

Rootnote

Final Master Project Report

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Executive Summary

This report describes the improvement of Rootnote. At the start of this semester, Rootnote was just a minimum viable product (MVP), with around 210 users. This meant that the first steps of market validation were taken, yet there was no business plan put in place.

The improvement of various features present in the MVP is described. Most of these improvements were based on the feedback of actual users. By talking to these users, a more concrete design philosophy was created, that will permeate all design choices made going forward.

Additionally, the lessons learned through development of the product were formalized in a business plan. This document discusses the unique value Rootnote proposes, and lays out a route to monetization of the concept. The business plan is a separate document from this project report.

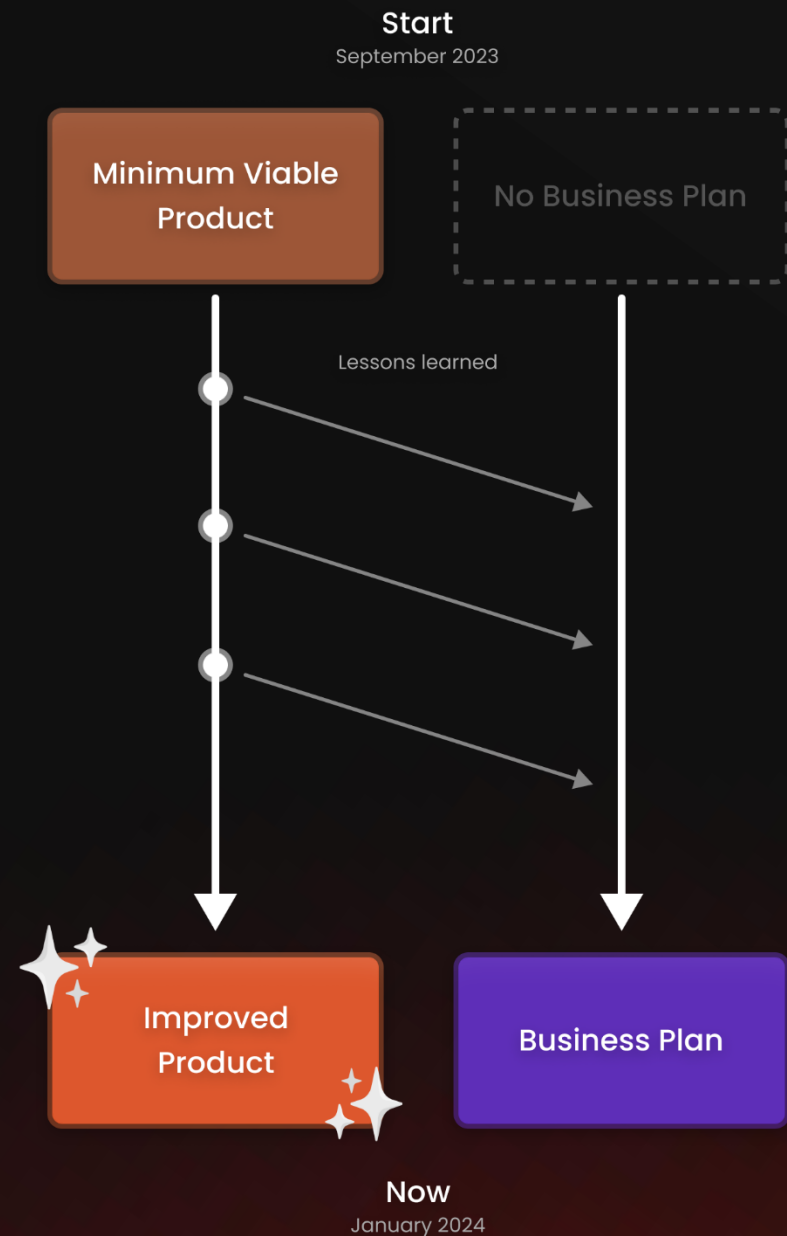


Figure 1: Overview of this project's progress and results

Prologue

With the seed planted during my final bachelor project, I have been obsessed with building out Rootnote for the past couple of years. Within the faculty, I jokingly get named the 'Spotify API guy'. But, honestly, I see it as a testament to my commitment and perseverance in building this project. But, this perseverance was very dependent on the people that chose to help me during the entire process. Thus, I would like to thank everybody who helped me test Rootnote in its early stages. It has not always been easy. Fullstack engineering is a discipline in and of itself. You kept me motivated to stay iterating, and, indirectly, you helped to become a competent full stack engineer, a skill that is very will prove to be invaluable throughout my career.

Rootnote was the first product I ever made that got 'real' external validation. It has lit a drive for entrepreneurialism in my, and – even if it does not work out – that is something I am eternally grateful for as well. It feels great to finally have the business aspects of Rootnote properly formalized.

Again, thank you to everybody who helped me throughout this journey.

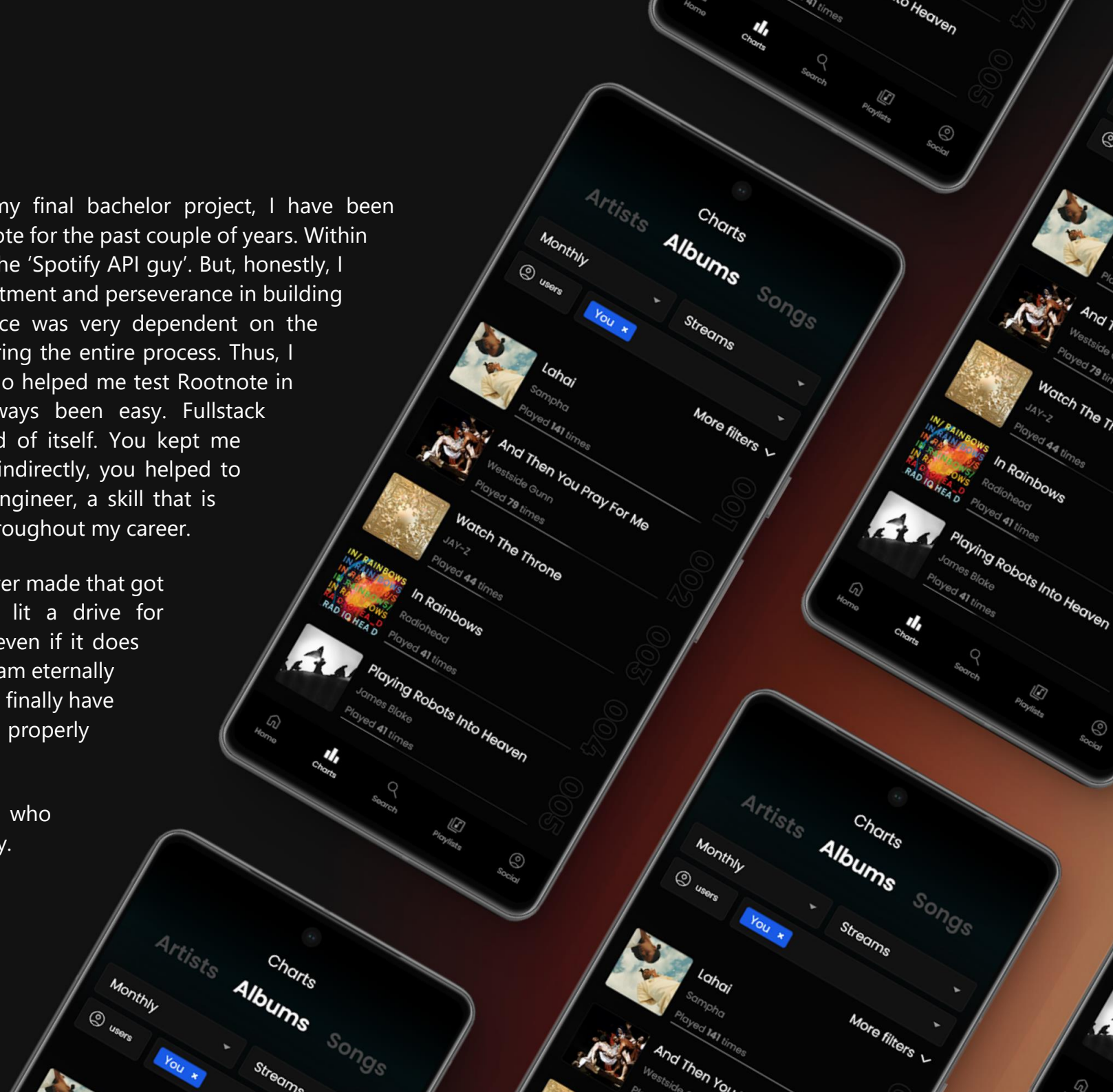


Figure 2: Rootnote's 'Charts' tab.

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Section One

The Introduction

Book Quote

“Music is the great uniter. An incredible force. Something that people who differ on everything and anything else can have in common.”

From Just Listen by Sarah Dessen (2008)

Introduction

The music streaming services of today very much focus on the individual experience. Their recommendation engines, specifically catered to you, can be a blessing. They can help users find music they would not have ever found on their own. Methods such as collaborative filtering (Schafer et al., 2007), and content-based filtering (Van Meteren & Van Someren, 2000) have made music discovery easier than ever. Yet, I argue that there are certain social aesthetics that were lost in the digitization and personalization of music listening. In the shift towards personalized playlists and algorithms, we've lost the communal experience of shared discovery that was once enabled by visiting music stores and sharing mixtapes. Additionally, the serendipity of encountering diverse genres and artists through friends' is diminished by our reliance on recommendation engines.

The same internet that took away some of the social interactions of music listening, also created a bunch more. Online forums, social media pages, chatrooms, websites, and more, all dedicated to the discussion of music (Nast, 2022; Vendrell, 2022). These groups often have a strong sense of community. Despite this fact, there are currently almost no ways for these groups to gain insight into their collective music streaming habits. They often resort to posting their personal listening statistics, hoping to find someone who is interested. Currently, there are no widespread tool that allow for these communities to peak into their *collective* music listening

hivemind. Through Rootnote, I aim to provide communities with the tools they need to augment what they currently enjoy so much: discuss music.

Of course, the music industry is not oblivious to the potency of social influence to strengthen the music recommendations. Tan et al. (2011) explore how 'social information' (e.g., friends made, topics followed) Can be included into a music recommender system (MRS). Similarly, Chen et al. (2019) discuss how a social influence graph can be used to improve the MRS. Pálovics et al., (2014) go one step further and considers the temporality of listening events. If a user listens to an artist for the first time, and someone in their social graph does so shortly after, their relationship strength increases. All of these approaches claim an increase in recommendation quality in comparison to no social factors being included in the MRS. Sharma & Cosley (2013) Explore how social explanations (e.g. "Alice likes this song") affect the persuasiveness of a suggestion. Yet, none of this research focuses on the creation of communities. They all focus in interpersonal relationships. Additionally, most research focuses on improvements that run in the background, instead of bringing the social recommendations to the foreground. With Rootnote, my aim is to take a more communal and socially translucent approach to music discovery and recommendation.

According to Srinivasan's 'The Network State' (Srinivasan, 2022), online communities are stronger than ever. He envisions a future where these communities might even get diplomatic recognition.

While this seems very far out right now, it does highlight how outdated national top 100 charts are, as they do not reflect the borderless and interconnected nature of music consumption in the digital era. Rootnote aims to let every group, local or global, large or small, gain insight into their music listening.

Within previous research, I have focused on creating social translucence within co-located shared music listening. Here, it became apparent that participants appreciated the insight into each other's music tastes that they were able to get because of social translucent design principles: visibility, awareness and accountability (Erickson & Kellogg, 2000). I firmly believe that some of these insights hold true for online communities as well.

Additionally, online communities love to gamify music discussions, transforming the way we interact with music into an engaging activity. This gamification often involves challenges, like creating themed playlists, sharing rare finds, or even "music battles" where members vote on their favourite tracks. These playful interactions not only make the process of music discovery more enjoyable but also deepen the sense of belonging and connection within the community. Currently there are little to no data-driven tools that can help create these experiences for these groups, and most of the time, one of the community members has to curate a list to the best of their ability. This is strange, since the streaming services such as Spotify and Apple Music have unfathomable amounts of user listening data. Yet, no solution exists to create these games in a data-backed way. This is another area where Rootnote aims to

take the forefront, by streamlining the process of creating games that are meant to strengthen social and musical connections.

To summarize, Rootnote aims to bridge the gap between individualized music consumption and communal music exploration. By doing so, it would not only enhance the personal experience of discovering new music but also strengthen the social ties that music naturally fosters. This approach acknowledges that while music is a deeply personal experience, it also has the power to connect people in profound ways. Crucially, Rootnote will co-exist with current day music recommendation systems, and does not aim to replace them. People should be able to benefit from modern recommendation engines, while also enjoying the communal essence of music discovery.

