistou | Digital -music maker

Tistou is an amateur digital music maker—among other things—and during the early 2000’s his music made it into an indie game called openTTD. I met with him to get a completely different view on what music making is.

Tistou makes music for his own pleasure. Not the writing and performing part but the end result. He enjoys listening to his own music and he has a good idea of what it should sound like.

Tistou describes the start of his process as an clear melody in his head. Then is just a matter of trying to get it out somehow. He used to use a note writing program to do that. It was challenging because he does not know how to write sheet music. That is the biggest challenge—to get the music out of his head. There is a big knowledge gap but that does not stop Tistou. Once the first part of a melody was written down things became easy. That first piece sparked ideas of how the next part of the song should sound like and Tistou keeps building until he reach a suitable song length. Usually three to four minutes.
Interviews summary

I interviewed five different professional music makers about their process and the digital tools they use. I created simplified flowcharts to visualize their individual processes (see appendix H). I learned that people that spend most of their time working alone talks about collaboration and improvisation as key aspects in their work. The most experienced musician still enjoys to explore new tools but is struggling with more complex technical challenges. It is important to listen to the music you create. I learned that there is possibilities to automate parts of the process. It might free people to do more interesting work.

In my brief I indicate that I would focus more on amateur music makers. Talking to Tistou made me realise that that is a completely different process than the one I learned from more professional music makers. I took the decision to focus on professional songwriters and producers instead of amateur music makers.

Keywords & Questions

The interviews were summarised with keywords that then were reworked into questions that acted as a starting point for the ideation phase. The questions highlighted the different topics and were often used in combination with each other during ideation workshops with other designers. Asking the participants how they could improve some aspect of the work songwriters and producers do.

Collaborate
  How do you create a collaborative workflow?

Improvise
  How to nurture improvisation?

Explore
  How do I explore sound and song structures?

Listen
  How do I encourage listening and decision making?

Simplify
  How to lower the starting threshold?

Automate
  How do I minimise non-creative tasks in the process?

Mundane or repetitive tasks

Visiting professional musicians, songwriters and producers gave insights into their daily work routine. There was a need to specify specific everyday work tasks to focus the ideation around. My own observation helped me to define four areas or work tasks to focus on (see appendix H for visualised work process).

• There is the first recording or creation of a song. Alexander described this as ‘just starting somewhere’. He would sketch out a basic song idea by recording something—either digital or with microphone—and start building from there. As soon as you have some sound you can start explore, improvise and experiment with the material.

• The second moment was based on how Joel described his work. Sitting with a software—in his case Logic and a lot of plugins—adjusting values to get the ‘right sound’ is an important part of his job. That includes adding effects and change aspects of the already existing sound and song structure. This is today happening with a cursor moving around at screen.

• The third is looking for samples or sounds. Martin, Joel and Alexander all spend a lot of time looking for the sound they have in mind. Alexander described it as having something in your head and then just spending hours looking through folders for that thing that sounds similar to your brains imagination.

• The fourth was around listening and taking decisions. Johannes talked a lot about the importance of actually listen to what you have in front of you.
Ideation

Every iteration and especially the first included me sitting at my desk trying to come up with ideas. I did however try to involve other people in my process. These people were mainly classmates and other design students but I tried to keep some of the people I interviewed part of the process throughout the whole project. I will try to highlight important moments and decision from the creative process and give examples of methods used.

Workshop 1

Pen and paper ideation based on selected keyword questions. First workshop was held with two other design students. The goal was to get a wide range of material and bring other people into my own process. The participants were asked to spend 10-15 minutes on each question sketching ideas. The ideas were then shared in the group and followed by a short discussion. The outcome was new unexpected references and ideas. The participants came with suggestions for further research areas and could show examples of existing products dealing with the same kind of issues targeted within this project.

Clustering

Because a lot of the ideas touched on multiple areas clustering and re-alignment of ideas and sketches happened continuously (images of these clusters can be seen in appendix A). Many ideas helped re-define what some of the keywords meant. It also helped to solidify and develop the mundane tasks.

Selection 1 | low-fidelity video prototypes

To get a better understanding of which topics or ideas were relevant—five ideas were selected to be developed into small video prototypes. They were selected to cover a broad area and were based on ideas I felt was most relevant for the project. The fidelity was kept on a low level to make them easy to share, criticise and iterate upon. The five videos were around 30 seconds long and were shot with a mobile phone camera.

These first prototypes aimed to question workflows and re-open discussions with my users. I shared them in a workshop format where they gave me further insights into work processes and helped me keep them engaged during the full duration of the project. (A description of each video and links can also be found in appendix B).

