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User mapping in audio streaming services

Bachelor's thesis in design and product development

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CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2017

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Abstract

The aim of this project has been to provide insights on how users utilize streaming services for listening to audio in their daily lives and to anchor the insights in how technologies work to provide them with the user experience they desire. Additional objectives of the project have been to ideate around possible improvements to the user experience based on the insights and also to examine how implementation might affect privacy and social sustainability.

Several methods for data gathering were used, including street and personal interviews and an online questionnaire as well as methods for analyzing gathered data, such as the KJ-methodology, brainwriting and brainstorming.

Insights from the user research show that, within the target audience of people between 20-30 years old who reside in an urban environment, music is by far the most common form of audio consumed, followed by the relatively new form of audio known as podcasts. Since users of streaming services now have access to a large variety of music, they listen to different kinds of music as a tool in their daily lives to steer their mindset and mood in a way they desire. Music has to some degree become a background to whatever else they are doing, helping them perform the way they want. They have also given a lot of control over their music consumption to the streaming services, giving the services access to data in order to understand their taste and preferences so that it can play music that they like without having to put much effort into finding and choosing themselves. There is also a desire amongst the users for these services to become better at finding the right music for them. At the same time, there is a fear of giving up one's privacy and losing control over what data that is being shared with companies that provide audio streaming services.

Taking trends within technology into consideration, like big data and the vast data mining and analyzing power that comes with AI and machine learning, the conclusions made from this project points towards the possibility of creating an automated listening experience that answers specific user desires, but that also offers a more transparent and intuitive way of giving users a better overview and control over how their data is processed.

Acknowledgements

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Table of content

1. Introduction

This is a report on a user research project within audio streaming services that was carried out in New York City by the author, a bachelor's thesis student at Chalmers University of Technology in Gothenburg, Sweden. This chapter describes the background, aim, objectives and delimitations of the project.

1.1 Background

The music business had a rough time entering the digital era, transitioning from physical to digital and from ownership to access. Since 1997, when IFPI started measuring global sales, the recorded music industry's annual revenue has been in almost constant decline (IFPI, 2017). The industry lost 40% of its revenues between the years of 1999 and 2014, but the last couple of years have been somewhat different. In 2015 the business took a step in the other direction and revenues increased by 3.6%. This was followed by 2016 where revenues increased by another 5.9% as shown in figure 1 (IFPI, 2017).

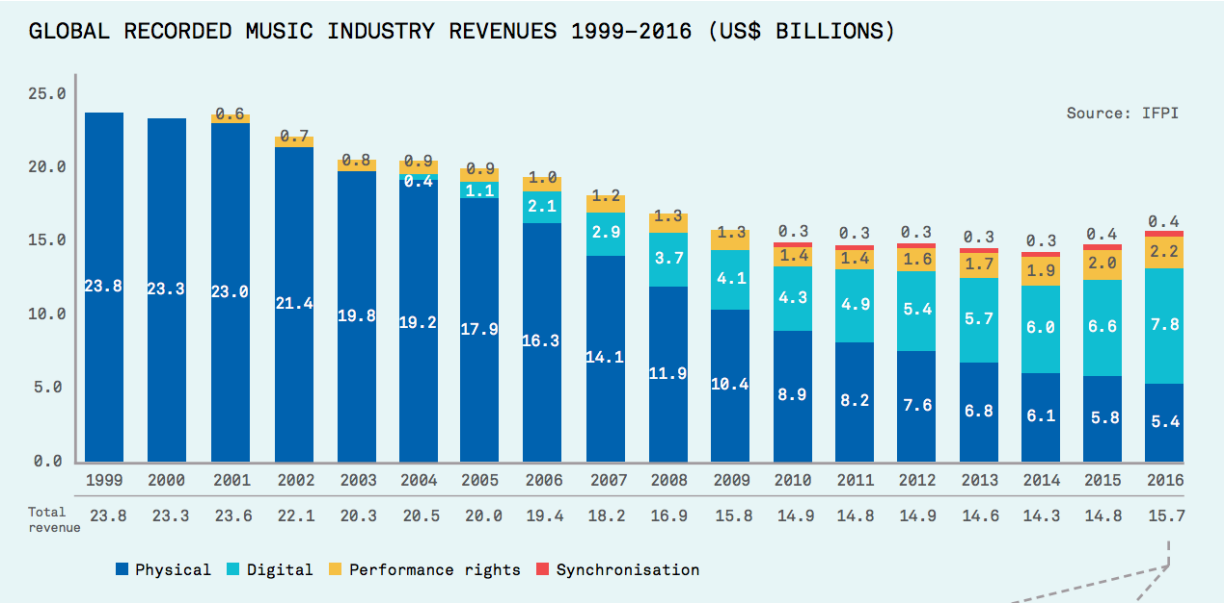

Figure 1. Global recorded music industry revenues between the years of 1999-2016 in billions of US$ (IFPI, 2017).

The revenue increase from streaming services largely drives the overall rise in revenue. Streaming is now making up 59% of the total digital revenue, which in itself has passed the 50% mark of the total global revenue as shown in figure 2 (IFPI, 2017).

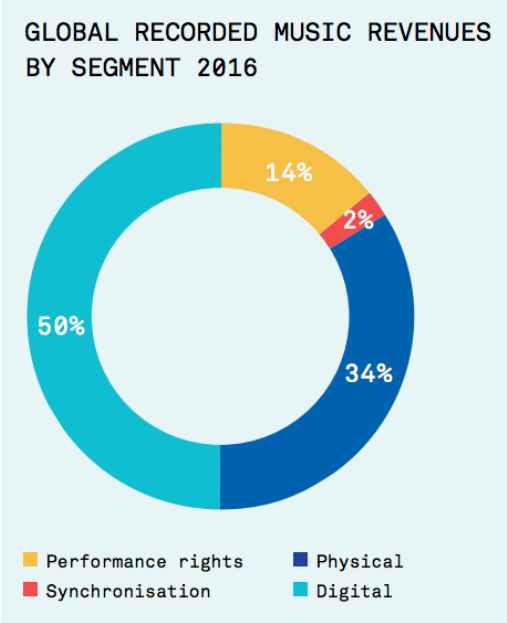

Figure 2. Global music revenue by segment 2016 (IFPI, 2017).

Streaming changes how the world consumes media. It has made it possible to access all types of digital media whenever you want, wherever you are. Expanding mobile device usage (Poushter, 2016) and large corporations making investments in providing internet connection all over the globe (Gibbs, 2016) open up the opportunity of designing user experiences of the future since a large audience are yet to be introduced to the different tools that smart devices provides. Streaming has opened the door for other types of media. Podcasts are an example of a relatively new format of media that has reached a much larger audience thanks to the increased use of smartphones together with streaming services.

Due to trends such as streaming becoming mainstream, smartphone usage increasing and internet connection being more widely spread across the world, this project sets out to investigate how the users of today's audio streaming platforms use their services and how these platforms could be developed to better suit theirs and future users' needs.

1.2 Aim

The aim of this project has been to provide insights on how users utilize streaming services for listening to audio in their daily lives and to anchor the insights in how technologies may work to provide them with the user experience they desire. In order to do this, the project sets out to complete three objectives, described in section 1.3.

1.3 Objectives

Objective 1 – Data gathering and processing:
To explore how personal data can be collected and processed in order to improve personalization and usage of audio streaming services from a user perspective. This will be done by understanding what techniques and technologies are used today and how users are

utilizing the functionalities they provide. The methods for doing this are listed below and will be further elaborated on in chapter 3.

Data Sources:

- Articles, reports and statistics from secondary sources
- Users of various audio streaming services
- Industry experts

Methods:

- Desk research
- Online questionnaire
- Street and personal interviews
- Workshops

Objective 2 – User Experience (UX):
To explore how a better understanding about individual users could improve the user-experience within audio streaming applications by ideating around and conceptualizing high-level functionalities based on the insights that the primary and secondary research of this project provides. The methods for doing this are listed below and will further elaborated on in chapter 3.

Data sources:

- Users of various audio streaming services
- Designers, researchers and students

Methods:

- Ideation techniques, e.g. brainstorming and brainwriting
- Workshops
- KJ-analysis

Objective 3 – Privacy and social sustainability:
To explore how users perceive and are affected by data collection and processing taking place in order to improve the user-experience of audio streaming services. The methods for doing this is listed below and will be further elaborated on in chapter 3.

Data sources:

- Articles, reports and statistics
- Users of various audio streaming services

Methods:

- Desk research
- Online questionnaire

1.4 Delimitations

Delimitations are necessary to provide a framework for how this project is going to be conducted, to enable researchers to draw the line of what goes into this report. The focus of the research is the user of audio streaming services, but in order to understand how these services work and where future developments are heading, some attention also has to be paid to the technologies that are powering them. The delimitations of this project are listed below:

- The thesis will cover research on people's listening habits within audio streaming applications.
- The thesis will cover research on how collection and processing of user data within audio streaming applications in order to personalize the experience is done.
- The thesis concludes after the research and conceptual solutions have been presented and do not include implementation and testing.
- The research in the thesis will be focused exclusively on private use – not commercial use.
- The thesis describes developments conceptually and technological aspects are explained briefly.
- The thesis will not describe how audio-streaming services manages relationships with content providers.

1.5 Structure of the report

Chapter 1, Introduction, is an introductory chapter of the report presenting the background, the aim, the objectives and the delimitations of the project.

Chapter 2, Contextual background, presents and describes trends and technologies that are essential to gain an understanding about the links between product development and the objectives of and insights from this project.

Chapter 3, Methods, presents the methods used in for gathering and analyzing data and also describes how the methods were adapted and used for this particular project.

Chapter 4, Results and discussion, describes the insights and ideas that each method resulted in and how they shaped the forthcoming work throughout the project.

Chapter 5, Conclusions and reflections, reflects over what the project has concluded, what the insights mean going forward and what future work there is to be done building on the work done in this project.

2. Contextual background

The business of recorded audio is trying to convert the rise in revenue over the last couple of years to a sustainable situation, where artists and content creators can continue creating and investors can continue investing in them. Frances Moore, the CEO of IFPI (International Federation of the Phonographic Industry), writes in the organization's annual report that “the industry is seizing the moment, driving further innovation and exploring ever-expanding new ways of engaging with fans around the world” (IFPI, 2017).