Throughout this report, a various features of a minimum viable product are improved. Through these improvements, a product design philosophy is created, which will end up permeating all design choices going forward. Additionally, the lessons learned through product development have been taken into account in Rootnote's business plan, and have helped to make Rootnote unique within its market segment (Kim & Mauborgne, 2007). Additionally, meetings with various entities are discussed. These meetings include potential clients, as well as other founders with expertise in the market area. The lessons learned were formalized in the Rootnote business plan.

The Starting Point

Rootnote has its roots before the start of this semester. This section will shortly describe the initial creation of (what would become) Rootnote, as well as the first public deployment.

The Initial Idea

The concept for rootnote started within my final bachelor project, AUD_I/O. This project tried to see envision the relationship between the car and music as symbiotic. Instead of simply porting a streaming service app to the dashboard, are there any functionalities that emerge when looking at music streaming through a car-first lens? The project envisioned a future where the circumstantial data from the car would inform the playlists. Driving in the rain? The playlists would become more sad. Driving fast on the highway? The system would suggest more high energy music.

Additionally, AUD_I/O allowed the passenger to easily join the music listening session, and their streaming history would be included in the recommendation algorithm. This combining of the driver and passengers' music tastes formed the basis for what would ultimately become Rootnote. As the assigned 'DJ' of the friend group, I came to the realization that an automatic playlists generator based upon a group's streaming history could provide useful in a multitude of scenarios – not just the car. Spotify apparently thought so too, since they not much later decided to introduce Spotify Blend (source), a service that allows you to create

a playlist with you and up to nine friends. This announcement ultimately led to Rootnote's customer segment pivoting (Ries, 2014) to larger communities.

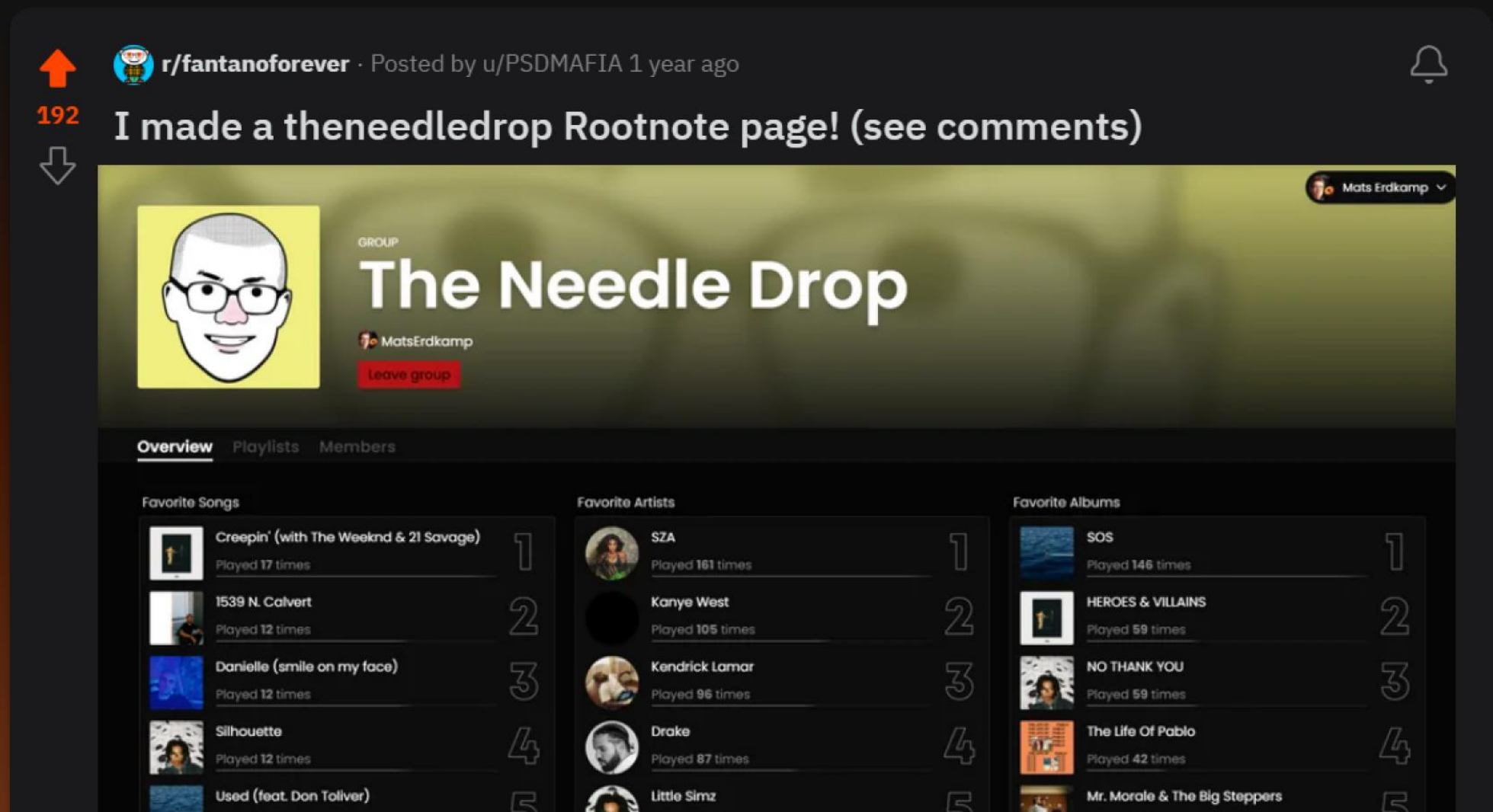
To summarize, at this point, Rootnote was a platform that allowed communities to create top 100 playlists based upon the streams of their group members. This top 100 list can be based upon the stream counts, or on a novel 'compatibility' value. This value rewards a more even distribution of streams. Two people streaming a song five times gets a higher score than one person streaming it ten times. This compatibility-ranked playlist worked great for my friends and me during get-togethers. The next step was to validate the concept publicly.

First Concept Validation

The first public deployment happened in January of 2022. With the platform's features being deemed sufficient for a market validation test. Mainly, the subreddit r/FantanoForever had been used for MVP validation (PSDMAFIA, 2023). The user response to this first unveiling was very positive. This positive result of this market validation played a key role in convincing me to further formalize Rootnote as a legitimate business.

After a short diversion into reimagining shared interfaces for co-located listening in my Preparation Final Master Project, I decided that I wanted to keep working on Rootnote for my Final Master Project. Within the Final Master Project, most time was spent on

further developing the product, as well as creating a business plan to try and make the idea commercially viable.



Section Two

The Product

The Product

Within this section of the report, I will describe the product development steps that were taken this semester. Throughout the semester, the company vision was refined to become an actionable metric (more on that later). All functionalities of Rootnote should either increase social connection or musical connection. The User Connection Graph on the right (figure 4) visually shows what we aim to achieve: push a user's connections with a community or friends as far to the top right as possible.

This realization came about by user testing the various features of the platform that were already present. Users helped me recognize that the social aspects of Rootnote should not only be second order effects, but core to the product design philosophy. For example, the Stats Export started as just a top 10 list. Users highlighted that they would like more information about the composition of the list on a social level. This feedback helped shape the redesigns of the rest of the platform. All functionalities are now more explicitly designed to strengthen social connections. To achieve this, a (draft) product design checklist has been created (appendix A), inspired by the structure of the DASS Framework (Niemantsverdriet et al., 2019). The newfound product design philosophy is also crucially important in our business, and is core to our Blue Ocean Strategy (Kim & Mauborgne, 2007). In other words, it plays a big role in how we set ourselves apart from competitors.

The next page shows a schematic overview of the product improvement steps discussed within the rest of the chapter.

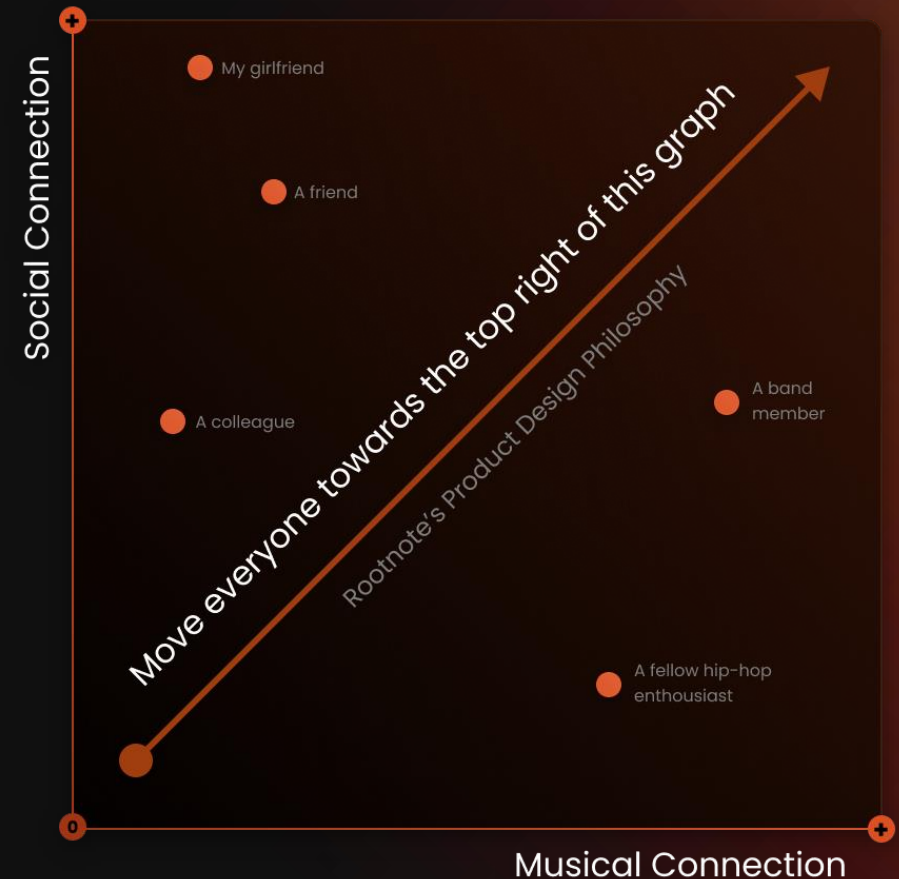


Figure 4: The User Connection Graph.



Product Improvement Overview

The big steps taken to improve the minimum viable product.

Completed 

WIP/Planned 

Stats Export

Created



Revised



Tested



Revised

Stats Export, a functionality where users can create images of their listening behaviour was made this semester. Its appearance was revised. After that, it was user tested. Lastly, a mock-up based on the insights gained was made.

Insights

Conceptualized



Tested



Partial Creation



Full Creation

The Insights page was ideated upon to improve the amount of Daily Active Users on Rootnote (data showed it was lacking). A test was done to see if users hypothetically liked the insights page. Their feedback was incorporated, and a partially complete version was deployed.

Filtering 2.0

Ideated



Questionnaire



Concept



Created

Filtering 2.0 was ideated as a better way to create (play)lists. Users were asked to come up with ideas for playlists in natural language. These ideas were used to further define the concept and its requirements.

Backend

Event-Driven

Smarter Cache

Server Migration

Mobile App

Various backend improvements have been made to reduce computational resources and thus costs. This was needed to effectively scale the platform to 1000 users and more. A mobile app has been postponed.

Gamification

LLM Games

Social Game

Frontend

Landing Page

Better UI/UX

Two LLM Games were created to explore if AI can be a meaningful addition to the gamification effort.

The landing page was redone (for demo day) and the general UI/UX was improved on mobile devices.

Figure 5: The Product Improvement Overview

The Stats Export

Most music communities already have a place they call their home. Be it Discord, Instagram, TikTok, X, Reddit, or someplace else [sources]. With Rootnote, I always aimed to augment the musical discussions and insights that these communities can have on their own platform. For the initial market validation, these images were manually made. This of course does not scale beyond a few groups. It was therefore crucial to create an automated tool that enables communities to export their listening insights to wherever they want.

The first version of the Stats Export functionality can be seen in figure 6. Here, the main focus was to figure out how to create an image that can be saved by the user.

Redesigning the Appearance

While the first version was very much in the style of the Rootnote platform itself, we felt that, since the stats export aims to serve communities on their platform of choice, that the stats export should be made more customizable. This lead to the creation of the second and current version of the Stats Export appearance, as can be seen in figure 6.