Reflective workshop | Reconnecting with musicians and producers

I reached out to the people interviewed earlier and asked them to look at ideas, reflect and ideate together with me. Three of them responded and agreed to help. Because we could not meet physically an email was put together with short descriptions about the ideas, a link to each video and a couple of question to reflect around. The participants were asked to look at it from their own personal and professional perspective. They were also given examples of directions the concepts/ideas could take—asking how it should be used. Joel agreed to a Skype session where we could go through all the material together. Alexander got a couple of hours to look at the material and we thereafter had a 40 minute phone conversation around the ideas. Martin preferred to look at the material and then return his feedback and thoughts in written form.

1. Turn it into gold >> An audio based interface. Use simple sounds and rhythms to sketch more complex results. The computer picks up your sound, average the result and add sampled beats/sounds to play along with you. You can afterwards tweak the result and complexity of the sound.

   How should it be used?
   • Use it as a pure sketch tool that’s simpler than midi controls but also give you less control of the end result?
   • Make it as a control for already existing material. For example swipe to scroll or knock to confirm an action?
   • Focus on improvising together with a computer. You play a pattern and the computer responds?
“I really like this, believe that many songwriters would love something like this where they can sketch songs, hands on and not have to worry so much about the technical details.” - Alexander

“Sure, why not! A bit like jamming with someone, good for playing around. Maybe more for the start of creating a song. Which is not what I’m doing” - Joel

“This is the most interesting to me. A very nice idea!” - Martin

2. Physical interface >> Make a physical interface that focus on controlling DAWs and plug-ins. One or multiple controls for volume, pitch, speed etc. Focusing on tactile feedback and versatility.

How should it be used?
• Manipulating sound?
• Navigating software (DAW)?
• Playing instruments?

“Just felt like another midi interface and there is so many out there. Sure it could be cool but not as interesting because of that.” - Alexander

“It’s so important to be able to close your eyes and listen. You can get so influenced by the visual values and numbers and you forget to actually listen” - Joel

3. Finding Sounds >> Computer sorts sounds based on their auditory values and let’s you quickly search or scroll through the material.

How should it be used?
• Finding sampled beats?
• Finding instruments or sounds?
• Scrolling through already existing songs?

“This I want! You usually have something in your head and you try to find a sound that’s similar to what you have in mind. So if you can find good values to map it according to it could be very useful.” - Alexander

“Yes, exactly. Don’t take the long detour around language. The computer should also be aware of what I might like” - Joel

“Feels very useful. Could decrease the time looking for sound significantly. Interesting” - Martin

4. Making a song >> Generating sound and music based on a set of preferences and references.

How should it be used?
• Direct a computer to create material expressing your wishes?
• Focus on translating your emotions to music?
• Focus on automating self expression?
“Think it could be good for some kind of end client but maybe not for me.” - Alexander

“Has to be super good before it’s useful, then it can revolutionise the market. [...] I would like to be given a couple and the possibility to re-iterate. For example ‘nice, but with less strings and a bit angrier [...] Then I would also like to get separate tracks and full control.’” - Joel

5. Exploring song structures >> Developing the regular timeline (represented in most DAWs). Connecting different parts or previous versions of the same song, making it possible to improvise and experiment with bigger chunks at the same time.

How should it be used?

- Tool for experimentation and collaboration?
- Focus on file management?
- Explorative tool for decision making?

“So I think it could be good but this basically already exists.” - Alexander

“This is not really a problem, if you want to compare things it’s quite easy to just export.” - Joel

Selection 2

A second selection was made based on the feedback from the reflective workshop. There seemed to be three directions that in general got positive feedback and had potential as interesting areas to continue working on.

It was clear that exploring song structures did not suggest anything new—it functions in a similar way to how people already are working. Making a song was lead to interesting conversations and Joel saw possibilities of how it could develop into something interesting—some of his ideas were used in a later concept. It was however taking over too much of the creative process. Martin, Joel and Alexander saw it as a concept or idea aimed at non-musicians.

Selected directions to continue working with were:

1. Turn it into gold
   Because of its playfulness and simplicity. Use it for sketching, improvising and collaboration.

2. Physical interface
   To shift the focus from visual to auditory decision making.

3. Finding Sounds
   Because of its potential usefulness.

The decided directions, the discussion with Alexander, Joel and Martin lead to three directions that related to the earlier defined mundane tasks. In combination they helped to define three initial concepts that were developed further after individual needs.

Workshop 2

Pen and paper ideation based on selected video prototypes. The second workshop was held with one other design student. The goal was to bring in the prototypes and feedback from users and discuss it with other designers. Me and the second designer would watch the videos and in a free open discussion come up with alternative ways or directions the idea could go. We tried to get the ideas to a more detailed level. The desired level of detail was not achieved but the workshop did however broaden the scope and allowed for a discussion about how to proceed with the project.
Fig. 4. Key-Touchpoints

Create
Create a basic form, a demo song or sketch.