The transformation of the audio landscape enables listeners to benefit from constantly evolving services and artists and content creators have new ways of connecting with fans and sharing their work in diverse and creative ways. On the other hand, this has also contributed to a huge decline in sales of physical copies, as well as collecting and processing users’ data. As streaming is currently the strongest driving force in the developments of the recorded audio business, this chapter looks into some of the trends, technology and techniques that are already or could be used to power the experience within audio streaming services. The information presented in this chapter was acquired in order to assess objectives 1 and 3, presented in section 1.3, but was used as input to objective 2 as well.

2.1 Streaming services for audio

From a user perspective, the concept of audio streaming is straightforward. There’s a company that provides a service in that they have libraries of content that their subscribers can access. Content varies depending on what the company’s focus is, some have music, some have podcasts, some have audiobooks, some have a combination of different types of audio. Users access the libraries of audio files over the internet through software, usually either web-based, a standalone application and/or an application on a mobile device.

The fact that listening is done directly via software makes the user experience of that software an interesting topic to explore since it is possibly a key area in the future of audio consumption which will most likely affect billions of users. In this section some of the trends, technologies and techniques that are used to power these services is presented to provide a basis for the user research and concept development that is to be presented in this report.

2.2 Personalization

One of the biggest trends in a lot of consumer facing services is personalization. The expectation of relevant, personalized and assistive experiences will continue to rise among users (Ramaswamy, 2017). Brands will focus on acquiring a detailed, data-driven view of people to really get to know them individually and help them in their daily lives. Automation and mobile devices will be of high importance in order to do this (ibid). So, what does this mean and how is it done?

2.2.1 Big data

Big data is generated by a lot of things around us at all times. Every digital process produces it and systems, sensors and devices transmit it. Big data is arriving from multiple sources in high velocity, volume and variety (IBM, 2017).

Spotify, the audio streaming service with the most paying subscribers in the world (Resnikoff, 2016) says data is the company's biggest asset for shaping the user experience (Palmer, 2013). They say that most of the company's data is user-centric and is for example used to determine which song to play next when its users listen via the personalized radio stations on the platform or to build the personalized playlist called *Discover Weekly*, which recommends new songs to users on a weekly basis (Johnson, 2015).

In order to assess objective 1 of this project, looking into data collection is necessary. Data comes in many forms, by definition it is factual information used as a basis for reasoning, discussion and calculation ("Definition of DATA", 2017). Data can be for example an opinion, expressed through talking or filling out a form, or it can be a specific action on a mobile app, collected and transmitted digitally. So how do companies collect and process data about their users and how do they use it to improve their service?

2.2.1.1 Different types of data

There has never before been so much data available as there is today and tomorrow there will be even more. So how do companies classify all the data and which types of data are there? The list below is an example of how companies and marketers can group data.

Declared data
When a person shares personal or specific information willingly through filling out a form or another purposeful action, the data is called declared data. Declared data is often valuable since it is reported directly from the user and it forms the foundation for content personalization (Bailis, 2016).

Inferred data
Data and characteristics assigned to a person based on their actions and behaviors are called inferred data. This data is often based around content consumption and can be used to build a richer user profile by combining it with declared data (Bailis, 2016).

Observed data
Observed data is data based on a person's engagement with a specific product or content. For example, a person might not make a purchase, fill out a form or some other type of purposeful action, but they spent time visiting pages about a specific product category or a specific product (Bailis, 2016).

Intent data
Data about a person that expresses intent of performing a specific action or activity. This type of data can be used to predict the behavior of a user in order to enhance their experience (Bailis, 2016).

Interest data
Data about a person's interests, often based around the subject matter of the content the person consumes on websites (Bailis, 2016).

2.2.1.2 Different sources of data

There are also different sources of data; the list below describes how data is classified based on how it was acquired.

First-party data
This is the data that a company collect from users on its own website, mobile application or other types of direct interaction with its users. First-party data is often thought of as the most valuable data because of its quality and because it is relatively cheap (Lotame, 2017).

Second-party data
Second-party data can be thought of almost as first-party data, but is collected directly from another source than the company's own users. A deal can be made between companies to offer access to data points that would have otherwise been hard to reach (Lotame, 2017).

Third-party data
Third-party data is generated and aggregated on other platforms. There are a lot of companies that sell data, but it is also available through other avenues. The important thing when using third-party data is to determine how the data was gathered and how it has been manipulated (Lotame, 2017).

2.2.2 Context-aware devices

Sensors bring intelligence and awareness to devices such as smartphones, wearables, tablets and laptops. Mobile devices have several different sensors that produce raw data on motion, location and the environment around it (Forsblom, 2015). Smartphone sensors can be categorized into three different groups based on their application (Abdulazim, Abdelgawad, Nurul Habib & Abdulhai, 2013):

Motion sensors
- Accelerometer - measures the device linear acceleration.
- Gyroscope - measures the angular change (i.e. rotation velocity).
- Magnetometer - (i.e. compass) measures magnetic field strength.

Location sensors

- GPS - commonly used in outdoor settings.
- Network-based location services that use cellular network and Wi-Fi to determine the location; this is often used for determining the location while indoors, where GPS systems are less effective.

Ambient sensors

- Light sensor - used for example to adjust brightness and levels of the screen.
- Microphone.
- Proximity sensor - detects nearby objects, used for example to shut of the touchscreen when holding the phone close to the ear.

With mobile sensors becoming smaller and more sophisticated and with the introduction of new sensors to the market, devices are becoming more and more self-aware. This means that even more data will be stored and available for building detailed individual user profiles. This is important to understand in order to assess objectives 1 and 3 of this project.

2.2.3 Artificial Intelligence, Data Mining and Machine Learning

So, we have established that there are heaps of data, different types from different sources. Lying hidden in all this data is information, potentially useful information, but how and for whom? This section links with "Objective 1 – Data gathering and processing" of this project when it comes to ways of processing collected data in order to make sense of it. The process of finding the information through patterns in the data, making it useful, is called data mining. Many of the techniques in data mining have developed within a field known as machine learning (Witten, Frank, Hall & Pal, 2017).

Applied AI and machine learning are composed of many technologies and techniques, such as deep learning, neural networks and natural language processing. The techniques move beyond traditional rule-based algorithms in order to create systems that appear to understand, learn, predict, adapt and operate with little or no human input (Gartner, 2016).

Through machine learning, a machine can learn and adapt its future behavior. For example, by analyzing vast databases of medical case histories, learning machines can reveal insights in treatment effectiveness, but the technology has many applications. Natural language generation can dynamically increase the volume and value of insight and context in data analytics. It can automatically generate narratives and personas to explain meaning or highlight key findings in data.

AI and advanced machine-learning techniques are evolving rapidly. In order to successfully exploit the techniques, companies will make investments in setup, integration, algorithm/approach selection, data preparation and model creation. In addition, these systems have to be maintained and improved, meaning that exploiting the system's learning

capabilities, evaluating the accuracy of findings and updating the algorithms and models can take significant effort, not only from the data scientists creating the system, but also from others who have the knowledge to "train" the system.

These technologies give rise to a range of intelligent implementations both in the physical world, such as robots, autonomous vehicles and consumer electronics, and in apps and services such as VPAs (virtual personal assistants) and smart advisors. The data science needed to create these systems is complex so many organizations will consume applied AI and machine learning mainly through packaged intelligent apps or devices or through packaged "models as a service" that can be built into custom applications.

Looking at objective 1 of this project, the vast possibilities of data collection and analyzing powers that comes with AI and machine learning can enable systems to build detailed profiles based on individual habits and behavior in order to assess user needs and desires. This applies to audio streaming software due to the fact that companies providing these services have the possibility to map their users' listening behavior not only in terms of their taste in music, but also where, when and in which situation the users find themselves.

2.2.3.1 Intelligent Apps

During the next 10 years, virtually every application or service will incorporate some level of AI (Gartner, 2016). Some of these will be obvious intelligent apps and some will have AI and machine learning working "behind the scenes".

Some intelligent apps, such as VPAs, will perform some of the functions of a human assistant with the goal of making everyday tasks easier and their users more effective, for example prioritizing e-mail and highlighting the most important content and interactions.

AI is expected to be one of the next major battlegrounds in software and service markets and there are particularly three areas that stand out where app and service providers will likely be applying AI techniques:

- Advanced analytics
- Increasingly autonomous agents
- Continuous and conversational interfaces

Models as a service are likely to see an expanding market. Predefined models that have been taught about a particular domain and trained to identify key patterns are expected to be delivered as a service for incorporation into other packaged or custom applications. For example, customers may use an intelligent app to act as a personal shopping assistant or a financial advisor, among various other possible applications of the technology.

Gartner (2016) suggests in its report that intelligent apps constitute a long-term trend that will evolve and expand the use of AI and machine learning in apps and services during the next 20

years. There should be in every organization's interest to establish a process to continually evaluate where the organization can apply AI today and over time and to use a persona-based analysis to determine the opportunities. However, the underlying AI and machine-learning elements for creating intelligent apps are not ready for most application development at scale. Development of applications should therefore proceed with caution and the potential business value should be high, but note that the competitive gaps and missed opportunity costs for laggards could be significant.

2.3 Privacy

Looking at objectives 2 and 3 of this project, the collection of personal data in order to create a personalized user experience has a positive impact in that services can provide their users with relevant content more accurately, but the collection and use of data to create detailed personal profiles have clear privacy implications (Tene, 2011). One of the concerns is that users are seldom aware of the data collection process, prospective data uses and the myriad of actors involved.

The controller of the data can strip it from personal identifiers, such as names and social security numbers, to prevent marketers and identity thieves from abusing personal information. But there are ways around figuring out who is behind the data through background knowledge and by cross-correlation between different databases. De-anonymization of seemingly anonymous databases has been demonstrated by researchers who were able to identify a large proportion of anonymous Netflix subscribers by matching data from the movie rating system against additional online databases (Narayanan & Shmatikov, n.d.). The researchers were able to uncover apparent political preferences and other potentially sensitive data and link it to individual subscribers.

With mobile device usage rising, so are the complications surrounding privacy. Through sensory technologies, described in section 2.1.3, mobile devices can transmit data on their surroundings at all times even when not being used. This happens without many users being aware of it, which has sparked discussion in how new rules should be put in place to reinforce the individual control over the collection and use of location data as well as third party access (Tene, 2011).