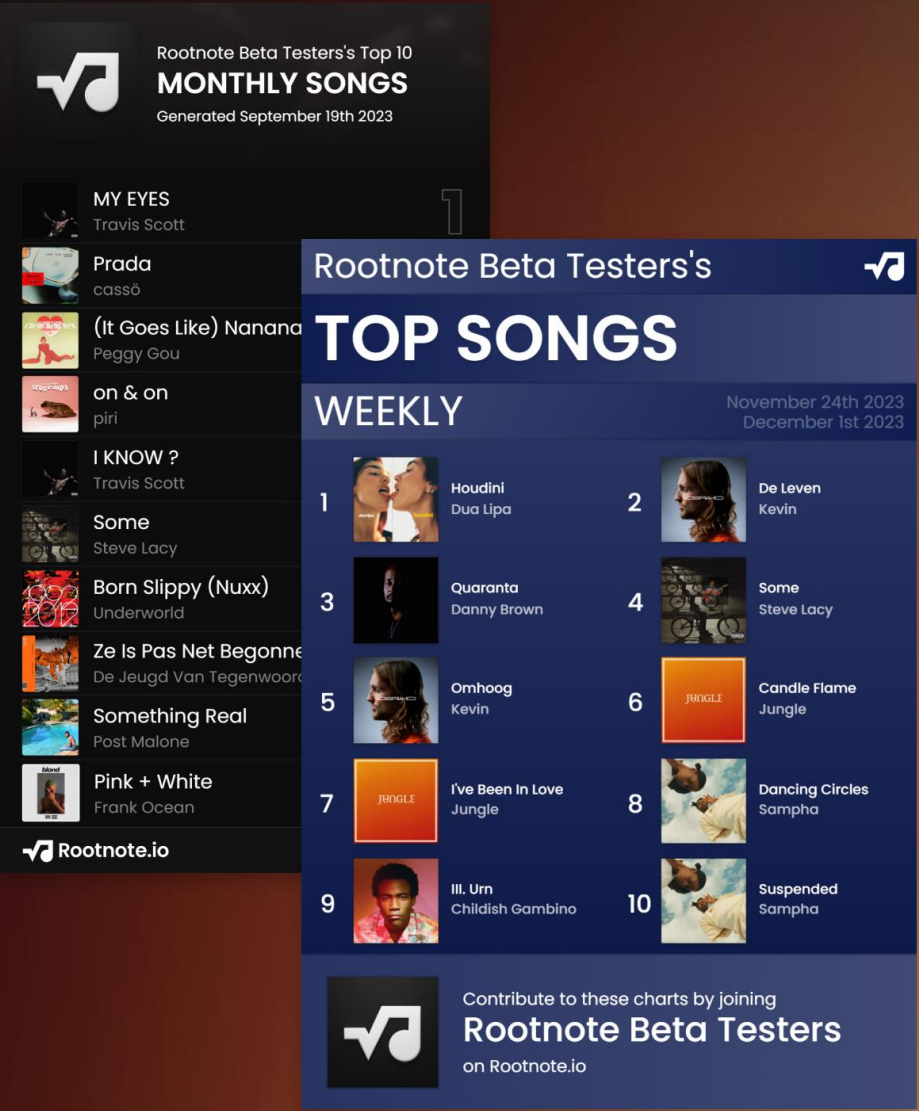


Figure 6: The First two versions of the Stats Export.

User Testing

While the Stats Export functionality was created to be used in online communities, it became apparent that it could also be of use for co-located groups. To test this idea, a Rootnote group 'Office Floor 5' was made. This group consisted of a few master students who had their own desk at floor 5 of Atlas TU/e to work on their graduation project. Every Friday, a Stats Export image would be printed out and hung upon a wall (figure 7). An outline of the open-ended conversations had with users can be found in appendix C. The main conclusion being that while it is nice to see the top songs, they were interested in seeing some additional insights on a more personal level. Examples included highlighting who streamed the most songs this week, or visualizing that someone had a certain

song on repeat this week. It should be noted that this group, in our own framework, would be described as a more socially connected group. This means that it is unclear if these opinions would be shared by for example an online community. I hypothesize that in their case they would be mostly interested in the non-personalized data. To serve both types of communities, a revised version of the Stats Export should allow for sections of it to be toggleable.

Unfortunately, Stats Export could not be tested in such an aforementioned online community. The discussion further describes the reasons behind this. Further testing with those groups will need to be done at a later stage.

Figure 7: The wall of Stats Exports used during testing.



The New Version

Based on the feedback in the small-scale user test, a revision was made to the Stats Export feature, that aims to provide insight into users' listening highlights. Through this inclusion, the Stats Export feature has become more socially oriented. Instead of only looking at the stream count data itself, we extract extra socially relevant from the streaming history and its metadata. We call these highlights the 'social highlights'.

The following classification of possible social highlights was constructed:

- **Personal:** about a user.
 - **Self:** about the user themselves.
 - **Other:** about another user.
- **Interpersonal:** about a subset of users.
 - **Inclusive:** including the user.
 - **Exclusive:** excluding the user.
- **Global:** about the full set of users.

These categories all have their own strengths, but when they are applied should be carefully considered. If we look back at the user test, it would not make sense to prioritize the social highlights for the user that generated the Stats Export. In a personalized email, however, personalization could be applied. For now, the focus was on creating social highlights than do not prioritize a specific user.

This realization has been incorporated into the product design checklist (appendix A).

Social explanations are more persuasive when they are personal (Sharma & Cosley, 2013). In other words, 'Alice & Bob listened to this song 10 times' has higher persuasiveness than '2 friends listened to this song 10 times'. While this application differs from the original research, the finding was taken into account when designing the social highlights.

Figure 8 shows some of the proposed socially oriented features that are planned to be included. Figure 9 shows 3 mockups of how the newly added functionalities could look.



Stats Export Social Highlights

Ideas to make the Stats Export more inherently social.

Figure 8: Possible social highlight for the stats export.

Name	Example	Options
Explorer	"Emma explored the most genres this week, diving into 15 different music genres!"	Genre, Songs, Albums, Artists.
Fanatic	"82% of Mike's streams were from the 80s this week!"	Era, Genre, Artist, Album, Song.
Rising Star	"Luna, was the group's favorite discovery. Her tracks were played 128 times this week!"	-
Trendsetter	"Three people listened to 'Sampha - Lahai' shortly after Joey did!"	Album, Song, Artist
Connoisseur	"Niels had the most niche music taste this week! With a median of 1200 song streams."	-
Record	"The group had its biggest streaming week ever, streaming over 5000 minutes!"	Streams, Songs, Albums, Artists, Genres
Twins	"Alice and Bob had the most similar taste. Sharing 8/10 top 10 artists!"	"Opposites"
Unhinged	"David wins strangest transition. 'Vivaldi - The Four Seasons' to 'Cardi B - WAP'"	-
Night Owl	"Paul listened most music only after 1AM"	"Early Bird"
Binger	"Morgan listened to music for 15 hours consecutively this week!"	-
Viber	"Taylor's streams were the most energetic and danceable this week!"	Danceability, Energy, Valence, etc.
Globetrotter	"Alex listened to songs in 12 different languages this week!"	-
Playlist	"The 'Summer Vibes' playlist was super popular this week!"	-
Outcast	"Only André did not stream 'Outkast - Ms. Jackson' this week!"	Song, Artist, Album, Genre
United	"The group was very in sync this week, with 5 artists accounting for 67% of all streams!"	Song, Artist, Album, Genre



Revised Stats Export Mockup

Now including some of the social highlights.

Figure 9: The redesigned stats export.



Applying Changes to the User Connection Graph

Mapping the newly made version of the Stats Export to the user connection graph, we see that the stats export is not hypothesized to also increase social connection.

Once deployed, validation tests could be run to see if the users value the functionality in the same manner. In the image below, a scenario is examined where a validation test shows that users value the Stats Export more for its musical insights than its social ones. This could subsequently be reason to keep exploring methods to increase the potency of the Stats Export as a social connection tool.

Main takeaway

By creating and printing out the stats export for 8 weeks for a test group of users, the insight was gained that they would enjoy the addition of some social insights, turning the prints into more of a social context display (Ding et al., 2012). This led to a revelation that helped reshape the product design philosophy of Rootnote. This would ultimately manifest itself as the User Connection Graph, and the product design checklist (appendix A).

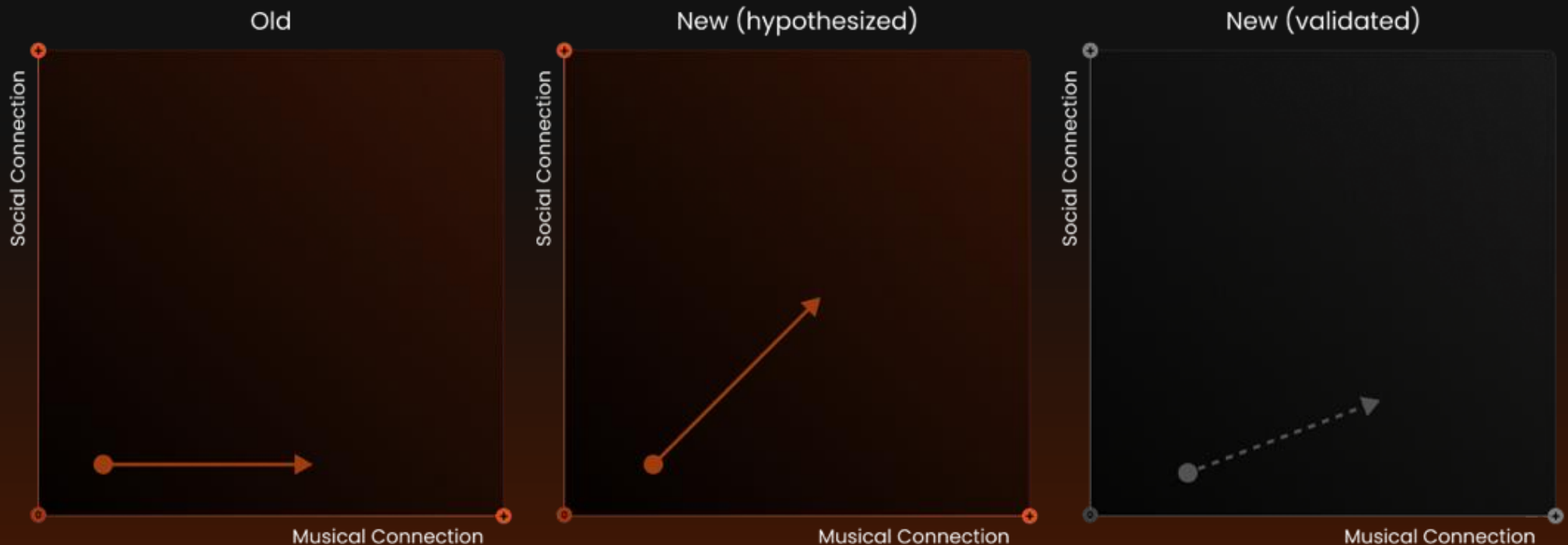


Figure 10: the user connection graph applied to the stats export functionality.

The Insights Page

Rootnote uses a service called PostHog (*PostHog*, n.d.) to gain insight into the actions users take on the website. This is crucial for consumer facing software development in the modern age. Almost all major software companies test their features through the automated logging of user actions (source).

On Rootnote, the first page you see when opening the web-app or website would be the 'Recent' page. This page allows users to see their own recently streamed songs, as well as that of their friends. Looking at the usage metrics, however, showed that looking at friends' recent streams was not a popular action to take. The hypothesis of why this would be was that the Recent page was not information dense enough, and thus boring. Additionally, the 'Charts' page allows users to gain insight into their friends' current listening behavior in a more organized way.

Based upon these revelations, the following design criteria were set for a redesign of Rootnote's homepage:

Align with the product design philosophy: The Stats Export redesign helped shape Rootnote's products design philosophy (as visually captured by the User Connection Graph). The insights page should adhere to the same design philosophy.

More information dense than individual recent feeds: As stated before, the information provided by scrolling through individual

friends' recently streamed songs is quite low. The new feed should provide more information at a glance.

Unique value compared to the 'Charts' page: The 'Charts' page allows users to see their (friends') most listened songs, artists, and albums within a selected timeframe (e.g., weekly, monthly, etc.). The new feed should therefore provide value that is unique in some key ways.

Stronger trigger to open the app: Lastly, the new feed should have better usage metrics. Ideally, people would open the app more often to take a look at this new and redesigned feed.