Find
Replace sounds with new samples or recordings. Look for sounds to apply to ‘instruments’.

Pick track
Add effects, adjust and tweak the material. Edit and color the sound.

Look through folders or lists with samples
Find what you are looking for or something good enough
Apply to instrument or track

Add plug and/or effects
Generate preset
Tweak and adjust

The full song (mastering)
Initial concepts

Up until this point multiple directions were worked on at the same time—to keep them open and possibly let them bleed over into each other. After selection 2 the ideation got more focused within the three different categories and resulted in three initial concepts. These were therefore worked on in different ways and depth depending on their individual needs.

The initial concepts were developed based on the feedback from users focuses on a couple of key moments in their process and are trying to change—not what they do—but rather how they do it. The idea is to use the key moments/touchpoints as an starting point—see how one or multiple alternative ways of performing the task can change the work itself and how that potentially could affect their overall process. The touchpoints are based on the mundane tasks defined after the interviews in combination with the ideas and concepts that came up during the creative process. Based on my initial plan of the project every concept assumes that the development of machine learning will allow for software intelligent enough to compose and improvise music. I assume that programs will be good and efficient enough to reduce the amount of time we need to spend building presets and organise files.

The concept and touchpoint names changed during the process but for clarity they are now referred to as Create, Tune and Find.

1. Create

**Touchpoint >>** One moment in the process of producing music is to create a base—a first draft. If you are a producer you often get some kind of demo of a song to start with. If you are a songwriter or musician like Alexander you have to create your own demo. Alexander would sketch out a basic song idea by recording something, either digital or with microphone and start building from there. As soon as you have some sound you can start to explore, improvise and experiment. When showing the first turn it into gold video prototype to Alexander, Joel and Martin they all saw possibilities of being more free in their work.

**Initial concept >>** If you could speed up or automate parts of this first part of the creative process and turn it into a collaboration between human and machine—what would then happen? The progression from the first prototype video was to develop a sketch tool based on audio and body language. To—without adding any new gear—interact with sound and music through a microphone. By humming, tapping and singing quickly communicate to a computer what you want to create. One key aspect is to take something from lo-fidelity to high fidelity through this tool.

**Exploration & Prototypes >>** The first turn it into gold video was used as inspiration for the body and mind workshop (workshop 3). The second iteration resulted in a more developed video showing how to sketch a first basic song structure.

The video were created to communicate the idea to other designers during a project midway presentation. The video show a person in front of a laptop. By tapping with hands on the tabletop we slowly hear a base pattern play. Another tapping pattern from the hands and a drum beat starts playing. The person in front of the computer starts humming and electric piano chords start playing and finally a brass section creating a full song. The video trigger enthusiastic discussions with other designers and managed to clearly communicate the concept.

**Workshop 3 | Body and Mind**

A more targeted (bodystorming) workshop with design students focusing on one idea. An empty room was prepared with a table to sit around, a camera setup and a computer with speakers. The designers were asked to listen to three different sound clips and imagine different ways to generate the same sound using their bodies as the only tool. Not to recreate the sound but how they would communicate to a software that this was the kind of sound, beat or melody they wanted to create. This exercise created a couple of interesting ideas around the core concept of using sound as an interactive medium for music creation and production. New questions were raised around possibilities to augment already existing sounds,
using sound as an input or if there is a possibility to create a conversational-user-interface for sound.

2. Tune

**Touchpoint >>** A big part of the work of producers is to fine tune and change aspects of the overall 'sound picture'. Digital softwares allows you to in detail control a wide variety values changing how we perceive sound. It is very common to add effects to recorded material, loops and samplings. This is a part of the process that today demands that you in detail adjust a lot of different values and numbers.

**Initial concept >>** This concept were based on the idea of making the controls of repetitive fine tuning easier and more pleasant. To get away from the screen and use your hands to manipulate sound files. Much based on what Joel said. “It’s so important to be able to close your eyes and listen. You can get so influenced by the visual values and numbers and you forget to actually listen”. If much of the basic effects and plug-ins could be automatically mapped to a modular surface producers could spend their time listening, adjusting values and taking decision instead of moving around a cursor on a screen.

**Exploration & Prototypes >>** Multiple sketches and prototypes were created to explore the tune concept.

The first was a grid of buttons that can be used as regular buttons but also sliders and a touch interface. The feedback you got was sound but also visual. Making this prototype I realised that visual—in this case light—was a distracting feedback.