Third party applications pave the way for endless functionality towards the end user. However, even if users would try, they would find it hard to understand which platform developer and application developer that do what with their personal data, where they store it and who has access to it. Apps operate on global levels, creating multijurisdictional patterns where a user could be operating in country A, with equipment made in country B, operated by a mobile operator in Country C, to download an application developed in Country D, which stores and processes data in Country E, transmitting it through routers in Country F. The vast

multitude of parties involved, automated computer to computer sharing, cross-border data flows and opaque privacy policies puts the app economy in a position where privacy and security frameworks still have tough challenges in order to protect the end-user.

2.3.1 Public perception of privacy on the internet

Research has shown that Americans perceive a lack of control over their personal information (Madden, 2014). These concerns apply to everyday communication channels and the collectors of the data, both corporate and government. An outtake from the study shows the following insights:

- 91% of participants reported that they "agree" or "strongly agree" with the statement that consumers have lost control over how their personal information is used by companies.

- 80% of those who use social networking sites say they are concerned about third parties like advertisers or businesses accessing the data they share on these sites.

- 61% "disagree" or "strongly disagree" with the statement: "I appreciate that online services are more efficient because of the increased access they have to my personal data."

- 61% said they want to do more when asked about their efforts to protect their personal data.

There are significant differences in what type of data the participants felt were sensitive, which is illustrated in figure 3 (Madden, 2014) below.

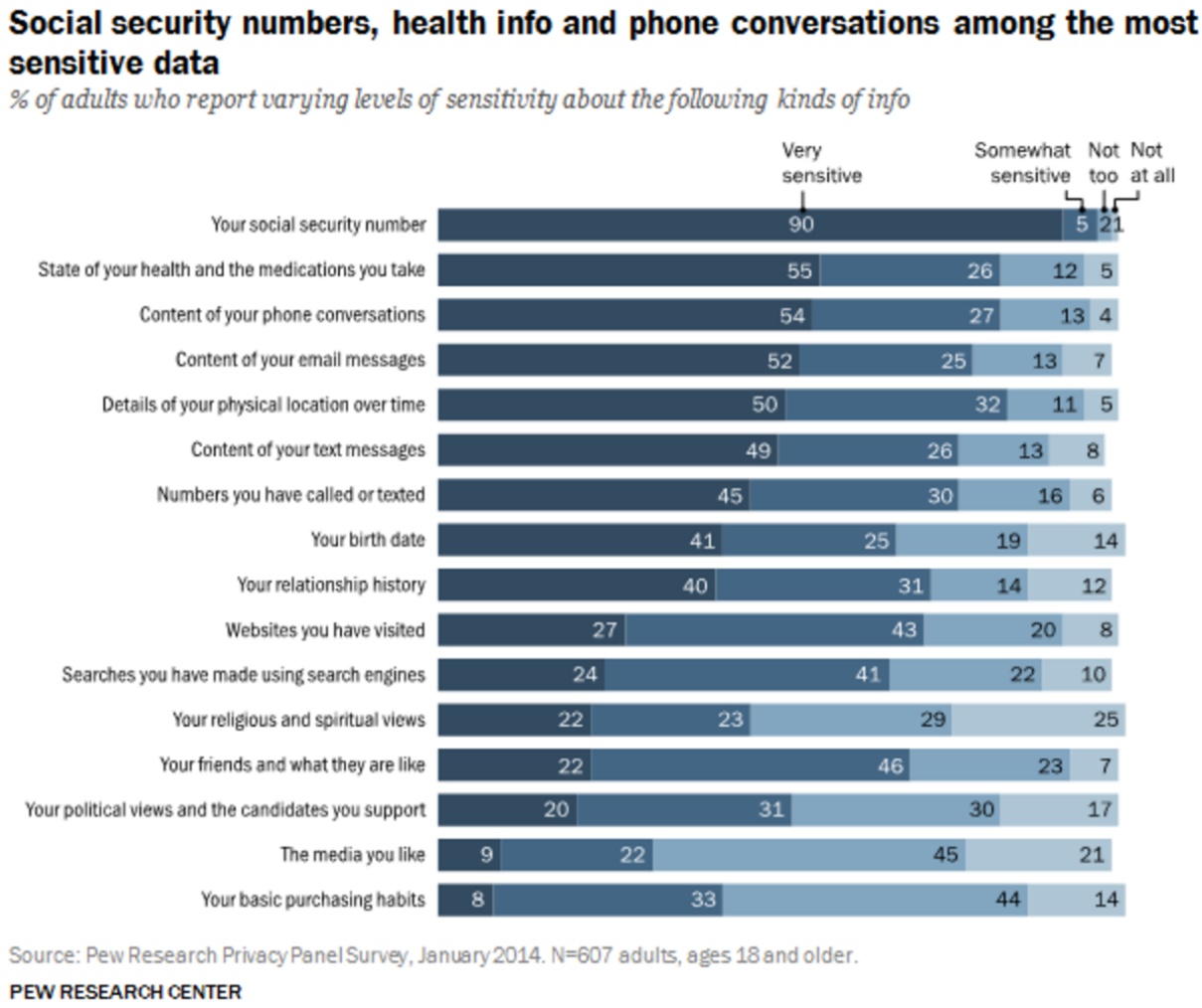

Figure 3. Showing the level of sensitivity of different kinds of information, expressed by American adults in 2014 (Madden, 2014).

3. Methods

The primary research in this project revolves around the user of streaming services – investigating how users utilize streaming services for listening to audio in their daily lives, and anchoring the insights in how technologies may work to provide them with the user experience they desire. Additional objectives of the project have been to ideate around improvements to the user experience based on the insights, as well as to examine how implementation might affect privacy and social sustainability and how issues regarding this can be improved in the eyes of the users. To explore this, different methods for gathering qualitative data and quantitative data were used in order to provide an as rich and detailed view of the current landscape as possible.

Trends and possibilities powered by technology developments play a big part in the future of streaming services, as with many other branches of digital business. Therefore, the primary research done in this project has been complemented with secondary research, commonly called desk research, which is presented in the contextual background of this report.

Analysis and ideation methods were used in an iterative manner both to assess gathered data and reach conclusions as well as design material such as interview guides and an online questionnaire throughout the research project. The different methods used in this project are described in this chapter as well as how they were adapted and performed to generate the desired outcome.

The decision of which order, shown in figure 4, the methods were to be carried out was influenced by the foot-in-the-door technique (McLeod, 2014), which leans on the psychological phenomenon of compliance, i.e. that a person is more likely to agree to a larger request if they have already agreed to a smaller one. For example, recruiting to the longer personal interviews, described in section 3.5, was often done after a person had taken the online questionnaire, described in section 3.3, or participated in a street interview, described in section 3.4.

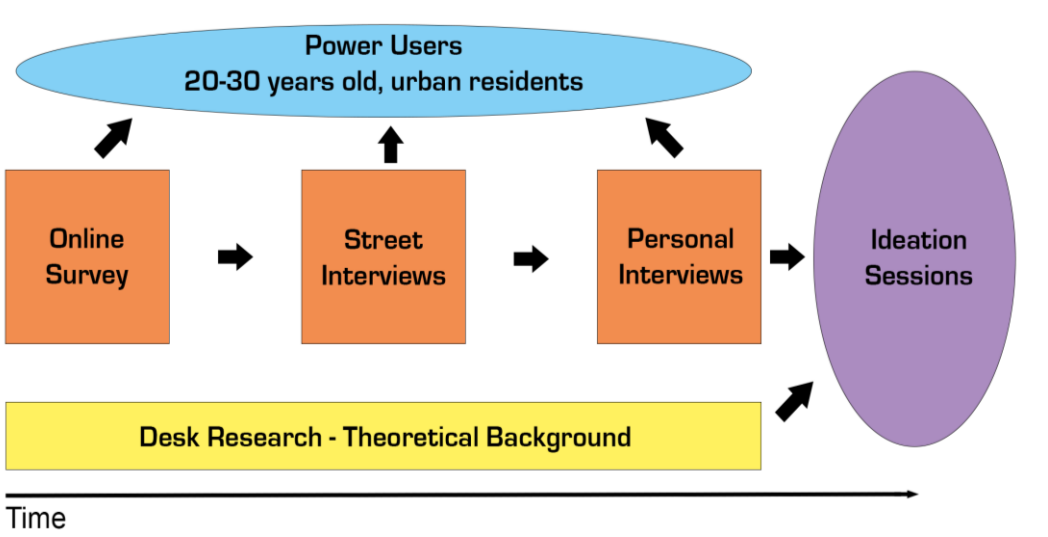

Figure 4. Visualizing the order of which the methods were conducted over time.

3.1 Desk research

Desk research, also known as secondary research, involves gathering and analyzing data that is already available on print or published on the internet (Business Dictionary, 2017). It is of high importance that the quality and source of the secondary data is analyzed well before including and drawing conclusions from it. The method is useful for guiding the primary research and ideation throughout a research project (Linh Do, n.d).

In this project, the desk research is both exploratory and investigating, the reason being that in order to understand how audio streaming services could be developed further, which ties into objective 2 in this project, one must have a grasp of how services work today, which ties into objective 1 of this project. Starting out as exploratory (e.g. technology trends), the desk research is used alongside the primary research of this project and is presented in chapter 2.

3.2 Ideation session

As an initial step of the primary research, an internal ideation session was hosted at the PURE offices where the contextual background and target audience for the research were discussed. The ideation was done together with two other students from Chalmers, also working with research on audio streaming platforms, as well as the supervisor from PURE. The session contained brainwriting sessions that were later analyzed using the KJ-analysis methodology.

3.2.1 Brainwriting

Brainwriting is an ideation technique very much like brainstorming, except instead of stating ideas aloud, participants in the brainwriting session write their ideas down individually. The starting point of conducting the technique is to pick a subject or question to assess and the

attending people write their thoughts and ideas down during a set amount of time and share them afterwards (Rudy, 2016).

In this project, the group made different sessions of brainwriting assessing different subjects, such as problems and opportunities within the audio streaming landscape and traits and characteristics within different audiences. This was done in two separate sessions. In the first one, all ideas were allowed, explored and documented on post-it notes. In the second session, ideas were grouped and prioritized using the KJ-analysis methodology.