First Concept

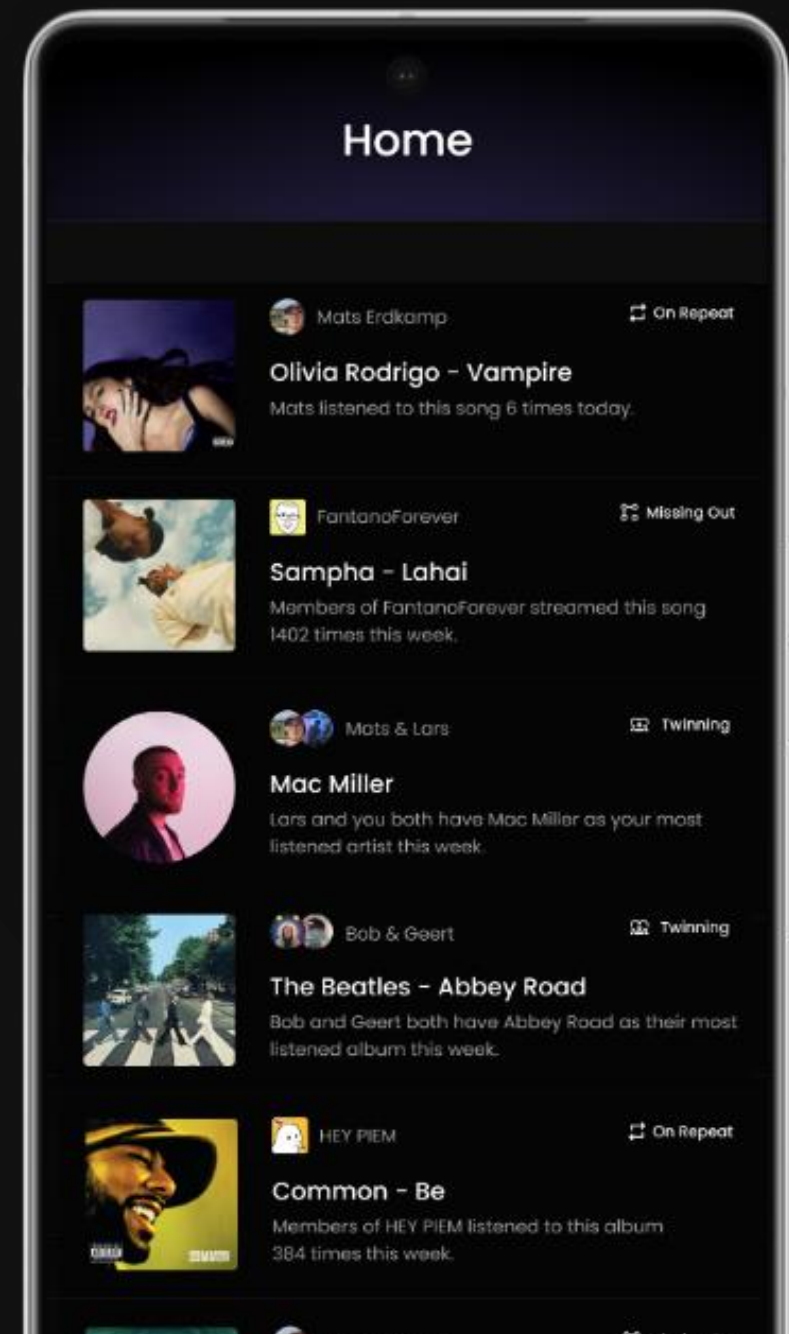
With these criteria in mind, as well as the overall company vision to bring people together through their shared love of music, an initial concept was created. This 'Insights' page would extract all the most interesting data from your friends' listening behavior, and curate it into a social media-like feed.

Crucially, for this to work, the insights need to be interesting to the users. Sharma & Cosley (2013) highlight how users significantly prefer social explanations that name the relevant friend. Meaning that 'Alice likes this song' is perceived as more persuasive than '2 friends like this song'. Additionally, they highlight that persuasiveness is linked to the relationship strength. This intuitively makes sense, and highlights the need for a feed that prioritizes close friends and social groups in which one is more active.

The insight types that I came up with aim to create a social translucence of noteworthy events within the recent streaming history of friends and joined communities. They are as follows:

- **On Repeat:** highlights when a friend or community is listening to a song multiple times in a short time span.
- **Missing Out:** highlights the fact that a big fraction of a community is listening to an album, that you have not heard yet.
- **Twinning:** highlights the fact that you and a friend (or two friends) are both listening to the same song often.

Figure 11: The initial concept for the insights page.



User Feedback

A small-scale user test (appendix D) was done to validate and iterate upon the three aforementioned insight types. 5 Rootnote users were asked about their experience with the recent tab. The aforementioned concepts of 'On Repeat', 'Twinning', and 'Missing Out' were explained to them. They were then asked if they had any other suggestions for insight types. The following additional insight types were conceptualized, together with the participants:

- **Milestones:** X amount of streams is achieved by a user/group.
- **New Discovery:** A friend recently discovered one of your favorite songs/albums.

Additionally, feedback was positive with users proclaiming that they would indeed use this more than the 'Recent' tab. Later quantitative confirmation of this finding will be done through Posthog by looking at the usage metrics.

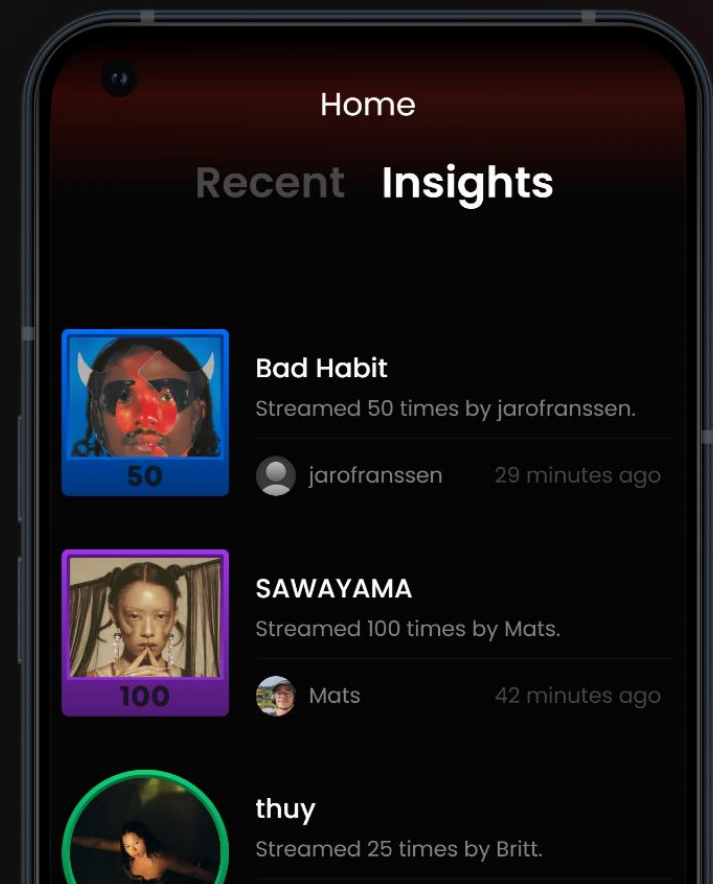
Partial Implementation

As a proof-of-concept. The 'milestones' part of the insights page was implemented (figure 12). Milestones were chosen since they provided the least engineering challenges and could be deployed within a short timeframe.

Main takeaway

Stats Export highlighted the fact that social features can, and should, be more tightly integrated within the functionalities provided by Rootnote. This lesson was applied to the redesign of the 'Recent' tab. As a result, the homepage has become more engaging, showing that the embedding of social functionalities within features creates a stronger end-product. User engagement with this new feature is yet to be measured. Further testing needs to be done to confirm the effectiveness of the redesign.

Figure 12: The newly implemented insights page.



Exploring More Gamification

Music communities love to come up with new ways to discuss music. Sometimes, they even invent games to do so. Knockout Tournaments are quite commonly seen in online music discussion circles. Yet, these games are not data-driven and are mostly created and curated by one user, who only has an approximate idea of the listening habits of the group. Rootnote's specializes in letting users gain insight into a group's collective musical hivemind. While talking to Twan Muste, whose graduation project dealt with music in the TikTok generation, he stressed the importance of virality. With this in mind, and due to my fascination with the cutting-edge of artificial intelligence, two large language model based games were made, 'Artistrology' (figure 13) and 'Rhythm Roast' (figure 14).

Mission Alignment and Challenges

While 'Artistrology' and 'Rhythm Roast' were generally well perceived by people who tested it (about 8 users). They are not strictly aligned with our product design philosophy. While the concept of using large language models holds promise, it needs to be reworked in a few key ways. This could be as simple as focusing on groups in new iterations, or being more explicitly encouraged to share the results. A full rework of the concepts will be done, using the product design framework (appendix A) as a guide.

Design Difficulties

So, how would a game that aligns better with Rootnote's mission look? We could for example imagine a party game where users have to guess to which streaming behaviour belongs to who. 'Who has been the biggest swiftie (nickname for a Taylor Swift fan) this month' or 'who has recently streamed this [guilty pleasure song]' could be imagined as questions popping up on a TV, with users submitting answers via their phone. While this concept is not fully fleshed out as of now, it is not hard to see how this could work. The scenario sketches a group that has a strong social connection, which strengthens their musical connection through gamification. The opposite, however, is a bit more tricky. Designing games for bigger, pseudo-anonymous online groups proved to be difficult. The discussion section of this report highlights some of the challenges had in designing for these groups during this project.

Main Takeaway

People generally seem to enjoy games and experiences based on their streaming data. This insight helped shape the vision for the Game Hub, which is further detailed in the business plan. How to design of a game that connects pseudo-anonymous strangers online through their shared love of music is still an open question.



Artistology

Fred Again - "Leavemealone": This song has a deep, introspective vibe. Astrologically, this might resonate with a Scorpio who is known for their intense and reflective nature.

Jungle - "Back on 74": Jungle's music often has a rhythmic, soulful groove. This could appeal to a Taurus who appreciates sensuality in music.

Frank Ocean - "Chanel": Frank Ocean's music is known for its emotional depth and poetic lyrics. This could be a hit with a Pisces, known for their deep emotions and artistic sensibilities.

Big Thief - "Simulation Swarm": This indie band often explores complex and mystical themes, something that might intrigue an Aquarius, known for their love of the unconventional and intellectual.

Sampha - "Like the Piano": This song's heartfelt and soul-bearing nature might appeal to a Cancer, who values emotional depth and sincerity in music.

Radiohead - "Nude": Radiohead's often existential and complex music could resonate with a Virgo, who appreciates intricacy and depth in art.

Portishead - "Glory Box": This song's moody and atmospheric vibe could strike a chord with a Capricorn, who often appreciates music with depth and intensity.

Childish Gambino - "III. Urn": The innovative and diverse style of Childish Gambino could appeal to a Gemini, known for their adaptability and appreciation of variety.

Given the range and depth of these songs, I would guess your star sign is Pisces. Pisces are known for their deep emotional capacity, appreciation for artistry in music, and their often eclectic taste, which seems to align with the diverse and emotionally rich selection of songs you've listed.





Rhythm Roast

Exploring large language models informed by streaming history.

Figure 14: Example use of the Rhythm Roast game.



Rhythm Roast

Student Industrial Design (finishing thesis)

Submit

Alright, let's roast your daily routine with a playful jab, incorporating your eclectic taste in music into this imaginative scenario.

Your day starts with "Like the Piano" by Sampha, a song as mellow as your morning motivation. You reluctantly crawl out of bed, contemplating the industrial design of your alarm clock, which, like your thesis, is a work in progress.

Breakfast is accompanied by "Back on 74" by Jungle, which is fitting because your cooking skills seem stuck in 1974. You're trying to design the perfect spoon but still can't use one properly to avoid spilling cereal.

As you sit down to work on your thesis, you put on "Simulation Swarm" by Big Thief. Your focus, much like the song, wanders in a dreamy state, leading to a design that's more abstract art than functional product.

Lunchtime is a brief affair, as "Chanel" by Frank Ocean plays. You admire the dualities in his lyrics while your sandwich showcases a duality of its own - edible and inedible parts.

In the afternoon, you're deep into "Nude" by Radiohead. The song's slow build mirrors your thesis progress - gradual, with occasional sparks of brilliance overshadowed by existential dread.

As the evening rolls in, "Glory Box" by Portishead sets the mood. You're hopeful for a breakthrough in your work, much like hoping for a love story in a film noir - unlikely but intriguing.

Dinner is a solo event, with "leavemealone" by Fred Again playing. The title reflects your thoughts perfectly - if only your thesis would leave you alone. Your meal is as uninspired as your current thesis draft.

Finally, you end your day with "III. Urn" by Childish Gambino. It's introspective and complex - qualities your thesis desperately needs. You ponder over your design, wondering if it'll ever be as coherent as the song. In conclusion, your daily routine, much like your music taste, is a unique blend of ambition, procrastination, and artistic chaos. Here's to hoping your thesis turns out as well-crafted as these songs!

Demo Day & a New Landing Page

The demo consisted of the newly designed landing page (figure 17), as well as printouts that highlighted some of the functionalities of the platform (figure 15). The focus of this demo day, since it is open to the public, was to gain feedback on the concept itself, and not necessarily the business aspects.