I looked at different interactive surfaces and created something that focused more on the texture and tactile experience. I created five different cardboard surfaces. In a first initial test I gave a couple of student some of the surfaces and asked them to instinctively come up with ideas of how they could imagine them to work. The results lead to the planning of workshop 5.
To find other ways of creating a surface that focused less on visual input, vibration motors were used—creating a couple of sketches of vibrating ‘pixels’. It was hard to find a way of isolating points good enough to make detectable areas on a solid surface. This lead to the decision to have a neutral ‘dead’ surface and focus on gestures and hand movement as the main way of interacting.

A short exploration trying to combine some of the aspects of the searching prototype (appendix C) with the touchpoint was made. A short video shows someone trying to adjust values and changing the perceived sound qualities of one looping sound file. This is done by selecting and dragging a single dot around on an empty window. Showing the video—together with the searching physical prototype (appendix D)—to other designers spawned a discussion around the future of the project and how to proceed with the different concepts.

**Workshop 4**

Pen and paper ideation. A workshop to once again try to involve other designers in the process. It was held with two other students. The goal was to continue exploring the Tune concept. The participants were shown two common DAW functions. An equalizer (Equalizer, n.d.) and a compressor (Compressor, n.d.). They got explained to them how they work and they could listen to the sound it produced. The participants were then asked to create a physical control that could replace these two functions. The ideas and concepts were shared with the group and a second round began. They were then asked to convert their ideas into a control that could be used blindfolded. The outcome were three different 1:1 scale interfaces that used bigger hand gestures to control what previously been done with a cursor and mouse.

The workshop provided insights and idea of how big a surface should be and the participants came up with metaphors for functions, e.g. twisting, dragging and pushing.

**Workshop 5 | Hidden ideation**

The tactile paper surfaces gave insights into possible ways of interacting with sound through a touch interface. I invited design students to blindfolded control an equalizer—actually controlled by me—to see if it was possible to do so without any visual feedback. I videotaped and asked them to verbally explain what they tried to do while testing the prototype. It worked as a hidden ideation session. Them explaining what they were doing as I tried to follow along in a software created a gesture language that later could be used in the concept. It also lead to the realisation that some kind of visual aid might be necessary.
3. Find

**Touchpoint** >> Martin, Joel and Alexander all spend a lot of time looking for the sound they had in mind. Alexander described it as having something in your head, you know it is gonna work and then you just spend hours trying to find it. You get better at this with experience. You learn what you like to use and you figure out a system to organise your work. Looking for sounds is something they spend a lot of time doing. Often by navigating folders of soundfiles.

**Initial concept** >> A concept based on a technology demonstrated by google in their ai experiment bird sounds (Bird Sounds, n.d.). The feedback on the first prototype video was very clear. Looking for the right sound and organising your library is time consuming and inefficient. If there is any way of automating parts of the process that would be greatly appreciated. The base of the concept is to utilise the computer’s ability to go through and structure large amounts of data. If the user can quickly scroll through material, structured and displayed in a spatial representation—then the user can take informed decisions.

**Exploration & Prototypes** >> One prototype were created as a development of the first initial sketch video finding sounds. It consist of a small program where sound clips can be organised and triggered by moving a mouse over a grid of dots. For the two first attempts of organising sound, random files found online was used. To get better feedback, Joel was asked to send some of his sound libraries. Access to more commonly used kinds of sounds allowed me to structure them in ways that later could be tested with Joel. This lay the groundwork for creating another video prototyped that was shared with Joel, Martin, and Alexander during the evaluation phase of the project.

A short exploration trying to combine some of the aspects of the tactile surfaces explorations (appendix C) with the first video sketch finding sounds was also created. Showing the video—together with the adjusting prototype—to other designers spawned a discussion around the future of the project and how to proceed with the different concepts.
Evaluation

To evaluate the concepts and process touchpoint the three initial concepts were shared again with Joel, Martin, and Alexander. Three video prototypes were put together to explain the concepts—only the create concept stayed static. Through conversation the concepts were explained, what they were about and how they could be traced to the earlier ideas. We watched the video prototypes together and they were asked to reflect on the content and its usefulness.

The feedback was in general positive. All three had potential to be good tools and were quite different from existing tools. A couple of concerns were raised around technological feasibility.

Here follow a description of each video, the general feedback it got and a short conclusion for each concept direction (video links can be found in appendix E).
1. Create

This was the same video shared with designers as in the initial concepts stage. The video shows a person creating a song in front of a laptop.