3.2.2 KJ-analysis

The KJ-analysis method is used to allow a group to quickly reach consensus on priorities of subjective, qualitative data (Spool, 2014). The idea is that when there is a base of written qualitative data, from for example transcriptions of interviews or a brainwriting session, KJ-analysis is used to distinguish patterns and themes within the raw data by grouping them and analyzing the groups. This method was applied in this project.

3.3 Online questionnaire

An online questionnaire is a fast and convenient way of gathering data (Sincero, n.d). The fact that everything takes place online makes this method an easy way of gathering data since it can be rapidly deployed and completed by many participants anywhere and anytime. The answers are automatically stored in a questionnaire database, which makes the data easy to access, sort and analyze. The disadvantage with online questionnaires is that there is no interviewer present and that limits the possibilities of probing and asking follow-up questions for gathering qualitative data. There is also the risk of participants completing the questionnaire with the sole purpose of acquiring the offered incentive, which risks skewing the results.

In this project, an online questionnaire was conducted in order to provide high-level understanding on certain themes such as which forms of audio to focus on when designing the later research of this project, how people feel about privacy implications such as third-party applications tracking their location, which smartphone applications most people use for streaming audio and if they use several for different purposes. The online questionnaire was used to assess both objectives 1 and 3 of this project. The questionnaire was conducted together with another group of students from Chalmers doing research within a similar area in order to get a larger sample size, since many of the questions were of interest for both projects. The online questionnaire was designed using an online tool called Typeform (https://www.typeform.com/) and distributed using social media and public forums.

The online questionnaire contained mostly closed-ended questions, meaning that the participants mostly encounter questions with a set of predetermined answers to choose from. This leads to mostly quantitative data.

The first couple of questions were meant to generate information on the individual participant, such as age, location and gender. Thereafter the questionnaire went into asking high-level questions on the person's audio consumption.

Some questions had the option of a free text answer if the participants would not find any of the alternatives suitable. There were also some questions where, if the participant chose a specific answer, they would be presented with a textbox and asked to describe the reasoning behind choosing that specific answer. Participants were also asked to provide their email addresses if they were interested in learning more about the research and participating in a personal interview. For the full questionnaire and the results from it, see appendix A.

3.4 Street interviews

Street interviews is a face-to-face data gathering method that usually takes place in the street, at shopping parks or different kinds of events (Visionone, 2016). The interviews are normally short and to the point in order not to deter people from participating. They are usually conducted in a structured manner with mostly closed-ended questions, but can be combined with a few open-ended questions to further explore the answers of participants.

One of the advantages with this type of data gathering method is that it enables an interviewer to use mediating tools in the interview like objects, product samples or some type of visual aid. Another advantage is that by choosing the right location, the researcher can target specific groups of people that would be of interest for the research.

In this project, the interviews were carried out with the purpose of getting more qualitative data to complement the data gathered in the online questionnaire and to assess the assumptions about the initially thought out target group, which are people between the age of 20-30 who reside in an urban environment and can be seen as “power users” of audio streaming services. These interviews were conducted in Washington Square Park by one of the New York University campuses. The location was chosen based on the assumption that there would be a high presence of people within the target group. The interviews were designed to determine early on if the interviewee was a part of the target group or not and therefore, the length of the interviews varied. This was done by first asking a couple screening questions, such as if the person uses streaming services, which services they use and so on and thereafter deciding which version of the interview guide should be used. As with the online questionnaire, as a last step of the interview, participants were asked to provide their email addresses if they were interested in participating in a longer personal interview where

going into more detail about their habits and needs would be possible. For the full interview guide, see appendix B.

The street interviews were documented through note taking and later analyzed to find patterns in what questions generated data that would have been possible to explore deeper if the interview would have been longer. This was done in order to provide a framework for designing the interview guide for the personal interviews.

3.5 Personal interviews

Personal interviews are used to probe the answers of a small number of respondents and at the same time observe their behavior. The purpose of this is to gather deeper and more detailed qualitative data on people's thoughts and behavior surrounding a certain subject. It is also used to provide context to quantitative data.

The advantages of this method lie in the rich and detailed data that comes from probing answers of the participants, who often feel more comfortable sharing their thoughts through conversation rather than filling out a questionnaire (Boyce & Neale, 2006).

When recruiting interviewees for this project, two types of interaction were used:

- **E-mail list** - by asking people who took the online questionnaire or street interview for their email address, a list of potential candidates had been formed based on their location and previous answers. These candidates were contacted and asked to participate in a personal interview.
- **Cold approach** - recruiting took place through asking around at Industry City, one of the largest co-working offices in New York City, hosting companies in different areas such as design, media, manufacturing, technology and more. As with the street interviews, a short screening process was conducted to determine if a person was a member of the target group for the research and a candidate for the personal interviews.

In this project, the interviews are conducted in a semi-structured manner, meaning the interviewer used a predetermined interview-guide, which can be seen in appendix C, with questions and areas of discussion. Since rich qualitative data was the desired outcome, the interviewer used probing questions extensively to explore the interviewees answers on a deeper level.

The interviews were documented by video and audio recording in order to provide rich material for researchers to analyze at a later stage. The interviews were later transcribed to enable the possibility of conducting KJ-analysis, described in section 3.2.2.

3.6 Concept ideation

As a last stage of this project, the supervisor from PURE and two other students were invited to ideate around the collected data, form concepts and reach conclusions. The focus here was mainly on objective 2 of the project, but objectives 1 and 3 were also assessed and ideated around since the objectives are intertwined on some level and at this stage of the project, all the gathered data was to be incorporated in the ideation session.

In this project, analyzing gathered data was done iteratively throughout the whole period of the project, shaping and nudging the next step of the research (see figure 4). Ideation sessions were conducted to assess the gathered data, both qualitative and quantitative. KJ-analysis, described in 3.2.2, was used to identify key user-insights, then brainstorming and brainwriting sessions were used to correlate user-insights against possible functionality and design guidelines in line with technological trends and developments, which ties into objective 2 of this project.

4. Results and discussion

In this chapter, the results that each method of primary research generated and how the learnings shaped the forthcoming work is described and discussed.

4.1 Ideation around target audience and methodology

Since the project was to be conducted in New York City, USA, where PURE is located and where thesis work like this is not as well-known amongst companies as in Sweden, one reason for this session was to sync the expectations between the student and the company. The other reason was to discuss the methodology, described in chapter 3, and which audience to target. The session generated the following idea as to which audience to target:

Geo
The target audience is residing in *urban environments*, which would most likely enable them to be more culturally engaged than if residing in rural areas and also easier to reach within the boundaries of this research project.

Age
The target audience is between *20-30 years old*. This was assumed partly on the basis of research on user groups for the popular streaming service Spotify (McIntyre, 2016), partly on the assumption that more people in this age group are engaged with streaming applications on a deeper level than people above 30 years old. This due to the target audience having had access to these services during a larger part of their lives.

Usage
The target audience is a "*power user*", meaning that they listen to multiple different sources of audio (music, podcasts etc.) and use a variety of platforms every day.

4.2 Online questionnaire

In order to assess objectives 1 and 3 of this project, an online questionnaire was distributed on social media and public forums and was available for completion over a one-week period. This generated 343 complete responses. 45% of the participants lived in Sweden, 38% in USA and 16% in other countries. 62% were women and 63% were between 20-30 years old. 95% of the participants stated that they use audio streaming services and 72% pay a subscription fee for at least one service. The most common audio to consume is music with 95% of the participants stating that they listen to music on a regular basis, podcasts being the second most common form of audio with 47% of the participants stating that they listen to podcasts on a regular basis. The most common places for consuming both music and podcasts is at home and during the commute. The most common platforms for consuming music are Spotify, Youtube and Pandora, in that order with Spotify being the most common platform.

For podcasts, the most common platform is Apple's Podcaster. For more insights from the online questionnaire, see figure 5 to 10.

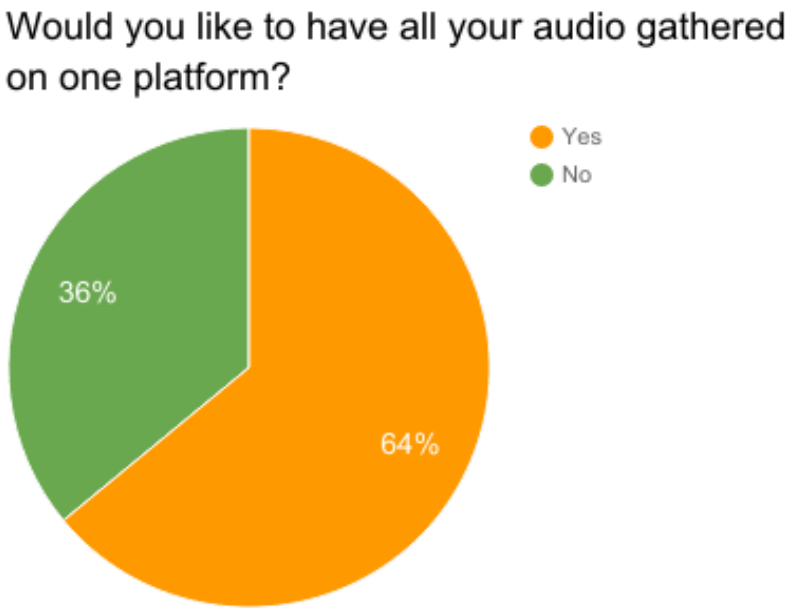

Figure 5.