Feedback

The feedback received during the demo day was positive, with ten people choosing to join the platform on the spot. There were however two points of feedback that came up multiple times.

Firstly, the question 'how does this compare to Spotify Blend?' was asked multiple times. In its current form, the main differentiators are the fact that communities can create playlists, instead of just up to nine friends. Secondly, there is more advanced control over the playlist creation as compared to Spotify Blend. This second unique selling point of having more control was positively responded to by visitors. Some visitors even joined the platform not for the group making capabilities, but for the fact that they would be able to generate filtered playlists for themselves with ease. This revelation has led to the inclusion of a persona that would be used in the re-imagination of the playlist creation controls. This re-imagination can be found in the 'Advanced Filtering' chapter.

Another point of feedback (by industrial designers) was the lack of inclusion of the core company values in the UX itself, instead of just including it in the outcomes. I was already working on strengthening these aspects through the various conceptualizations presented before.

Figure 15: Picture of the demo day stand.





Old Landing Page

The landing page at the start of this semester.

Figure 16: The old landing page.

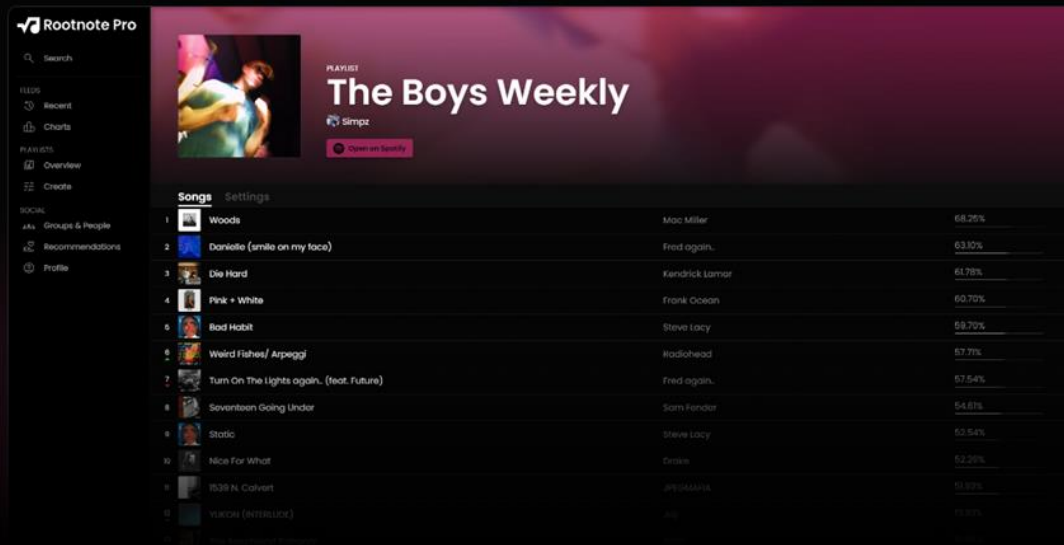
Top 100 charts for your friend group

Create automatically updating Spotify playlists based
on the streams of group members.

 Sign in with Spotify

Old Landing Page

The previous landing page. This
was just an image of a Rootnote
playlist and a call-to-action to join
the platform.



Rootnote Pro

Search

RECENT

- Recent
- Charts

PLAYLISTS

- Overview
- Create

SOCIAL

- Groups & People
- Recommendations
- Profile

PLAYLIST

The Boys Weekly

 Simpz

[Join on Spotify](#)

Songs Settings

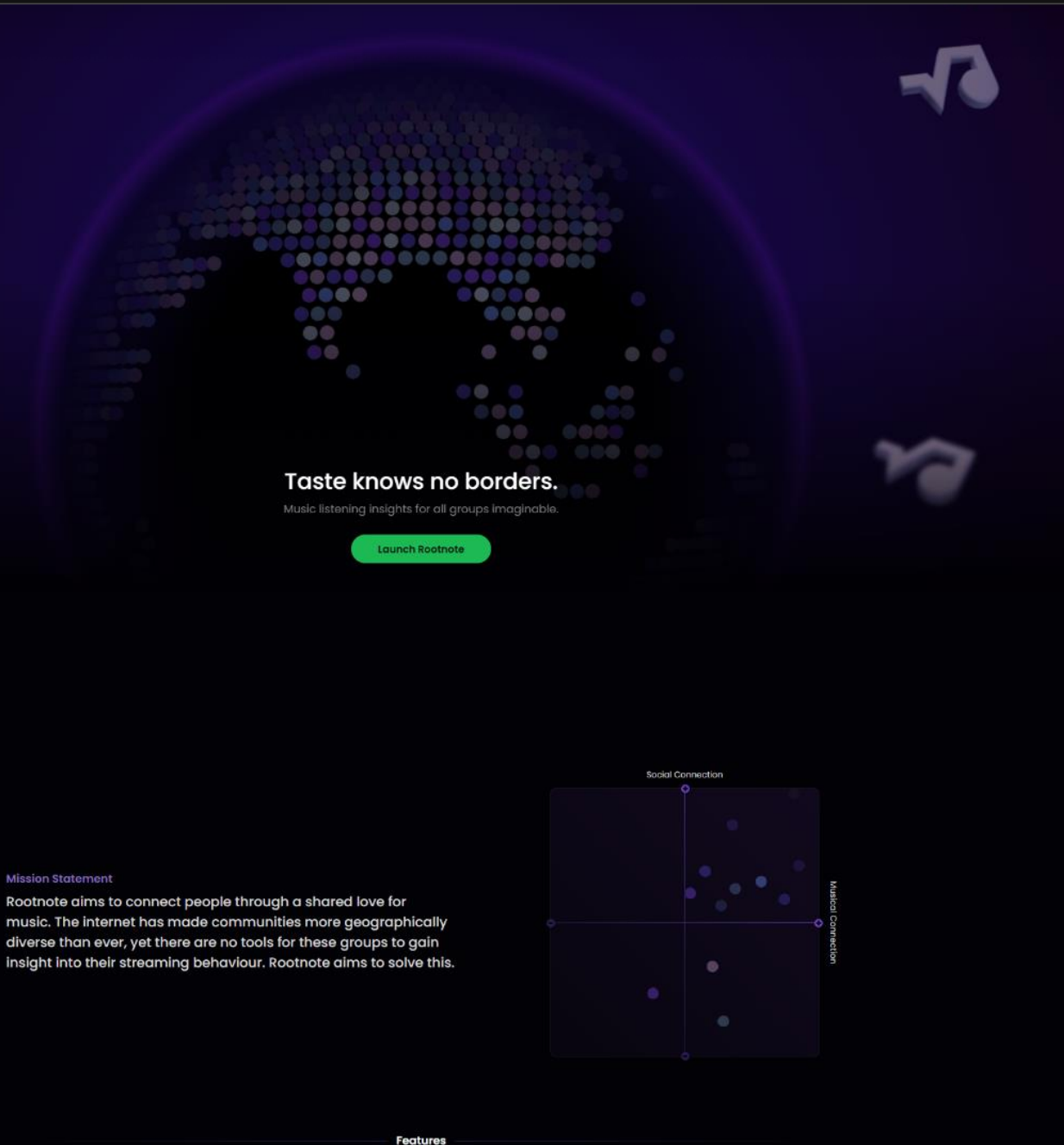
1	 Woods	Mac Miller	68.25%
2	 Danielle (smile on my face)	Fred again.	63.02%
3	 Die Hard	Kendrick Lamar	61.78%
4	 Pink + White	Frank Ocean	60.70%
5	 Bad Habit	Steve Lacy	59.70%
6	 Weird Fishes / Arpeggi	Radiohead	57.71%
7	 Turn On The Lights again. (feat. Future)	Fred again.	57.54%
8	 Seventeen Going Under	Sam Fender	54.81%
9	 Static	Steve Lacy	52.54%
10	 Nice For What	Drake	52.20%
11	 1939 N. Colvert	PREMAMA	51.89%
12	 VURCH (INTERLUDE)	AKA	51.80%
13	 The New Normal EP	Drake	51.60%



New Landing Page

The revised version to better capture the suite of functionalities

Figure 17: The new landing page.



Hero Section

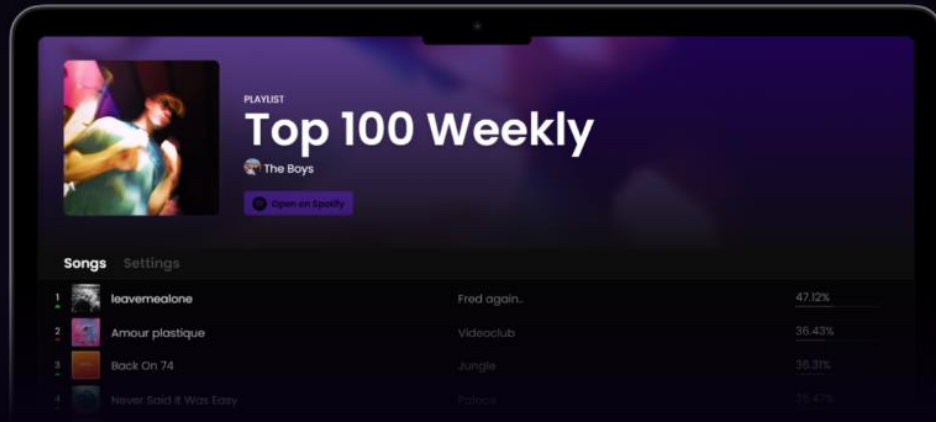
Shows a spinning globe. After a while, the various colored dots on the sphere get grouped by color. Highlighting that Rootnote can create music listening insights for all groups imaginable.

Mission Statement

Lays out the goal of Rootnote, as a primer before showing the various functionalities further down the page.

Create Automated Playlists

Listen to your group's personal top 100. Updates every day, based upon the streams of group members.

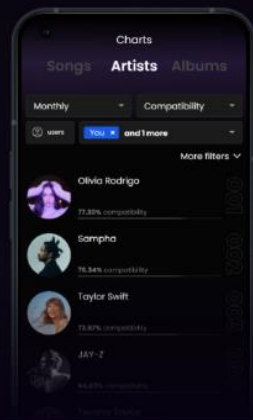


Playlist Creation

Highlights the fact that users can create automatically updating playlists based upon member streams. The functionality that Rootnote was originally created for.

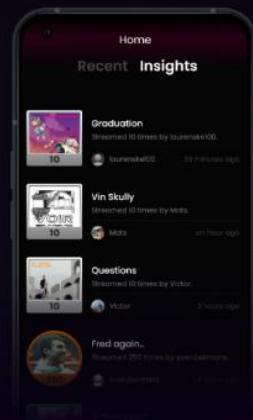
Chart

See what your community is listening to.



Learn

Gain insight into friends' streaming highlights.



Compare

See how your streams stack up against your friends'.



Insights

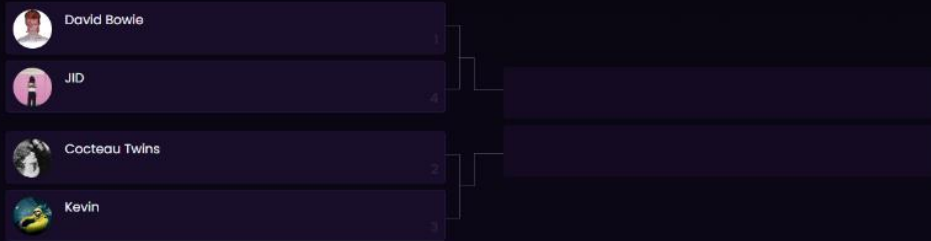
Shows the various ways in which users can gain insight into their community/friends' streams.

Gamify your data

Easily create games based upon your communities' streaming history.



Easily create games based upon your communities' streaming history.



Gamification

Interactive demo (based upon the month's most streamed songs and artists platform-wide) that highlights how much easier Rootnote can make gamification of streaming data.

Export your stats

Effortlessly bring your Rootnote statistics to other platforms.



Stats Export

Section that highlights how your (community's) streaming behaviour can easily be exported to be presented on other platforms.

Join Rootnote today, for free!

Launch Rootnote

Footer

Presents the user with a second call-to-action to join the service.

Advanced Filtering

In its currently deployed form, the playlist creation functionality allows for filtering through the usage of audio features as provided by the Spotify API. Artists can be whitelisted, genres selected, and energy or danceability ranges can be set. While this has worked for the proof of concept, there are a multitude of changes that can be made to make the functionality more aligned with Rootnote's vision at large. Throughout this section, I will lay out the design goals and propose a new and improved version.