“A very useful tool for people that quickly needs to share ideas and concepts without spending 200 hours on production. A lot of songwriters are bad producers. They could really use something like this.” - Alexander

“The danger is that you lose control of what you create. It has to (technically) work very well to be great.” - Joel

“Very interesting, maybe even a possibility to combine it with the Tune concept? I would like to be able to choose in the beginning genre. Maybe I want to do something rock based or RnB. I want to get the choice in the start. I believe it can be a very good way of testing ideas. Maybe not for the whole production but somewhere to start.” - Martin

Conclusions >> Easy to understand concept that works better for songwriters than producers. Concerns raised around technical feasibility and detailed control. Make sure you quickly can create something, export it and then bring it into the regular workflow.
2. Tune

The video shows a topview of two hands and a thumbnail view of a screen based interface. The hands starts to control an equalizer and are in real time adjusting levels. A second clip shows the same setup now with a distortion function. A coffee cup is placed on the surface and it is also affecting the sound.

“Really likes the idea! Logic has started to release ‘smart’ controls that simplifies and reduces the amount of settings. This is maybe something that could work well together with that sort of workflow.” - Alexander

“Might be a bit to general right now. Techies like to be able to adjust everything. Has to be very intuitive to work well. Imagined a screen from the start but this is maybe better.” - Joel

“Also very interesting, but I think it may take longer to learn as well as longer for the computer to learn how I want it to work. Otherwise, it seems very nice to get rid of small controls with mouse pointers.” - Martin

Conclusions >> A concept that has to work in unison with existing DAW functions. It should probably be represented in a physical product to better communicate that. Need to create a clear connection between screen and hands to better show how it could work.
3. Find

The video shows an empty screen. A text field appears and someone writes drums. A small amount of dots appear and someone moves the cursor above them. They play different types of drum sounds. When one of them is selected a new grid of dots appear and the cursor is now exploring the sounds. Eventually one is finally selected displaying detailed information of what sound it is and how many times it been used the last 12 months. It also highlights three similar sounds to use instead.

“Really good. Like the speed and possibility to roughly categorise large amount of samples. To be able to compare sounds is the real selling point.” - Alexander

“I want more details to get even more use out of the tool. Also want the possibility to search on genres and years. Might work as a search engine for sound. Could be cool to have access to collaborative online libraries.” - Joel

“The third idea is probably the one that got me most excited because I am currently experiencing a real problem. I have a sampling pad (Roland SPD-SX) where I insert different drum samples or loops. It comes with a software to the path that you enter the different samples in. It’s quite difficult and time-consuming especially as I have many different samples on my computer. For example, if I want a special crawl space for the sampling path, I’m currently looking for lots of different folders and files to find the right one.” - Martin

Conclusions >> The concept that got Alexander, Joel and Martin most exited. A clear usecase and the feedback focused mostly on adding details in how sounds are represented.
Final concepts

After the evaluation the decision was taken to deliver three final videos. They should be seen as video prototypes rather than concept or presentation videos. They were developments based on the previous evaluation videos and some of the concerns raised in the feedback was dealt with in the refinement process. Some issues were consciously ignored to make the videos more clear in their message. They are otherwise refined versions of the evaluation videos. Made to better communicate the idea. The videos were developed through storyboards (see appendix G).

Up until this point most things were kept on a rough and basic level to quickly and easily produce material. Form decisions and the look of the final delivery are based on a couple of key decisions. To present three concepts on an equal level—the decision was taken to show them with similar look and feel. It was also decided to bring the concepts back to an environment that the users would recognize. Instead of offering alternatives in the aesthetics of the products the decision was taken to try to blend into the existing set of tools available. A moodboard helped form this look (see appendix F). Some of the screen based interfaces mainly consist of simplified elements borrowed from existing DAWs.

The project outcome is three concepts focusing on three different moments in the workflow of songwriters and producers. It is taking these three moments, look at how to perform a specific task and change—not what you do—but how you do it. The concepts consist of three short videos. They are presented together with a similar look and feel but focuses on a specific task and concept. The concepts should propose alternatives to existing interaction models manifested in modern DAWs.
Selection 1
Ideas selected and turned into short video sketches. Shared with users.

Selection 2
More defined directions based on feedback from users.

Exploration
Simple sketches, prototypes and the occasional workshop to explore chosen directions further.

Evaluation
Video prototypes made to share and evaluate in discussion with users.

Final concepts
Developed versions of the evaluation videos ready to share with a larger audience.
1. Create

The create concept is a conversational user interface (CUI). It allows you to interact with sound and music through a microphone. By humming, tapping, and singing communicate your musical ideas to a computer. It is a way for you to improvise and collaborate together with a software. Write a simple song and export its individual parts.

It consists of a software capable of detecting musical patterns, composing original music and perform it through sampled sound in realtime. You as a songwriter will be in charge of taking decisions, giving commands and leading the creative process. You can improvise but you will never have full control. It is a collaboration and you must adapt.