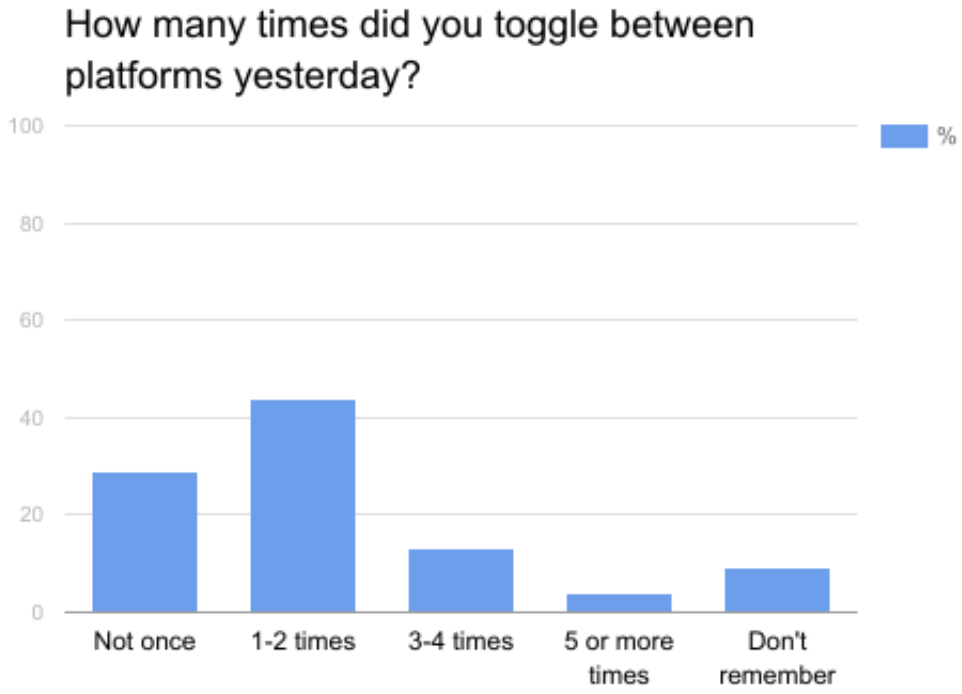

Figure 6.

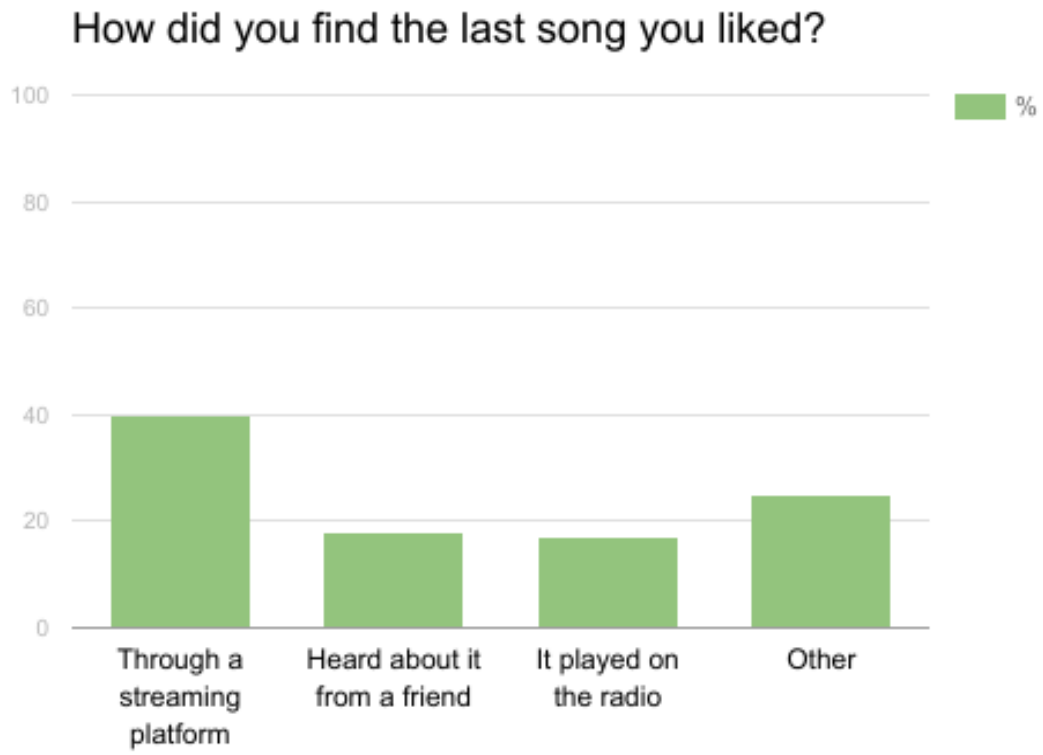

Figure 7.

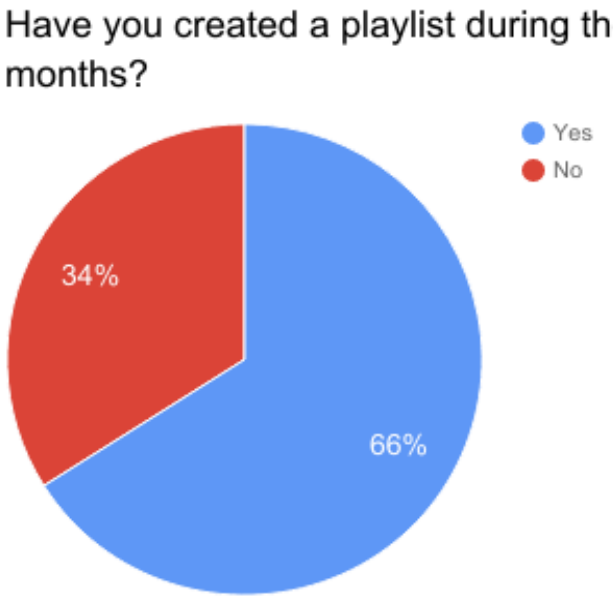

Figure 8.

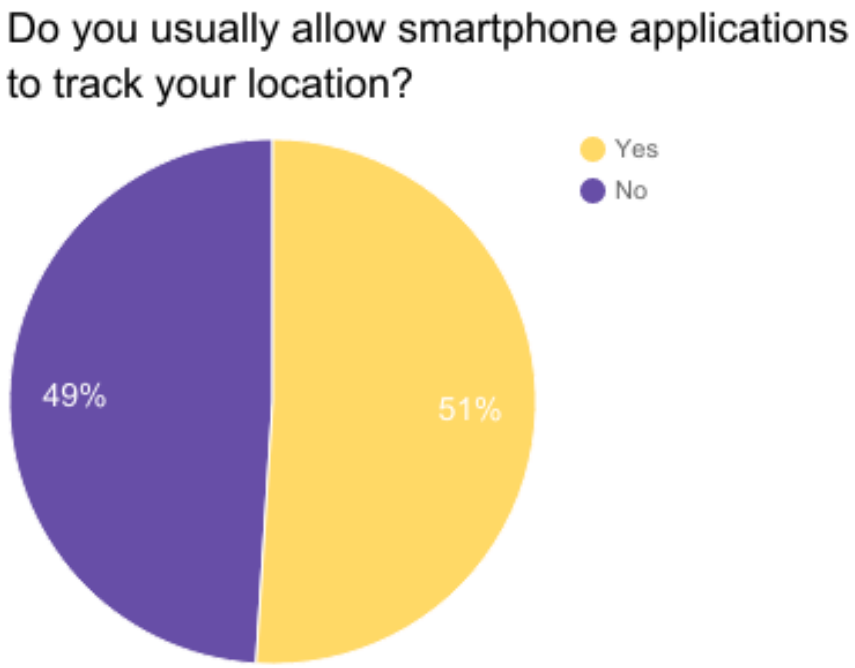

Figure 9.

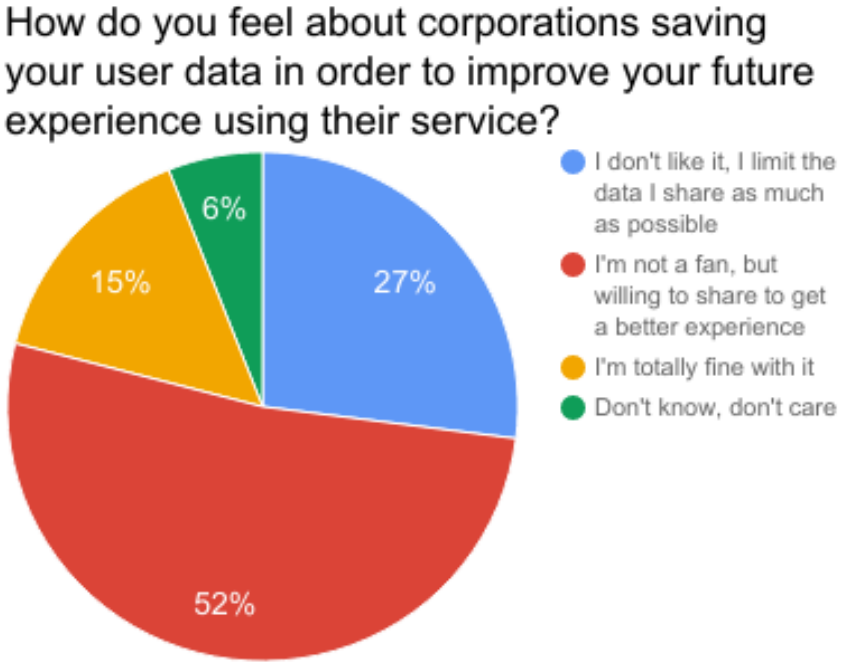

Figure 10.

The majority of the participants in the questionnaire is using more than one platform for consuming audio, switching back and forth between them. Many would like to be able to access all their audio through one single platform.

Many of the participants uses streaming platforms for discovering new music, more so than getting recommendations from friends or hearing a song on a radio station. Also, many of the participants use playlists to organize their audio, many of which created a new playlist during the last three months.

Only 15% of the participants stated that they feel comfortable with their usage data being gathered in order to improve their user experience. 52% stated that they feel uncomfortable with their data being stored and analyzed, but in order to not miss out on an improved experience, they are willing to share it anyway. 27% stated that they do not like sharing their data at all and that they are actively choosing to not share it when given the opportunity. The fact that 79% of the participants are experiencing discomfort with sharing data is a sign that many companies have a long way to go when it comes to making their users feel comfortable about how their data is being processed.

When asked specifically about location data, 49% stated that they usually do not allow smartphone applications to track their location. This points towards location data being specifically sensitive in the eyes of application users.

The data from the online questionnaire correlates with the data from the secondary research presented in section 2.3.1 when it comes to thoughts on privacy, especially location tracking.

4.3 Street interviews

The street interviews (appendix B) generated qualitative data that were useful to develop the interview-guide for the longer personal interviews and to assess objectives 1 and 2 of this project. In general, there was not much room to deeply probe the responses since the people being interviewed were often ‘on the go’.