Design Requirements

Based upon user feedback and personal gripes with the current implementation, I have come up with a few design requirements for a redesigned version. These requirements are as follows:

Unified Filters: Functionalities such as playlist creation and the generation of stats exports should all be built upon the same underlying algorithms. If I can create a 'My Favourite 70s Rock Songs by Women' playlist, I should also be able to create a stats export based on that same filter.

Advanced Querying: Currently, filters apply to all songs. There is no way to selectively apply a filter to a subcategory. Users can not, for example, create an '80s Pop & 90s Jazz' list. The revised version should be able to apply filters and other transformations not only to the list as a whole, but to subsections as well.

Social Translucence: Throughout my past project, I have made a few contributions towards the creation of interfaces that aim increase the amount of social translucence (Erickson & Kellogg, 2000) present within music control. The filter interface should when possible, clearly communicate why an end result is the way it is.

Social Connection: The new filtering methods should allow for customization that is uniquely valuable to a community or friend group. Groups should be able to make something uniquely their own.

Presets: There should be good presets present to get the user started with creating their playlist.

Remixing: Filters should be able to be added upon. If a community has a top 100 jazz songs, users should be able to then take that list and build upon it, by for example excluding the songs they have already heard.

Visual Scripting Explorations

Based upon the set requirements, a visual scripting approach seemed like a good fit. Visual scripting often gets used in scenarios where there are a lot of logical operations, which need to be combined and separated in various ways (Green & Petre, 1996). Additionally, with visual scripting, it is easy to follow along the sequential application of various transformations. 3D-modeling tools such as Blender and Maya, as well as game engines such as Unity and Unreal Engine, use visual scripting (more specifically, a node graph) to let users create materials and shaders.

To get a better understanding of what kind of operations would need to be performable, 7 Rootnote users were asked to help come up with lists. The participants were asked to come up with the following:

- Lists that (persona) Eve would make.
- Lists that (persona) Bob would make.
- Lists that are *ridiculously* niche
- Lists you would like to have yourself.

The questionnaire structure is summarized in figure 18. These prompts as provided by participants were broken up into subsections, and semantically analyzed (Goddard, 2011). A subset of the prompts was also converted into a node graph, in an effort to better understand any additional nodes (logical operations) that

might be required to achieve the desired output. Figure 19 shows an example of a prompt analysis. The resulting table of nodes can be found in appendix E. The next few pages show some of them in action.



User Test Setup

Overview of the questionnaire.

Figure 18: Questionnaire explanation.

Content		Description
1	Do you currently use a Rootnote playlist? [Y/N] [if Yes] Please describe your experience using a Rootnote playlist. What works well, and what could be improved?	1. Introduction First, users were asked if they currently use a Rootnote-powered playlist, and if there are any improvements that they would like to make. Second, they are given a bit of context on the nature of the questionnaire.
2	This questionnaire's goal is to help redesign the filter capabilities present in Rootnote. A short exercise will follow to better understand the user (you) needs. Within the test, you will need to write down ideas for filtered playlists in natural language. Examples include: "My most listened songs from 1973.", or "[group]'s favorite songs I have not heard yet." Ideas do not have to be bound by feasibility (go wild!)	
 Eve Please describe two or more playlists that Eve might enjoy. Eve seeks a platform that integrates her love for music with her social life. She values community opinions and enjoys discovering music through social interactions. Eve is drawn to features that allow her to connect with others, share playlists, and explore music that is trending within her social circles. She finds joy in the communal aspects of music and looks for platforms that emphasize social discovery and shared experiences.  Bob Please describe two or more playlists that Bob might enjoy. Bob is passionate about the statistics and analytics behind music. He prefers a music platform that offers in-depth insights into his listening habits and the ability to explore music through detailed filters and data-driven recommendations. Bob enjoys creating highly curated playlists based on specific criteria and appreciates tools that allow for sophisticated querying and analysis of music trends. He is less concerned with the social aspects and more focused on the technical and analytical side of music exploration.		2. Persona Warmup Secondly, they get to try writing a playlist prompt with two personas. These are not the focus of the test, but might still provide valuable insight. Their main goal is to warm them up for the next round.
Extreme Please describe two or more playlists that are extremely specific. Examples: "The most played jazz songs in Singapore, during autumn, with female bass players." "[My Group]'s favorite songs streamed between 1 and 5 AM, that are very sad lyrically, listened to more than 3 times but less than 20 times by my mom. Also exclude Tame Impala's second album." "Songs for surviving a new years hangover that no members of [My Group] have heard yet, but everyone has listened to the artist at least 30 times." You Please describe two or more playlists that you would personally enjoy to have.		3. Extreme & Personal Lastly, users are tasked to come up with extreme and personal prompts respectively. The idea behind 'extreme' is to get their creativity flowing even more, and to unearth potential filter actions we have not thought of yet. The 'you' question's goal is to help me understand what users actually desire.



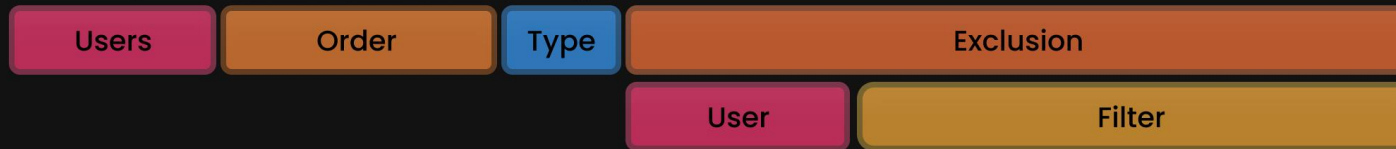
Questionnaire Analysis Method

Overview of how the answers were analysed.

Figure 19: Questionnaire analysis explanation.

Prompt + Analysis

“[Group]’s most listened songs that I have not heard more than twice.”



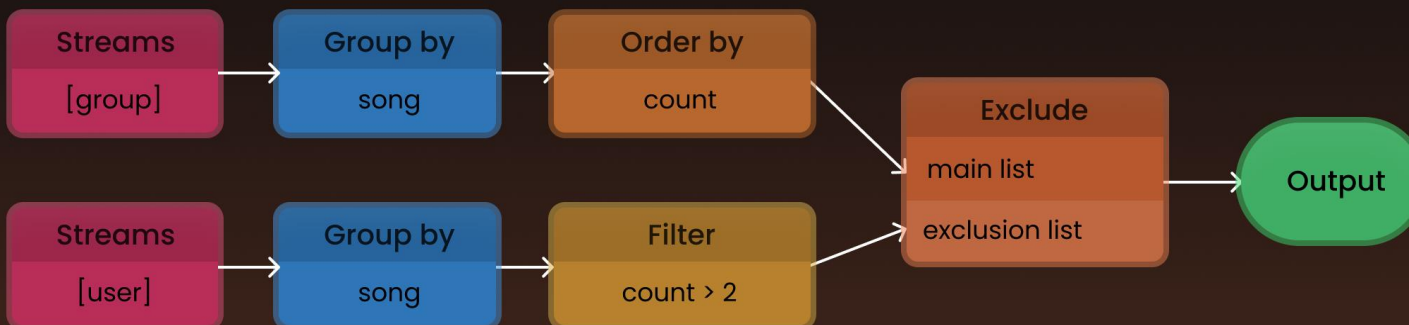
Questions were first broken up into smaller chunks. This was done to get an idea of the types of actions that would be needed.

Rewriting

STREAMS BY group GROUPED BY song ORDERED BY count. EXCLUDE
STREAMS BY user GROUPED BY song WHERE count > 2.

Prompts were rewritten in a more methodological manner. The phrasing was inspired by the SQL database querying language, which will ultimately be used to get the result. (This is what the node graph will represent).

Node Graph



Lastly, for some prompts, a node graph was made to see if there were any hidden operations that are not immediately obvious from the written language. Additionally, this helped in getting a feel for the system.

Visual Scripting Actions

This exploration of prompts led to a table summarizing the actions (appendix E). Various actions could be expressed in other ways as well. For example, [streams by user] → [group by song] could also effectively be expressed as [songs] → [streamed by user]. Here, I tried to adhere to the findings of Myers et al. (2004), which looked at how children with no experience in programming express various logical operations. Additionally, the design principles as laid out by Norman (2013) were also considered when multiple operation chains were plausible solutions.

Most actions are straightforward in how they would be implemented. There is one, however, that could use some clarification: 'order by similarity'. Within the questionnaire, users often used phrasings such as 'that sound like [vibe]'. This operation aims to let users sort by that vibe. But, how do we convert the vibe as described to an operation that can run in the database. As an example, we will use '[songs] that sound **villainous**'. The literature highlights two main ways of filtering used in recommendation engines, collaborative filtering (evaluating items through the opinions of other people) (Schafer et al., 2007) and content-based filtering (Van Meteren & Van Someren, 2000). Since 'villainous' is an attribute of the content itself, it makes more sense to use content-based filtering for this use case. Streaming services use various parameters that describe a song to power their content-based recommendations. Spotify, for example, uses what they call

Audio Features (Spotify, n.d.). This includes values such as the 'energy', 'danceability,' as well as the tempo and key. Their recommendation engine has no 'villainosity' parameter however. Some (AI) system would still need to express 'villainous' into the other audio features that are available. As a first implementation, content-based filtering based on a seed playlist will be used. Users will be able to provide a playlist with songs that they think sound villainous. Analysis of the underlying audio features will be used to extract the 'vibe'.

In recent years, a new kind of filtering has emerged, however. context-based filtering (a subset of content-based filtering), uses the context in which the song is placed by the user (Pichl et al., 2015). Applying context-based filtering to our 'villainous' example can significantly enhance the accuracy of recommendations. By analyzing the titles and content of user-created playlists where a song frequently appears, the system can infer the mood associated with that song. For instance, if a song is often included in playlists titled with words like 'villainous', 'dark', or 'intense', the system can reasonably categorize it as having a villainous vibe. This approach can lead to more precise and contextually relevant recommendations, tapping into the subtle emotional connections that users make between songs and the moods they evoke. Currently, such a system is out of scope for Rootnote, but it could significantly strengthen the functionality in the long-term.

Visualization Details

A node graph basically consists of nodes, and arrows connecting them. Yet, there are plenty of optimizations we can make to improve the user experience. Visibility, feedback, affordance, signifiers, mapping, and constraints (Norman, 2013) were all considered for the design of the node graph. Additionally, the different types of feedback and feedforward as described in the interaction frogger framework (Wensveen et al., 2004) were tried to be applied.

One additional insight that could potentially increase the usefulness of feedback was the fact that some feedback can be made user aware. As an example, if a user wants to know what a danceability score of 0.8 actually means, it would be better to show them an example song that they have listened to extensively.

Some users had concerns about the amount of effort it would take to create a list. While they might set up a few, it would not occur, say, weekly. This feedback has led to the conceptualization of two concepts that aim to strongly increase the speed at which a list can be created. These ideas have been called 'Text-to-Nodes' and 'Share Target Remixing'.

These concepts have been materialized and visualized in figures 20, 21, and 22. Figure 24 shows an visualization of how the whole UI might look.

Design Philosophy Alignment

The list creator itself is not necessarily the most socially oriented feature. Its main goal is to allow for the creation of lists that are usable by other services (e.g., automated playlists, stats export.) Yet, some socially oriented features can still be embedded within the design.

The design requirement of 'Social Translucence' is not yet addressed. Going through the product design checklist found in appendix A, two ideas were thought of: traces and explanations. Figure 23 explains the two concepts. In short, explanations allow users to hover over a song to gain insight about why it was included, and traces visually show the route taken through the node graph.

Main Takeaway

Improving the way lists are made has yet again strengthened the product design philosophy of Rootnote. Crucially, it highlights how the design philosophy can be embedded with the functionalities itself, and not just in the outcome. Additionally, this exploration highlights that music enthusiasts also might be interested in these functionalities. This helped further define Rootnote's target user base.

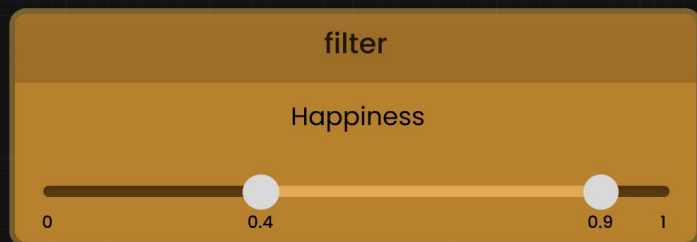


Node Graph UX 1

Ideas to make the user experience better.

Figure 20: Node graph UX ideas (1).