The concept tries to find a less technically challenging alternative to digital softwares used in a songwriting processes. It focuses on automating parts of the process and create a collaborative workflow between you as a user and the computer. It does that through a graphical user interface (GUI) and voice commands (CUI).

A dialogue is created through text between user and the software. The software makes it clear that it is actively listening by writing “I’m listening” and displaying a big microphone icon. It is now up to the user to give a command. In the video the user starts out by asking for a drum beat. The GUI displays a constant ‘chat log’ writing out what it hears and also communicates its own decisions. The user starts drumming on the tabletop and the software detects a pattern. It starts overlaying (auditory) its own newly created drum beat as it continues to update the chat log. The user can then continue working on the project. Adding new material by asking for it or once again sing and hum something that could be re-created by the software. You can export the project when you have something that you are happy with. That allows you to bring the material into your regular (DAW) workflow.
2. Tune

The tune concept is a pressure sensitive touch surface that let you manipulate sound. It is an adaptive system that automatically detects active windows and controls in your DAW—it maps the active controls from your computer screen down to the touch surface. The software predicts your hands intention and let you adjust, tweak and fine tune sound by larger gestures. It consist of a product, the touch pad and a software plug-in for your DAW.

The concept aims to simplify many of the basic DAW functions and automatically map them to a modular surface. This could free producers to spend their time listening, adjusting values and taking decision—instead of moving around a cursor on a screen and look at numbers. The goal is to make repetitive fine tuning easier and more pleasant for the user.

The video shows someone working on a looping sound clip, with their hands on a big rectangular plate. A screen based interface shows a window with an equalizer (Equalizer, n.d.), a common device used within music production (the function and they way it is represented is borrowed from Apple’s Garageband (DAW)). The screen also shows a small window with a simple rectangular representation of the touch pad. The rectangle lights up showing how equalizer controls are mapped down to the touchpad. As the user moves his/her hands over the surface the screen based graphics reacts and you can hear the changes to the looping sound clip. When a new type of function is opened, this time a compressor (Compressor, n.d.), the screen based touchpad representation lights up and divides the new controls. The user is free to jump between any controls and the touch pad will be linked to the current active control.
3. Find

The find concept change the way you organise and look for sound files. It is a automated process where a software helps you compare different sounds to each other. It takes away most labels and focuses on mapping sound according to sound profile. This makes you as a producer stop relying on memory or 'knowledge' and instead focus on listening. The concept aims to help the user listen and take decisions—to help them find what they are looking for.

It consist of a software that is capable of listening to large amounts of sound files—example of technology taken from google a.i experiments (Bird Sounds, n.d.). The video shows someone searching for drums. The software then goes through libraries of files to find sounds that somehow can be associated with the drum tag. That can be either samplings of drums or other sounds that have a profile the software judges to sound similar to percussion instruments. It will display a first selection with different categories of drum sounds. The software does that by drawing a grid of dots. When a cursor is moved over the dots a correlating sound file are played—allowing the user to quickly scroll through all soundclips. As soon as the cursor is moved away from a dot the sound will stop. When the user find a sound he/she prefers they will select the dot linked to the sound category by double clicking on it. The software will now display a second grid of dots with sound audibly closer to each other. The sounds are now mapped according to their different qualities (e.g. frequency distribution). The user can now on a more detailed level search for the specific sound they had in mind. When a decision is made he/she can highlight the chosen sound and get more detailed—and more regular information about the sound. The software will also keep track of which sounds you used and highlight similar/alternative sounds.
Reflections

I started this project with two questions and a specific goal, I wanted to know:

- When a computer generated music, how do you as a user or creator remain in control?
- Is there new or better ways to create music and how can that, in the future, be influenced by artificial intelligence?

Through this thesis I got to answer parts of these questions but the project itself drifted away from them. My expectations did not always correlate with reality. Apparently machines have created music for a long time—that is not really an issue. It is people's relationship to this music that makes this topic interesting and somehow problematic. When I did my interviews I tried to talk about machine made music, I brought examples of how it could be done and how it could be used. People I interviewed were however very sceptical and even told me they were scared of losing their jobs because of technological development. The one example that got the most positive response was the Intelligent Music Systems (IMS, 2016). It is a company that developed software for creating “real-time, procedural game music”. It was an example from a very different context than my interviewees were used to.

From reading The Master Algorithm (Domingos, 2015) and talking to Stefan I learned that automating parts of the process might free people from repetitive tasks and help them do more interesting work. I took that concept to my heart and it had a big influence on my process. I do believe that is why some of my ideas and concepts was so much more attractive to Alexander, Joel and Martin. They saw how these tools could help them in their work but not take over the creative parts in their music making process.

It might be worth pointing out that the project constantly been operating within a Western-European-popular-music context. Mainly because of my own background, access to people and the focus of my interviewees work.