A total of 21 interviews were conducted over two days and three themes could be determined based on the participants’ answers. These themes would later be incorporated in the interview guide for the personal interviews. The themes are described below with some illustrative quotes from the participants:

Theme #1: Use of different platforms and switching between them
When asking questions surrounding specific platforms, the interview subjects could easier remember in what situations they use each and the reasoning behind why they use a specific platform for a specific cause. The quoted answers below illustrate the theme:

"In Spotify I make playlists, but if I'm not in the mood for picking music and just want to have something playing or I wanna find something new I'll go to Pandora." – Participant 5

"I use Spotify for mainstream listening, like the Daily Mix or Discover Weekly, if I don't feel it there I'll go to my own playlists. Soundcloud is more for local stuff, bands that aren't signed, I would say that it's usually better but Spotify is simpler. Sometimes I listen through Youtube because there's stuff that's not on Spotify, like Logic, the rapper." – Participant 17

"I use Spotify on my phone and Youtube or Soundcloud when I'm on my PC. I don't use Soundcloud that often, it's more for local indie stuff, so I guess my go to app is Spotify and if I'm not there I'm on Youtube." – Participant 8

As this data reveals some insight into the listening habits of people, probing these answers, exploring more deeply for example why a person does not want to pick their own music, how they feel about switching between the apps they use, which app does what better and so could give deeper insight about how and why people listen to music.

Theme #2: Discovery and organization of music

Another subject that resulted in interesting qualitative data was talking about discovering music. This subject also enabled the interviewer to lead the interview into the way the interviewees organize their music and what they do when they find a new song.

"I do use Daily Mix to find new music. I don't like the Discover Weekly, like who do they think I am? I try to save the songs in my own playlist. It's hard to remember the song but I usually remember the artist. I usually find new music when I'm out walking, that's when I'm really exploring" – Participant 11

"I found it when going through the Spotify Discover Weekly playlist, then I saved it to my own playlist." – Participant 2

"Like if I hear another artist talk about it for example, then I'll usually download the whole album with that song in it, I mostly listen to albums, I don't use playlists that much." – Participant 4

This illustrates an opportunity for future work, to probe these answers to get an even deeper insight. What is it about being out walking that makes the person more receptive to new music? Is the person looking at their phone at that point? Questions like these could provide rich data about a person's habits and relationship to music.

Theme #3: Mood and situation

Another theme that provided interesting qualitative data was the way mood and situational context affects what audio a person listens to. This subject is especially interesting looking at it from the perspective of the streaming service and the curated music it provides. The fact that people carry their phone with them almost everywhere they go, while it collects data

about its surroundings, its location, the time, the weather, other devices around it, etc., makes it interesting to find out how much these things tell about a person's mood and actual situation and how much the mood and situation affects the preference of music.

"In the morning I listen to a lot of old songs, then I'll switch to my favorite music during the day." – Participant 20

"Today it was hard to choose music because it's such a nice day. It really depends on like the weather and my mood." – Participant 7

"I don't listen to the same music when I'm with friends or going out." – Participant 17

"If I'm stressed out I'll probably listen to music to relax. I listen to podcasts when I feel I have the energy for it." – Participant 12

4.4 Personal interviews

The personal interviews (see appendix C) in this project provided rich qualitative data in and around the subject of audio consumption, which was useful for objectives 1 and 3 of this research, but also used to assess objective 2. Eight interviews, around 30 minutes each, were conducted and documented using video and audio recordings. These were later transcribed and analyzed through KJ-analysis. The personal interviews gave the following four key insights, which were combined with data from the questionnaire and street interviews when ideating around functionality and formulating the conclusions of this report.

Key insight #1: Music as a tool in daily life
Streaming services offer huge libraries with a large variety of music, some of them also offer podcasts and other types of media, such as music videos. But what has been clear throughout this project is that music is the form of audio that people consume the most and almost everybody does it. An insight that the personal interviews provided was that an always-accessible source of different kinds of music has made people use it as a tool in their daily life. People seem to use music for different things, such as blocking out distracting noise when they need to focus, or steering their mood and mindset in a desired way.

"I will play music that, in a way, affects me in the way I need to be affected in order to be productive within what I'm doing, so I would choose music that goes in tandem with my intention." – Participant 3

"..and I have to do a lot of you know like, administrative work, I have to have something in my ears or else I won't focus." – Participant 1

"It depends, what is it that I need to be doing, what else I need to be doing besides listening to music, the listening to music part is usually the background of whatever else that I need to do." – Participant 3

"It depends on what I'm working on, if I'm stuck on a problem, I might listen to some like, slow trance, just like low bpm trance that is kind of relaxing, versus like if I'm just building another web-app, and can do that like with my eyes closed, I'll put on some metal and just bust it out, so it kinda depends on what I'm trying to do." – Participant 7

Since hearing is the only sense being occupied when listening to audio, listening to music does not prohibit people from completing tasks where there is no need to hear. But getting focused and productive it is not necessarily the only way that people use music. People have different purposes for different kinds of music, and it affects them differently both physically, mentally and emotionally.

People also have their own ways of categorizing music in their head and these categories in turn have different meaning and levels of energy that is somewhat individual to each person.

"It feels like I'm admitting how I like conduct my emotional life, but if I get in a fight before I leave for work, to get on the bus, the days I need music, I have the headphones on immediately." – Participant 1

"So, just now at the shop, we were listening to Pandora and the station we created was Disclosure, because we needed something to like really pick us up in the last couple of hours. But, you know, in the morning I would listen to some soft classic jazz" – Participant 2

"So there's feel good music, music to release too, I'm one of those people who, if I'm really sad, I need to listen to music that kinda like evokes these emotions and I just can like let them out, pour them out and get it over with, so that I can move on with the rest of my life, uhm, there's another compartment for wake me up music, keep me in the gym music, relax of course, go to bed, let go of the day music, get into meditation mode music, yoga music. This is generally how I go about it in my head, I obviously don't necessarily compartmentalize them in the labeled genres that you think of when you go to a record store or when you go on Pandora or something, simply because I can listen to an Ella Fitzgerald tune that I find really relaxing, but if I'm in a mood for listening to, I dunno, bhajans from India, some of them I also find relaxing, so those two would go in the same category in my head because essentially, they have a very similar effect on my psyche." – Participant 3

Answers like the quotes above were interpreted to form the insights that the interviewees use music as a background in their life to, in a way, create an ambiance to their environment and situation and that the purpose of the listening activity is not exclusively to listen to music.

Key insight #2: Personal bridges between and elements in music that services do not recognize

Many of the interview subjects like using curated playlists in order to not have to pick music every time they want to listen to something and to discover new music. But services seem to have room for improvement when it comes to finding what personal and individual bridges people build between different music and also what elements within songs actually speak to the listener.

"I like to hear something new, and Pandora does that sometimes but I feel like it doesn't, for me it doesn't really hit the mark very often." – Participant 1

"I feel like there's different aspects of different music that we like, that I like, that it's not necessarily gonna pick up on, like if I type in King Crimson for example, I might also wanna hear Bartok, you know, classical composer, like for me that makes perfect sense, but there's no streaming service that will recognize that, because that's, one is classical, one is classic rock or whatever, so I feel like there's more bridges between music than it recognizes." – Participant 5

"I don't want Ariana Grande on my, why is this here, but I get it why it's there because it's similar to other stuff I like but it's not, yeah" – Participant 1

"I wanna hear something new so I'll type in like, Dirty Projectors or something, wanting to hear new bands, and sometimes that introduces me to somebody but more often I feel like it's kinda stuck in a similar, like that's obviously in the sort of modern indie-rock category and then that's what you get, whereas that's not necessarily what I like about that band." – Participant 2

The fact that most of the larger streaming services today are using data collection and machine learning to constantly improve their software for picking music makes room for questioning if the interview subjects have used the services long enough and provided the services with the necessary information to become better at picking music for them. Nonetheless, the interview subjects experience is that the service is not as great as it could be at doing so and perhaps there should be ways of making the software more effective. Maybe it could be done by communicating a message to the user that they can help the service become better by providing it with useful data, but also by enabling the user to provide such data easily and intuitively.

"Eventually, based on that [uplikes and downlikes] like if you do it for a long time, it'll just play basically all the songs, you'll love, like, it's awesome, once you get Pandora to like an awesome station, like once you've formatted it and like really put a lot of work into it, Pandora will just play like every song you love that's like that, it's awesome but like, it takes a while." – Participant 6

"I think Pandora starts out worse, because there's like a broader range of artists that they're trying to say like; Hey, do you like this, do you like this, do you like this, but if you use it correctly and say I like this song, I don't like this song, I think that their algorithm is better to where they get more precise of kind of what you're looking for in your music, where as Spotify is more like, they base it I think on other subscribers so they say, all these subscribers likes this song, and you like this song, and they all like this song so you should like this song too, you know, and it doesn't always work that way." – Participant 7

Key insight #3: Music, memories and nostalgia

Nostalgia and music seem to go hand in hand, as many of the interview subjects could connect specific musical pieces with life events and some of them even put certain songs in playlists to sometimes get that nostalgic moment back, because they liked the feeling.

"I mean it's the best, that's why you'd see like 5 year old songs in same playlists that has only new music, right, like I'll sprinkle them in because it's, it's nostalgic, nostalgia is, it's really important." – Participant 1

"It's a little stupid, when I was 15 I went to Disney World with all of my friends from high school and it was like the summer that all of those songs like Billionaire with Bruno Mars and, what was the other one, like the Usher song OMG, California Gurls, they were all like big in the US and all over the world, and these were the songs that made my trip, every time I listen to one of them I remember that trip." – Participant 8

"There's specific like Johnny Cash songs and stuff where it's like, I can go back to that exact night. It kind of a flashbulb memory-ish where it's like I can remember, like if it's in my house with my dad, I remember where the stereo is, where he's sitting, him like bouncing his leg off the floor to the beat and me like, sitting and eating mac'n'cheese for this one song, when I'm 8 or 9 right, it's not necessarily a good or bad memory, it's just like a memory of like a time spent with me and my father, yeah it's just like this vision of it happening." – Participant 7

This is an interesting insight from a psychological perspective. How music could be used in for example psychotherapy or similar areas to treat anxiety or other mental or physical illness. What streaming services could make out of this insight and how it could be incorporated in the user experience would be an interesting future research project. Since streaming has not been around for too long, this might be even more powerful in a few years when there is more historical data about the user's listening.