Numeric (Current Implementation)

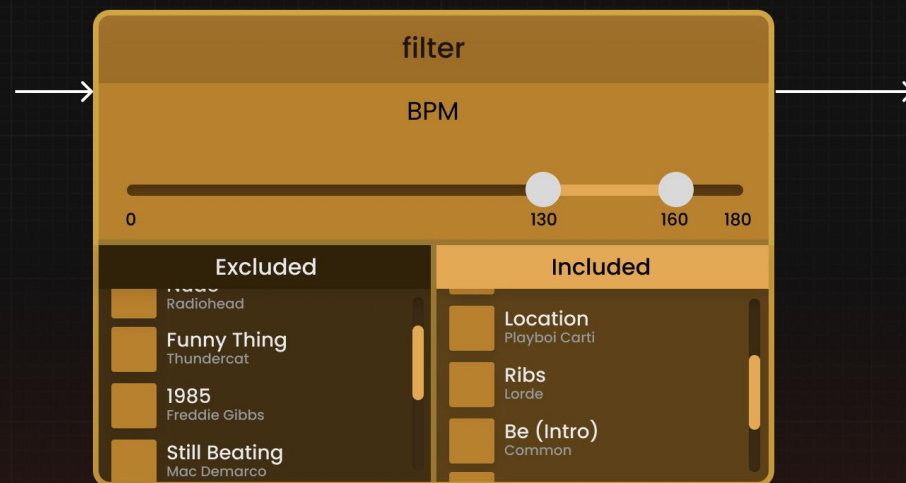


Numeric + User Aware Tooltips



User Aware Tooltips

Since Rootnote is aware of the user's (recent) streams, we can give them more useful feedback. By making sure they know the song quite well, their frame of reference will be better than if it were 4 general examples. With multiple examples, the other parameters (in this case, anything but happiness) can be chosen to be quite varying for each other. This should help paint a better picture of what 'happiness' entails in this context.



Visualizers

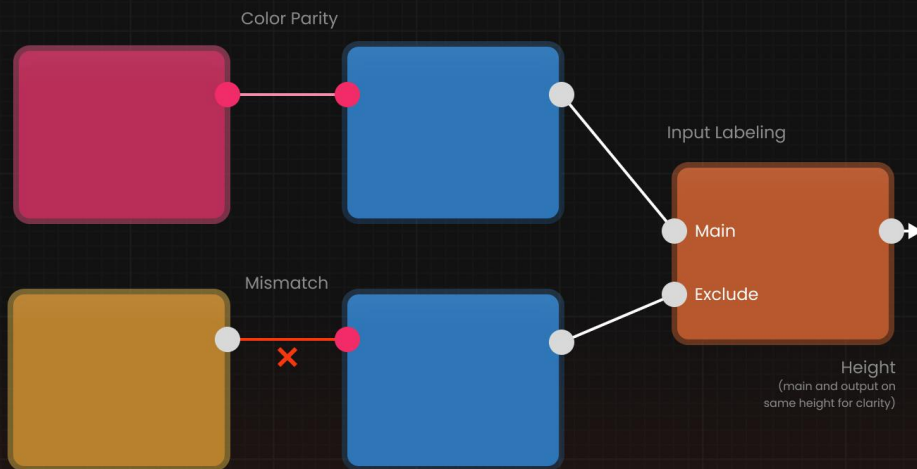
Operations such as filtering can have their result visualized. This can help users get a sense of what the operation does. This way, it is easier to tweak a node's values, as opposed to using the final output as the feedback. It should be noted that doing this adds computational complexity, and it should thus be added with care.



Node Graph UX 2

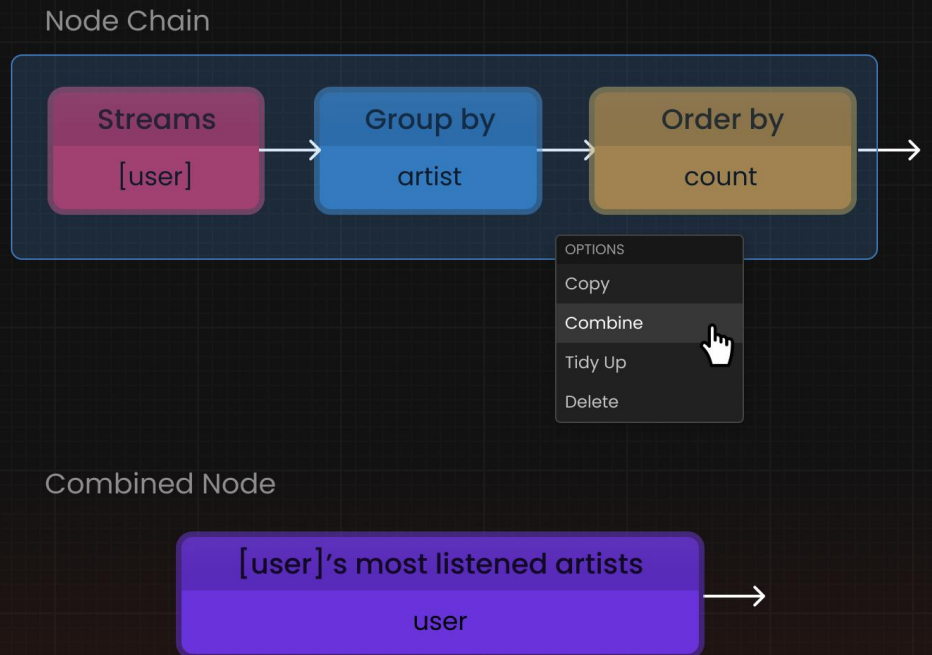
Ideas to make the user experience better.

Figure 21: Node graph UX ideas (2).



Inputs & Outputs

The nodes are connected through lines, and have input and output connections. By colouring these inputs and outputs, users could more easily understand their relationship. The varying input and output types (and their corresponding colours) are not yet created as of now. This will be done at a later stage.



Composability

By combining nodes into one, users can clean up their canvas. Additionally, if a user uses a certain combination of nodes quite frequently, they can save the combination and re-use it when needed.

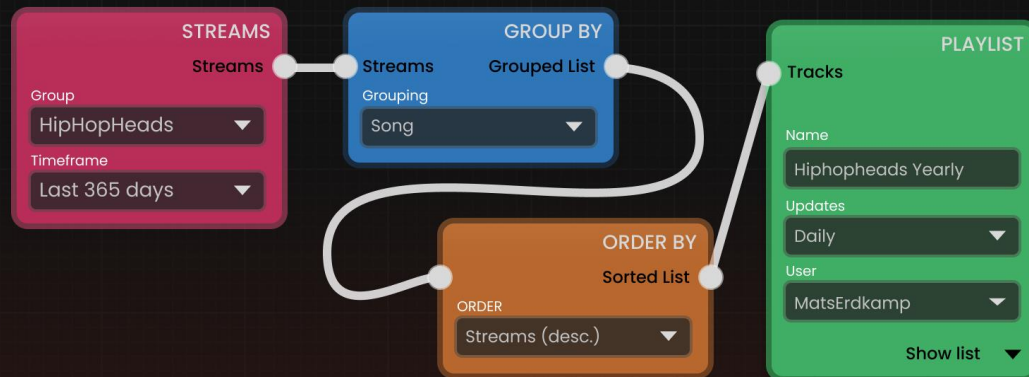


Node Graph UX 3 (AI)

Ideas to make the user experience better, powered by artificial intelligence.

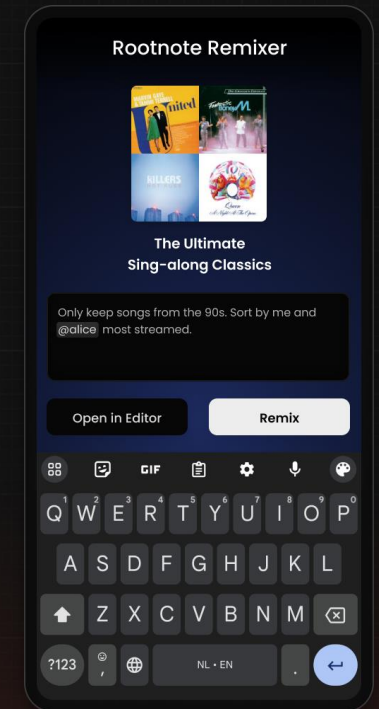
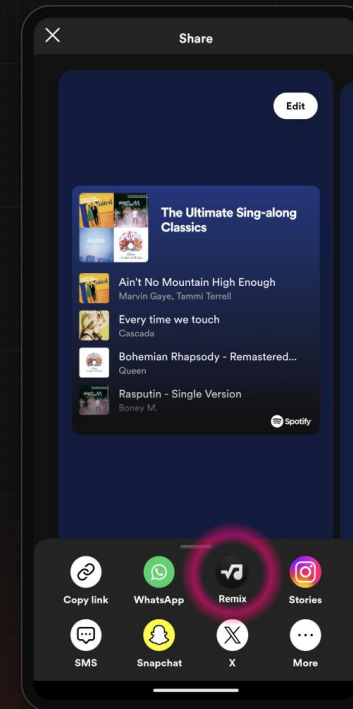
Figure 22: Node graph UX ideas (3).

“Give me @HipHopHeads most listened songs this year”



Text-To-Nodes

I envision a future system that can create a node graph based on a text prompt. This would simplify the user experience immensely, and helps users to get started. With the recent advancements in artificial intelligence, it seems likely that this would be doable (by myself) in the near future.



Share Target Remixing

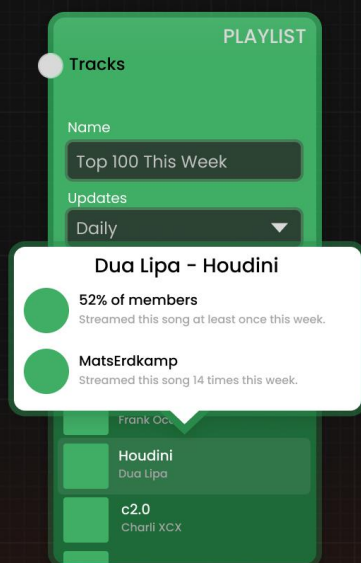
Some questionnaire participants (rightfully) had questions about the effort needed for the node graph. While they might use it to set up a few playlists they like, it would not be a frequent endeavour. Share Target Remixing aims to lower the barrier to entry as much as possible. Especially combined with the Text-To-Nodes functionality, modifying playlists based on some (social) criteria would be super quick and easy.



Node Graph UX 4 (Social)

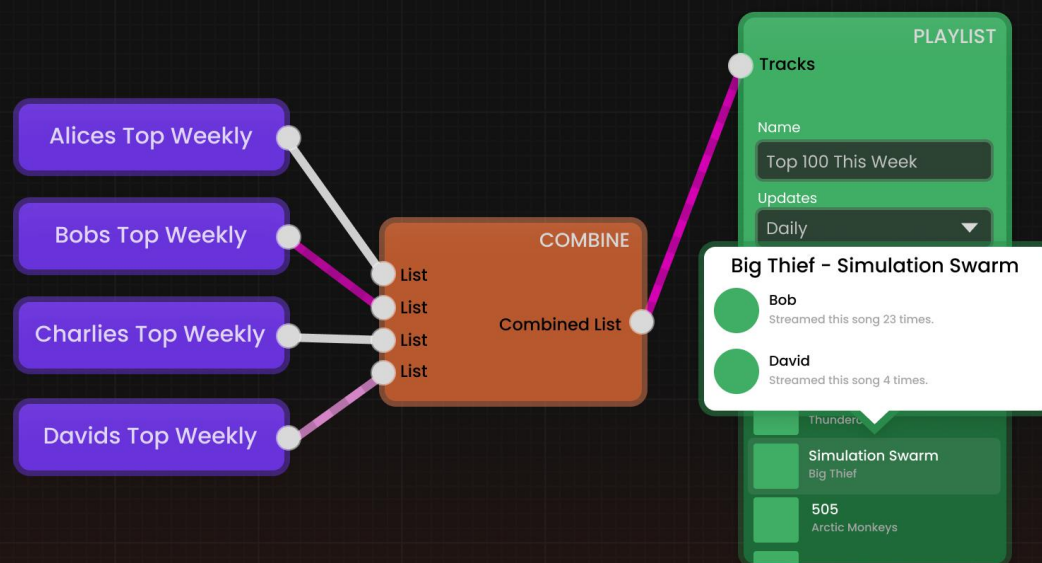
Ideas to make the user experience better, by considering the translucence of decisions.

Figure 23: Node graph UX ideas (4).



Explanations

Hover over an inclusion to get a breakdown of why it was included. Makes users more aware of each other's influence on the end result.