**Instruments >>** When I began the project I often got the question if the outcome of the project would be some kind of musical instrument. I was more interested in the technical mundane reality of music creation. That is why I reached out to producers and music technicians—but instruments are also tools for music creation. In a discussion with Alexander he mentioned the vast number of tools available for a music creator like himself. He believed there is tools out there that would help him a lot in his process but he is not very interested in finding them or learn how to use them. It is too much work and he wants to focus on the things he already know. Mastering tools takes years and we have a tendency to focus on the ones we already know. This was also one of the main reasons I did not want to create another instrument. Medeiros, Calegario, Cabral and Ramalho (2014) paper Challenges in Designing New Interfaces for Musical Expression influenced me a lot in that decision. To create a instrument you need musicians to master it and many musicians pick up an instrument because some music utilizing that instrument made an impact on them. Music and musical instruments should probably come from musicians themselves and not be based on design. A project focusing on developing an instrument could be very interesting and I believe a lot of NIME’s (New Interfaces for Musical Expression) could benefit from a design perspective. It would however been another kind of project focusing on close collaboration with musicians and instrumentalist.

**DAW >>** I wanted a project that somehow question how we use digital tools in music production. I wanted to offer alternatives. My final concept/prototype videos are closer to a traditional workflow than I expected. I did learn that the DAW is very important to digital music creation and it is within that framework a lot of the work happens. There is a wide variety and individual differences between the different DAW’s and I never learned or even saw them all. I had to trust my contacts to describe what they were doing
and try to create my own understanding from that. Final result are more like complements to the common DAW instead of completely new ways of working with music. My final result are still on a concept level and undefined in their functions and inner workings. That has made it easier to share with musicians and will hopefully help me keep the conversation alive in the future.

**Sketching & Prototyping >>** I said that my goal was to create and explore multiple concepts that offer alternatives to already existing ways of working with sound in music production.

The aim was to do this through low-fidelity prototypes, mockups and sketches. It lead to many small iterations and allowed me to constantly have something to show to other people. I wanted to bring these concepts and sketches back to a few experts to get feedback on my ideas and incorporate that feedback into the creative process. Because many of my tests and discussion were done over long distance video was used extensively. I have in this report tried to at least mention most of my sketches and prototypes. Not all were useful or lead to a concrete decision but they have all played an important role in the project. To keep them on a unfinished level has helped me use them more as discussion pieces in my conversations with users or fellow designers. It was however difficult for anyone to actually experience my ideas. Presenting and testing everything in video form—made it hard to judge the usefulness of my final result. It seems to be good but no one can experience the tool in first hand. Some kind of experience prototype would be very important next step.

**Result >>** Presenting my final result a couple of questions were raised from examiners and advisors. These question focused more on how machine learning is used and how the three different concepts related to the topic.

The create concept is closest to what I had in mind starting the project but also the one that my interviewees hard the hardest time to relate to. Some people have called it a design fiction and I am not sure about its technical feasibility. Looking at services as Jukedeck (Jukedeck, n.d) and Intelligent Music Systems (IMS, 2016) has made me convinced that it is only a matter of time until regular computers can start creating music in realtime. It has however proven difficult to find a good way to evaluate or determine a credible timeframe. It has been useful for sharing and the idea seems to attract attention at least opening up for discussion of what is a desirable tool in relation to music making.

The tune concept focuses more on how machine learning can affect the controls you use for manipulating sound. It looks at how you can change the physical controls of a computer. In many ways inspired by equipment like the sensel (The Sensel Morph, n.d.) or wacom boards (Wacom Global, n.d.). The goal was to come away from the visual and focus on auditory values. It still relies on a screen based user interface and the concept video struggles to explain how the device is intended to be used—making it difficult to evaluate.

The find concept is the one that Alexander, Martin and Joel all reacted to the best. It has a useful application—utilizing existing technology and do not interfere to much with the creative process.

**Future work >>** The project is now at a stage where my concept videos can be shared and I have slowly started doing so. I wish to reach out to more people and present the work. Hopefully the project and its outcome can serve as a base for discussion around alternative ways of experiencing sound and music.
References


Appendix A

Clustering
Apendix B

Sketch videos

Turn it into gold
https://vimeo.com/206047560
Video shows two hands drumming on a tabletop. Soon a sampled drum track starts playing in tune with the tabletop drumming.

Physical interface
https://vimeo.com/206047536
Video shows a piece of wood, a rubberband and a wire. A constant humming sound can be heard and a hand enters the frame. When the rubber band gets pressed down or bent the sound changes character.

Finding Sounds.
https://vimeo.com/206047460
Video shows a big piece of paper with black dots on. A hand enters the frame and starts moving over the surface. Random sounds get triggered as the hand moves.