"I was listening to the radio, and this was actually a classic thing that came on that I remembered had touched me so deeply in the past. When I heard it on the radio, I almost lost all my bearings, I had to pull over because I would have had an accident, it was so strong." – Participant 4

"If someone made a chart of what I was listening to over periods of my life, it would tell you when traumatic shit happened." – Participant 1

"Yeah, I mean, this is so deep now but like, I was listening to Hallelujah when my dad died, certain albums that reminds me of that period of time, or like, there are certain songs that I listened to get over my angst that I can't listen to anymore, like it's very visceral and it like, puts me in, it's a memory, if you play Yeah by Usher, I remember dancing in the car with my dad, because he loved that song for some reason, so it's like very connected to life events." – Participant 1

Key insight #4: Listening to podcasts is a concentrated effort

For many of the interview subjects, it is more of a concentrated effort to listen to a podcast and it has a completely different purpose than listening to music. If music has become somewhat of a background tool to daily life, podcasts have become a new form of audio to occupy the active listening part of some people's days.

"I've been getting slightly into podcasts, mostly tech related, so mostly stuff about like papers that are coming out or research that's being done." – Participant 7

"Walking to school is almost always music, when I'm listening to audio that is not music, it's almost always a concentrated effort." – Participant 7

"I actually listen to podcasts very much for educational purposes, it could be to learn something new or for personal change or something like that, but for me it often has an educational purpose." – Participant 1

"When I choose to listen to podcasts it's somebody speaking about something I need to hear or that I care about, a lot of the times it's interviews, so then it's not really background, then I actually really need to pay attention to what's being said on that podcast." – Participant 3

There is an interesting dynamic between active and passive listening in general. Podcasts seem to almost always be an active listening effort for the interview subjects while music seems to have become more of a background, passive listening experience. Of course, not all music listening is done passively, but compared to the way the interview subjects talked about podcasts, there is a distinct difference in the level of effort between listening to the two forms of audio. Yet these two forms of audio often occupy the same time and place for listening, at home or on the commute, as shown in the online questionnaire. The implication of this is that streaming applications cannot simply look at location data and time of day to conclude how the user experience should be shaped but would need additional data to draw accurate conclusions. How to most easily draw a conclusion about how a user is actively or passively using the application could possibly be an interesting route to explore in future work.

4.5 Ideation sessions

The ideation sessions used insights and data mainly to assess objective 2 (UX) of the project. The key insights from the personal interviews (presented in section 4.4) were anchored to the information presented in chapter 2 as well as the data presented through section 4.1-4.3 in order to generate concepts that could work as a baseline when designing the user experience within an audio streaming service.

The ideation led to two concepts that could serve as starting points when designing the future user experience, these are: An automated player and a system for tagging songs with attributes.

4.5.1 Concept - An automated player

The idea with this concept is that most of the interactions with the service could be made through the actual player, i.e. where you press play, pause, skip songs etc. As a lot of people use music as a background tool in daily life, the idea is to provide a user interface where a user has to do as little as possible to get the right music for that moment playing. For example, it could play bhajans from India if you are at home and it is early morning, if that is what you usually want to listen to in that situation. Or it could play energetic EDM music if you are approaching your gym and usually listen to that kind of music when you are getting pumped up for a workout.

The way this could be done is to give the app access to as much data as possible and make it find patterns within the data. As described briefly in chapter 2 of this report, this is what data mining and machine learning together with extensive data collection from user interaction and sensory technology could enable software to do. Combining this automated player with a system for assigning attributes to songs, described below in section 4.5.2, people can assign attributes to songs in line with their personal preference, making the player everything a user needs in their daily music life.

However, to let a service complete access to your data can create a real or perceived sense of lack of privacy and control. Part of the key to alleviating these issues is to offer a transparent and intuitive insight into which data is gathered, how it is stored, what is it used for, and the results of the analysis. Offering an easy way of limiting or revoking access to or deleting the data could also make people feel more safe, in control and inclined to share their data.

4.5.2 Concept - Tagging

The idea with tags is that they could replace the need for users to build and maintain playlists as well as help the automated player to get better at playing the right songs. This by having users assign attributes, or tags, to songs instead of putting them in enclosed folders, like playlists. This way, the user could save, organize and access audio based on what they attribute it with instead of pushing it around different playlists. Since there are no limits to

what tags a person assigns to a song and what songs they assign a tag to, this enables a more organic way of organizing audio. For example, a person could tag a song with “instrumental” and “focus” if that is what the person feel is appropriate for a song and this could be done both for a classic Mozart concerto as well as a song from the guitarist Billy McLaughlin, a connection that might otherwise be hard for an automated player to recognize.

A system of attributes through tags could help the automated experience become better at a faster pace, combining data that is automatically gathered on a user's listening habits with the data from the attributes a person assigns to songs. It also enables users to have more control over how their player works.

5. Conclusions and reflections

The aim of this project has been to provide insights on how users utilize streaming services for listening to audio in their daily lives and to anchor the insights in how technologies may work to provide them with the user experience they desire. Additional objectives of the project have been to ideate around possible improvements to the user experience based on the insights and also to examine how implementation might affect privacy and social sustainability. Key insights into user behavior have resulted from this research as well as ideas on how to better gather qualitative data and improve personalization features in services. Also, the results from this research include reflections on how sharing data affects user privacy and promotes the users' sense of losing control.

The research has identified patterns in how users of streaming services utilize different existing services and how their behavior in listening to audio has been affected by the current offering by audio streaming services. Audio streaming services are seemingly, for many people within the target group, a constant companion in their daily lives. Whether the goal is to get into or enhance a certain mood, promote a certain energy or to find and consume knowledge, many are looking to their audio streaming service to help them achieve their aim. Playing such a central role in peoples live comes with an opportunity for the service creators to create a truly great user experience. For the same reasons, it also comes with the great responsibility of not playing a toxic role in the lives of its users, e.g. in order to drive sales numbers.

This project also contributed ideas on how services could incorporate the insights from this research in their future development. Users seem to truly enjoy automated functionality, if it is done right. Users also seems to be willing to give input to help shape the automated experience to fit them better. Finding an intuitive way of gathering data about the tastes and behavior of individual users and to complement this with the data collection possibilities of mobile devices may be the way forward. A suggestion of such functionality in the form of "tagging" was presented in chapter 4.5.2 of this report.

Another finding worthy of highlighting is the trust issues that users are experiencing about sharing usage data. How can companies ensure the trust of their users and create a situation of symbiosis where both parties are benefitting and maintaining a general feeling (and reality) that privacy is respected?

The focus of this project has been the user, the consumer of audio, and the way an audio streaming service could better help them in their daily life. However, it has been hard not to consider the business model side of recorded music because it has become clear while working on this project that the business model is complicated. As a user, or a user researcher for that matter, the business side of things may feel like it is 'in the way' when it comes to enjoying the music we want in the way we want to enjoy it. It feels strange how something so 'simple', speaking as an outsider looking in, is so complicated in reality. Two actors seem

essential, a content creator and a consumer of the content, but how it gets so complicated in between them is hard to grasp and I cannot help to wonder if the business model needs to be redesigned in order to become a better situation for both the content creators and the consumers. For example, the project results demonstrate that the participants in this project (the consumers) are interested in contributing to improving products, especially when they are interested in the field. How would a record label (and its business model) be organized if it was started today and was built around streaming and via co-creation? Maybe these are areas where innovation is needed.

During the course of this project, many interesting paths have opened that could not be investigated further within the timeframe of this project, e.g. the way music can be used as a trigger for memories; what a record label (business model) might look like if it were started today. There is much research to be done in the landscape of audio, especially because it is changing and it is growing.

The fact that mobile usage and Internet connectivity is spreading over the world and more people are starting to use streaming services, handling this aspect of life becomes a responsibility as well as an opportunity for these companies. One opportunity is that there are large parts of the world that are yet to be introduced to audio streaming, which means the user base of these services could become much bigger than they are today and the business of recorded audio could become bigger than ever before. And this ties into corporate responsibility, e.g. in social sustainability. Many of the personal interview subjects described music as something deeply rooted in their personal lives. By tracking an individual's music consumption, along with the context of any given situation, a company could probably acquire a detailed view of what is going on in the life and mind of a user in real-time. With a lot of companies leaning towards personalized and targeted advertising for example, the balance between what is actually beneficial and empowering *for a user* versus what is manipulating a user in a beneficial and profitable way *for a company* becomes an important ethical issue.

This is not just important for audio streaming services, but for social media services and other forms of media consumption services in general. One reflection based on my studying power users of audio streaming services over the last couple of months is that the consumption of audio and especially music can speak to people on a deep physical, mental and emotional level and now this can be linked to activities in their daily lives. Imagine if someone would record and store every move you make in a database, correlate this with data on whatever you are buying, saying and doing, and also see and control what music you are listening to (which affects your mood) as all this goes on. Combine this with the immense analytical power that comes with data mining and machine learning together with designers and engineers building systems that in the end are meant to make and keep companies profitable. It seems like an unfair game at this point if not handled with both the short- and long-term effects on the end user in mind, which makes the control and design of these services a responsibility as much as an opportunity. The data collection, the analytics, the engineering and the design are each a huge opportunity to provide great and ever improving experiences, well-suited solutions for

people in their everyday lives. But there has to be a level of ethics and social sustainability incorporated in the design of systems, both now but even more so in the future.

Another related issue is security, as there is always going to be a risk of breaches when it comes to storing information about people. good- and ill-willed players are getting more powerful tools to access and address deep user needs. This means that having personal information about people in the hands of people, systems or organizations whose intentions are not to affect users in an empowering way is becoming an increasingly important aspect of the risk with online presence.

Returning to this particular project and the way it was conducted, there is room for future work. The sample size of the personal interviews was small and the concept generation was done with the data from these interviews as a basis, which creates the need for further quantitative and qualitative data gathering to confirm the insights, and especially their generalizability to other target groups. The concepts resulting from this project should be viewed more as starting points than design concepts, as there is a lot of work to be done before any of these concepts are ready for testing. Both of the presented concepts need more work when it comes to the design of the user interface as well as engineering the back-end software for analyzing and processing data.