Making a song
https://vimeo.com/206047499
The video shows a paper based interface where a hand moves into frame. Two sliders are adjusted. One showing time and one beats per minute. Two music genres are selected and a loading screen appears. After a short delay a piece of music starts playing.

Exploring song structures
https://vimeo.com/206047448
The video shows a fragmented horizontal timeline and a vertical line moving along it. Different fragments are connected and a piece of music plays in the background.
Apendix C

Explorations 1

Light Grid
https://vimeo.com/210899577

A grid of buttons that can be used as regular buttons but also sliders and a touch interface. The feedback you got was sound but also visual.

Tactile surfaces | Exploration
https://vimeo.com/210927604

Three people tried five different surfaces. The surfaces were made with different colors, textures and sizes to explore what people would relate to trigger different senses.

The video shows how people freely touch and talk about how they could imagine to use a flat surface with different kinds of textures.

Searching
https://vimeo.com/215633268

A small program loading 300 sound files and displaying small dots in a grid. When the cursor hovers over a dot a correlating sound file triggers and plays.

Vibrating pixels 1

An exploration in creating a paper surface with tactile feedback similar to the light grid setup. A flat paper surface with vibrating spots or ‘pixels’. Four vibration motors would be set of randomly and a person had to try to pinpoint where the vibrating spot were. It was hard to tell exactly where the vibrations originated which lead to a second sketch.

Vibrating pixels 2

A second attempt to create a surface with vibrating ‘pixels’ or spots. The vibration motors were mounted on four separate foam-rubber pieces. The separation made it easier to distinguish where the vibration originated but it was still imprecise and ambiguous in its feedback.
A video prototype exploring how the concept behind searching could be used for other ways of interacting. Here trying to adjust values and changing the perceived sound qualities of one looping sound file. This is done by selecting and dragging a single dot around on in an empty window.

A video sketch exploring how the concept behind searching could be used in a different medium. Here in combination with the tactile surface. The video shows a flat paper surface and a hand slowly moving a finger over the surface. As the finger moves different sounds are triggered and played.
Appendix E

Evaluation videos

**Create**
https://vimeo.com/210899577

A video showing a person creating a song in front of a laptop (see appendix B).

**Tune**
https://vimeo.com/210900910

The video shows a topview of two hands and a thumbnail view of a screen based interface. The hands start to control an equalizer and are in real time adjusting levels. A second clip shows the same setup now with a distortion function. A coffee cup is placed on the surface and it is also affecting the sound.

**Find**
https://vimeo.com/210898373

The video shows an empty screen. A text field appears and someone writes drums. A small amount of dots appear and someone moves the cursor above them. They play different types of drum sounds. When one of them is selected a new grid of dots appear and the cursor is now exploring the sounds. Eventually one is finally selected displaying detailed information of what sound it is and how many times it been used the last 12 months. It also highlights three similar sounds to use instead.
Apendix F

Moodboard
Apendix G

Storyboard
Appendix H

Interview process flowcharts

Martin Frennberg | Creative

Martin Frennberg | Work

Johannes Oscarsson | Traditional
Demo → Experiment → Collaborate → Listen → Repeat
General | Producing

Create Form → Smart Drums → Improvise → Chord Progression → Baseline → Melody → Listen
General | Songwriter
# Appendix I

## Time schedule

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<th>Research</th>
<th>Ideate</th>
<th>Prototyp</th>
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<tbody>
<tr>
<td>Kick off</td>
<td>Research review</td>
<td>Half-way presentation</td>
</tr>
<tr>
<td>Aesthetic research tutoring Jonas Sandström</td>
<td>Aesthetic value tutoring Jonas Sandström</td>
<td>Aesthetic w Jonas Sanc</td>
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<tr>
<td>Focus on contextual interviews and secondary research</td>
<td>Quick iterative loops with focus on making rough prototypes and bringing back to users for feedback</td>
<td>Simple prototypes to take ideas to a more defined level</td>
</tr>
<tr>
<td>Every friday, write report and document work</td>
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</tbody>
</table>
Kick off Research review Half-way presentation 

Process gateway

Aesthetic research tutoring Aesthetic value tutoring

Quick iterative loops with focus on making rough prototypes and bringing back to users for feedback

Focus on contextual interviews and secondary research

Every friday, write report and document work

Simple prototypes to take ideas to a more defined level

Make something that you can present to the world

Communicate the result

Prototype Refine Communicate

presentation Process gateway Report Examination

Aesthetic value tutoring Jonas Sandström Style and story Demian Horst

Note: The diagram shows a timeline from February to June with phases labeled 'Prototype', 'Refine', and 'Communicate'.