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Appendix A – Online questionnaire (questions and results)

(note: these results are calculated at a total of 329 answers)

General Insight

If you had to choose one, which of these profiles would you identify the most with as a person? 329 responses

- Christina Carlton - 148 / 45%
- Cory Anderson - 52 / 16%
- Matthew Griffin - 50 / 15%
- David Zargo - 43 / 13%
- Zoey Macaroni - 22 / 7%
- Charlotte Evans - 14 / 4%

2. What country do you live in? 329 responses

- Sweden - 153 / 47%
- USA - 123 / 37%
- Other - 53 / 16%

3. Gender? 329 responses

- Female - 200 / 61%
- Male - 127 / 39%
- Other - 2 / 1%

4. Age? 329 responses

- 10-20 - 21 / 6%
- 20-30 - 208 / 63%
- 30-40 - 32 / 10%
- 40-50 - 52 / 16%
- 50+ - 16 / 5%

5. Do you use streaming services for audio? 329 responses

- Yes - 313 / 95%
- No - 16 / 5%

6. Do you pay for any such service? 313 responses

- Yes - 223 / 69%
- No - 90 / 29%

7. What types of audio do you listen to?

- Music - 297 / 95%
- Podcasts - 148 / 47%
- Online videos - 109 / 35%
- Lectures - 28 / 9%
- Audiobooks - 26 / 8%
- News - 26 / 8%

8. What platforms do you primarily use for consuming music? 307 responses

- Spotify - (40/54, 131/145, 9/14, 8/10, 65/77, 4/7) - 257 / 84%
- YouTtube - (20/54, 54/145, 8/14, 3/10, 62/77, 2/7) - 149 / 49%
- Pandora - (9/54, 6/145, 2/14, 2/10, 11/77, 1/7) - 103 / 34%
- iTunes - (7/54, 23/145, 4/14, 0/10, 0/77, 0/7) - 34 / 11%
- Soundcloud - (6/54, 29/145, 4/14, 1/10, 11/77, 2/7) - 53 / 17%
- Apple Music - (2/54, 11/145, 2/14, 0/10, 0/77, 0/7) - 15 / 5%
- Tidal - (1/54, 3/145, 0/14, 0/10, 0/77, 1/7) - 5 / 2%
- Other - (6/54, 15/145, 1/14, 2/10, 10/77, 2/7) - 36 / 12%

9. What platforms do you primarily use for consuming podcasts? 155 responses

- Podcaster - (0/4, 70/145, 2/3, 1/3) - 73 / 47%
- YouTube - (1/4, 15/145, 1/3, 1/3) - 18 / 12%
- Soundcloud - (1/4, 14/145, 1/3) - 16 / 10%
- Acast - (0/4, 13/145) - 13 / 8%
- iTunes - (2/4, 42/145, 3/3, 2/3) - 49 / 32%
- Other - (1/4, 28/145, 1/3) - 30 / 19%

10. What platform do you primarily use for consuming audio from online videos? 83 responses

- YouTube - (2/2, 3/3, 77/77, 1/1) - 83 / 100%
- Vimeo - (0/2, 0/3, 5/77, 1/1) - 6 / 7%

11. Where do you usually consume music? 253 responses

- At home - (62/145, 7/14, 4/10, 39/77, 3/7) - 115 / 45%
- On the commute - (51/145, 6/14, 5/10, 23/77, 2/7) - 87 / 34%

- At the gym or equivalent - (14/145, 0/14, 0/10, 3/77, 0/7) - 17 / 7%
- At work - (10/145, 1/14, 0/10, 8/77, 1/7) - 20 / 8%
- In school - (7/145, 0/14, 1/10, 2/77, 0/7) - 10 / 4%
- At parties - (1/145, 0/14, 0/10, 2/77, 1/7) - 4 / 2%

12. Where do you usually consume podcasts? 151 responses

- On the commute - (73/145, 1/3, 1/3) - 75 / 50%
- At home - (52/145, 1/3, 2/3) - 55 / 36%
- At the gym or equivalent - (10/145, 1/3) - 11 / 7%
- At work - (9/145) - 9 / 6%
- In school - (1/145) - 1 / 1%

13. What platforms do you primarily use for consuming TED Talks or similar lectures? 15 responses

- YouTube - (12/14, 1/1) - 13 / 87%
- Other - (3/14, 1/1) - 4 / 27%

14. Where do you typically consume TED Talks or similar lectures? 15 responses

- At home - (11/14, 1/1) - 12 / 80%
- At work - (2/14) - 2 / 13%
- On the commute - (1/14) - 1 / 7%

15. What platforms do you use primarily for consuming audiobooks? 13 responses

- Audible - (5/10, 2/3) - 7 / 54%
- Storytel - (5/10, 1/3) - 6 / 46%
- OverDrive - (1/10) - 1 / 8%
- Other - (1/10) - 1 / 8%

16. Where do you typically consume audiobooks? 13 responses

- At home - (5/10, 1/3) - 6 / 46%
- On the commute - (3/10, 2/3) - 5 / 38%
- At the gym or equivalent - (1/10) - 1 / 8%
- At work - (1/10) - 1 / 8%

17. Where do you typically consume audio from online videos? 80 responses

- At home - (66/77, 2/3) - 68 / 85%

- On the commute - (2/77) - 2 / 3%
- At the gym or equivalent - (2/77, 1/3) - 3 / 4%
- At work - (2/77, 1/1) - 3 / 4%
- At parties - (1/77) - 1 / 1%
- In school - (1/77) - 1 / 1%

18. What platforms do you primarily use for consuming news through audio? 10 responses

- Other - (4/7, 2/3) - 6 / 60%
- Podcaster - (3/7) - 3 / 30%
- YouTube - (1/7, 1/3) - 2 / 20%

19. Where do you typically consume news through audio? 10 responses

- At home - (4/7, 1/3) - 5 / 50%
- On the commute - (2/7, 2/3) - 4 / 40%
- At work - (1/7) - 1 / 10%

20. Do you remember how many times you toggled between audio platforms yesterday? 313 responses

- Not once - 92 / 29%
- 1-2 times - 138 / 44%
- 3-5 times - 42 / 13%
- 5+ times - 12 / 4%
- Don’t remember - 29 / 9%

21. One platform vs Separated platforms? 313 responses

- One platform - 199 / 64%
- Separated - 114 / 36%

22. Location tracking, do you let apps do it? 313 responses

- Yes - 160 / 51%
- No - 153 / 49%

23. How do you feel about corporations saving your user data in order to improve your future experience using their service? 313 responses

- I’m not a fan, but I’m willing to share to get a better UX - 164 / 52%
- I don’t like it one bit, I limit the data I share as much as possible - 85 / 27%
- I’m totally fine with it - 48 / 15%

- Don’t know, don’t care - 16 / 5%

24. The last time you found a song that you liked, how did you find it? 313 responses

- Through recommendations on an audio platform - 82 / 26%
- A friend told me about this awesome song - 56 / 18%
- On the radio - 52 / 17%
- In a playlist I follow - 44 / 14%
- In a movie - 23 / 7%
- Coffee shop/bar/restaurant - 10 / 3%
- I read a music review - 9 / 3%
- I went to a concert - 6 / 2%
- At a wicked party - 4 / 1%
- In a commercial - 4 / 1%
- In a store - 3 / 1%
- Other - 20 / 6%

25. In the last three months, have you created a playlist on any on your platforms? 313 responses

- Yes - 207 / 66%
- No - 106 / 34%

26. Do you use Spotify’s *Discover Weekly* playlist to find new music? 313 responses

- Yeah, I’ve used it once or twice - 102 / 33%
- Yes, I use it often - 99 / 32%
- Nope, never - 81 / 26%
- Don’t know what that is - 31 / 10%

Appendix B – Interview guide: Street interviews

IF THE INTERVIEWEE USE MORE THAN ONE AUDIO PLATFORM

1. Which profile do you identify with most?
2. Do you use streaming services?
3. What types of audio do you listen to? How much time yesterday?
4. Tell me about how you typically use them?
5. Have you ever had trouble deciding which of them to use?
6. Why did you have trouble deciding?
7. When was the last time you switched between them to listen to a different type of audio?
8. Where were you then?
9. Have you ever given up on listening to something you wanted to listen to because you didn't feel like taking the time to switch between platforms? (e.g from spotify to youtube or soundcloud)
10. How did you find the last song you liked? What made you like that song? (examples of feelings/situation)
11. Do you use the queue function?
12. **BONUS**: Would you mind showing me your most recently used audio app and, if possible, queue three tracks? Why did you choose them?

IF THE INTERVIEWEE ONLY USE ONE AUDIO PLATFORM

1. Which profile do you identify with most?
2. Do you use streaming services for audio? Which ones?
3. How do you use it?
4. How did you find the last song you liked? What made you like that song? (examples of feelings/situation)
5. Do you use the queue function?
6. **BONUS**: Would you mind showing me your most recently used audio app and, if possible, queue three tracks? Why did you choose them?

Appendix C – Interview guide: Personal interviews

Subjects of discussion	Examples of questions
3 min Relationship to music	• What kind of music do you listen to? • What do you like about that music? • Do you like any other types of music? • How come you like that music? • What is your best music related memory?
2 min Relationship to audio in general	• What types of audio do you listen to (other than music)? • If you no longer were able to listen to your favorite types of audio - how would that affect your life?
3 min Use of different platforms	• What platforms do you use? • What do you do when the song/podcast/audiobook you are looking for is not available on a platform? • Which platforms do you pay for and how do you justify paying for them?
3 min Reason for choosing	• What went through your head the last time you pulled out your phone and chose which type of audio to listen to? • Which situation were you in? • How did that affect your choice?
3 min Reason for switching	Walk me through the last time you switched between platforms. • Why did you switch? • Which concerns/frustrations did you encounter in the process of switching? • How did it affect your overall listening experience?
2 min Organization	• Are you generally an organized person? • How do you organize your audio? • How do you organize apps/social media etc.?
3 min Discovery (Music)	• How did you find the last song you liked? • What made you like it? • When are you most receptive to new music? • What do you usually do when you find/save a new song?

3 min Mood	• What affects your mood during the day? • How does your mood affect what you listen to that day?
3 min Context	• In what situations do you typically listen to each audio type? • Does music trigger memories for you? • What kind of memories?
(Only for influencers):	• What do think your friends say about your taste in music? • How do you think about sharing music? (NOT PIRACY but sharing w/ friends) • Do you take pride in finding the best new music?
BONUS: Physical/immersive	• What is your relation to hardcopies of music? (CD, vinyl) • Do you ever miss the tactile experience? • What do you miss? • Do you enjoy having access information around a song or artist (bio/lyrics/notes)? • Does that add value to your experience?