Traces

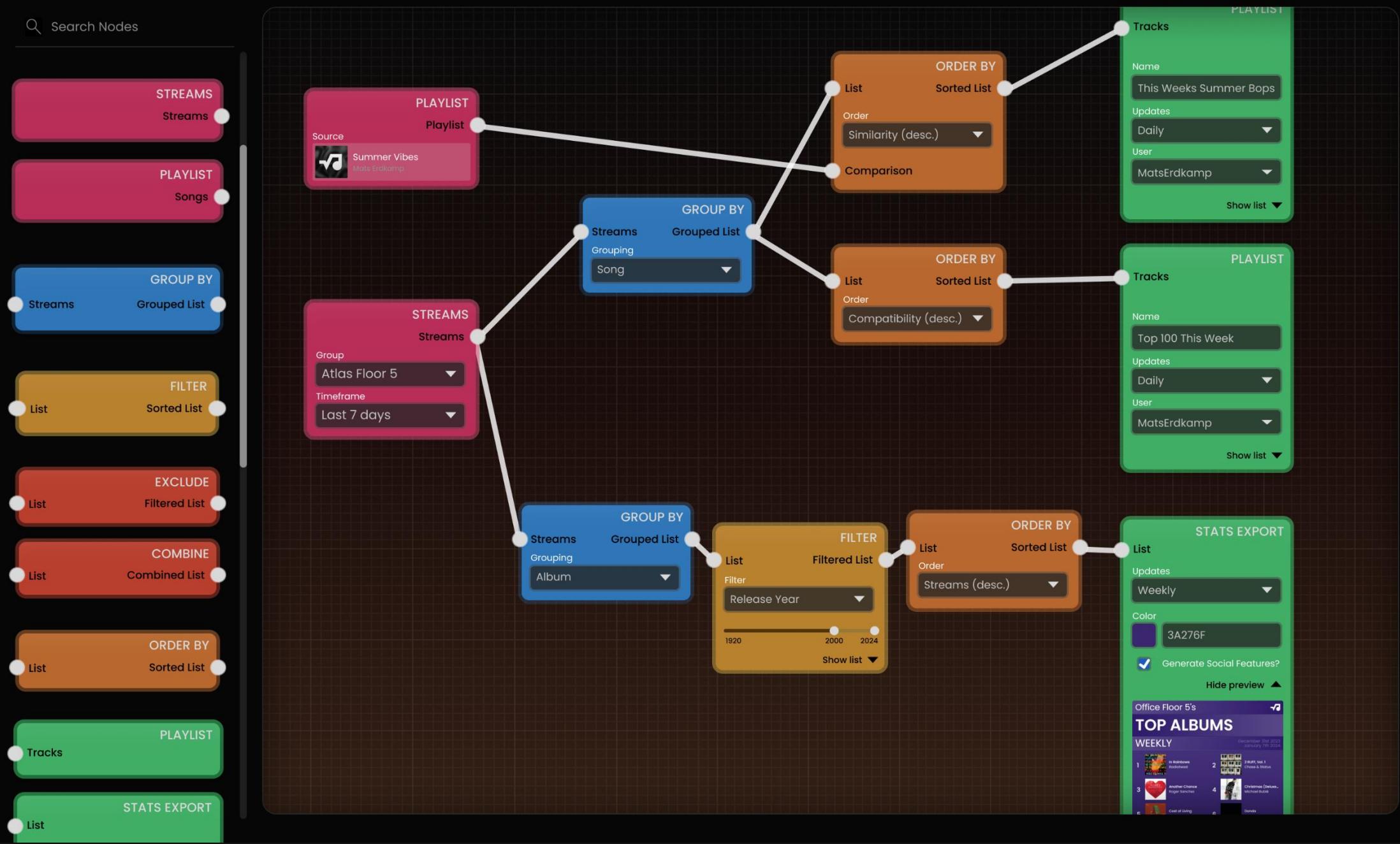
Visually highlights why a song is included, by clearly marking the route it has taken through the node graph.



Node Graph UI

Conceptual Visualization of the list maker node graph user interface.

Figure 24: Node graph UI.



General Improvements

During this semester, Rootnote was actually in use. This meant that the platform was also subject to some general improvements that, in my opinion, quickly needed to happen. In another case, it was not even a matter of opinion. Since the cache server kept crashing, loading times for simple queries increased to about 20 seconds, rendering the platform useless to most users. An overview of these improvements is provided within this section.

Mobile Improvements

Rootnote was originally designed with the desktop in mind. This led to a user interface that, while responsive to all screen sizes, definitely could be improved in usability on smaller screens. Figure 25 and 26 show the old and new version of the friend leaderboard respectively. There are a few key changes here that aim to better serve users on a handheld (touch-based) device.

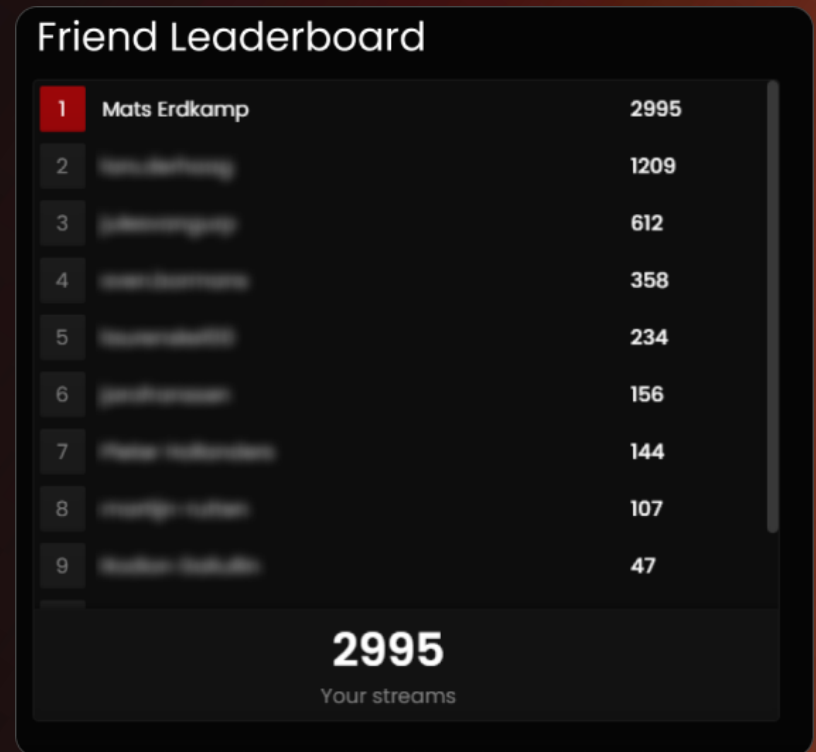


Figure 25 & 26: Old and new versions of the leaderboard on mobile.



The Backend Improvements

Throughout the semester, a lot was done to make sure that the server infrastructure can actually handle thousands of users. Writing code for a prototype is quite different from production code. Within this section, I will lay summarize the changes that have been made within the ~230 GitHub commits.

The most noteworthy changes to the backend all deal with how data is passed between the various services, and how it is stored. Here, we can see that a user having new streams would trigger full recalculations within the functionalities that depend upon the number of streams. **Thus, a singular new user stream would trigger recalculation of all Charts (weekly, monthly, quarterly, yearly, and all-time).** The more sensible solution of course would be to update the values for the streamed song only. This is the approach that was taken for the architecture revamp. Additionally, services such as the Charts of Insights will now be 'told' that this number has changed, instead of 'asking' if it is different. Switching from a polling architecture (asking), to an event-driven (telling) architecture, where services are proactively notified of updates, offers a few noteworthy advantages:

1. Enhanced Resource Efficiency: This shift dramatically lowers the need for computational resources. In a polling architecture, services like Charts of Insights constantly check for updates, which can be resource-intensive. However, in an event-driven system,

these services are informed only when a relevant change occurs. This is analogous to being notified when a task is completed, rather than continuously asking about its status, leading to more efficient use of resources. (Chandy, 2009)

2. Immediate Data Synchronization: In an event-driven model, data synchronization is immediate. As soon as a number changes, the Charts of Insights, for example, is updated in real-time. This ensures that the data presented is always current, enhancing the accuracy and reliability of the service. For end-users, this method ensures that they receive the most up-to-date information without delays. It leads to a more dynamic and responsive user experience, especially in applications where timely data is crucial. (Chandy, 2009)

Why?

A lot of time this semester has been spent on these backend improvements, and this report undersells the amount of effort that was put into making the backend scalable. This might make one wonder why this time was invested into making these changes. Initially, the plan was to do part of the product validation with new online communities. Unfortunately, the engineering challenge was too big to realize this in the short-term. The discussion highlights some of the consequences this had on the rest of the project.

Product Improvement Conclusion

The functionalities as present at the start of this semester were mostly things I personally envisioned. Frankly, I had a need for them or they seemed cool to me. By consulting the users about their opinion, I was able to get a better idea of Rootnote's unique selling point. This realization led to the creation of the User Connection Graph. The major features present in the minimum viable product have been (conceptually) redesigned to better fit this new product design philosophy.

By clearly defining the product philosophy, it is now easier to create and align functionalities with our vision: connecting people through their shared love of music.

These insights have been instrumental in guiding the direction of Rootnote. They have enabled us to carve out a distinctive position in the realm of stream trackers, setting us apart from the competitors. The business plan lays out the details of how we aim to set ourselves apart. While functionalities can be easily duplicated, a design philosophy that permeates every decision we make is harder to steal.

Section Three

The Business

The Business

Next to product development, a big part of this semester was spent on developing the business plan of Rootnote. This section of the report lays out the various steps that have been taken to formalize Rootnote as a proper business. These steps can roughly be categorized in three groups:

- Talking to (potential) customers for needs assessment
- Talking to founders for advice
- Formalizing the business plan

Having done most of my projects during my master's program on the topic of socially oriented music solutions, I feel like a lot of the value lies within my personal vision of what the future of music streaming can become. The conscious decision was therefore made to prioritize enabling myself to grow Rootnote as a business, instead of, for example, aiming to sell the idea at the end of the semester.

Talking to Potential Customers

Back in January, Rootnote was tested on a subreddit. While this lead to some people being ecstatic about the concept, they were not commercial clients. By talking to commercial clients, I aimed to better understand this customer segment. To summarize, this customer segment would be willing to pay if the service can elevate their brand in a meaningful way. Throughout this section, a few of the (potential clients) talked to will be discussed, each having their own unique attraction to the Rootnote platform. At the end, the results will be formalized into an actionable list of principles to keep in mind.

Literature Study

One potential benefit of having a presence on Rootnote would be increased brand awareness. This can lead to a wider recognition of the brand among potential customers, enhancing visibility in a crowded marketplace and potentially leading to higher customer acquisition rates. (Fujiwara & Nagasawa, 2015)

For music-related businesses, Rootnote could help them extend their brand. Brand extension (Grassl, 2000) into platforms like Rootnote allows businesses to explore new markets and customer segments.

Brand association (Low & Lamb, 2000) helps companies shape their image into what they desire. In this case, Rootnote could help businesses in creating playlists that fit the desired 'vibe' of their brand. Current examples of this are clothing brands associating themselves with a certain type of music. The effects of music on the shopping experience can be quite profound. This influencing of the customer through their senses is often referred to as sensory branding ("Brand Sense," 2005).

The community-oriented features of Rootnote also have the power to strengthen the emotional connection users have to a brand. This has the benefit of fostering customer loyalty and advocacy, as stronger emotional connections often translate to a deeper commitment to a brand, resulting in repeated business and word-of-mouth referrals (Magids et al., 2015).

Hey Piem

Hey Piem is a recently started business founded by Bjorn Nieuwenhoff. Currently, their main focus is the sale of (whimsical) T-shirts, with their greater vision being to spread as much positivity into the world as they can. When talking to Bjorn, it became apparent that this mission would not be limited to the sale of T-shirts. There are so called 'Piem Parties', as well as stickers that get spread all across the globe to hopefully put a smile on someone's face. Once I laid out the capabilities of the Rootnote platform for him, it became apparent that he was excited to try it. Specifically, the fact that Rootnote would allow him to create playlists that align with his brand (happy playlists), and the fact that there would be a communal aspect to it all, seemed very promising. Relating this back the literature study, I envision the following benefits for the Hey Piem brand:

- **Brand Awareness:** Their brand would have a presence in (customers') Spotify.
- **Brand Extension:** Hey Piem would extend their mission of spreading positivity to the realm of music.
- **Brand Association: Customers** would associate Hey Piem with the happy music, helping steer the brand towards being perceived as positive.
- **Emotional Connection:** the social functionalities of Rootnote would strengthen the group's interpersonal

connections, in turn strengthening their connection to the brand

One point of feedback received was on the implementation of the playlist creator. More advanced filtering would help Hey Piem to create more specific and brand related playlists. This feedback played a part in shaping the redesign of the playlist filtering system. Further larger scale collaboration of Rootnote and Hey Piem is planned sometime in the future.

Figure 27: Hey Piem playlist marketing poster.

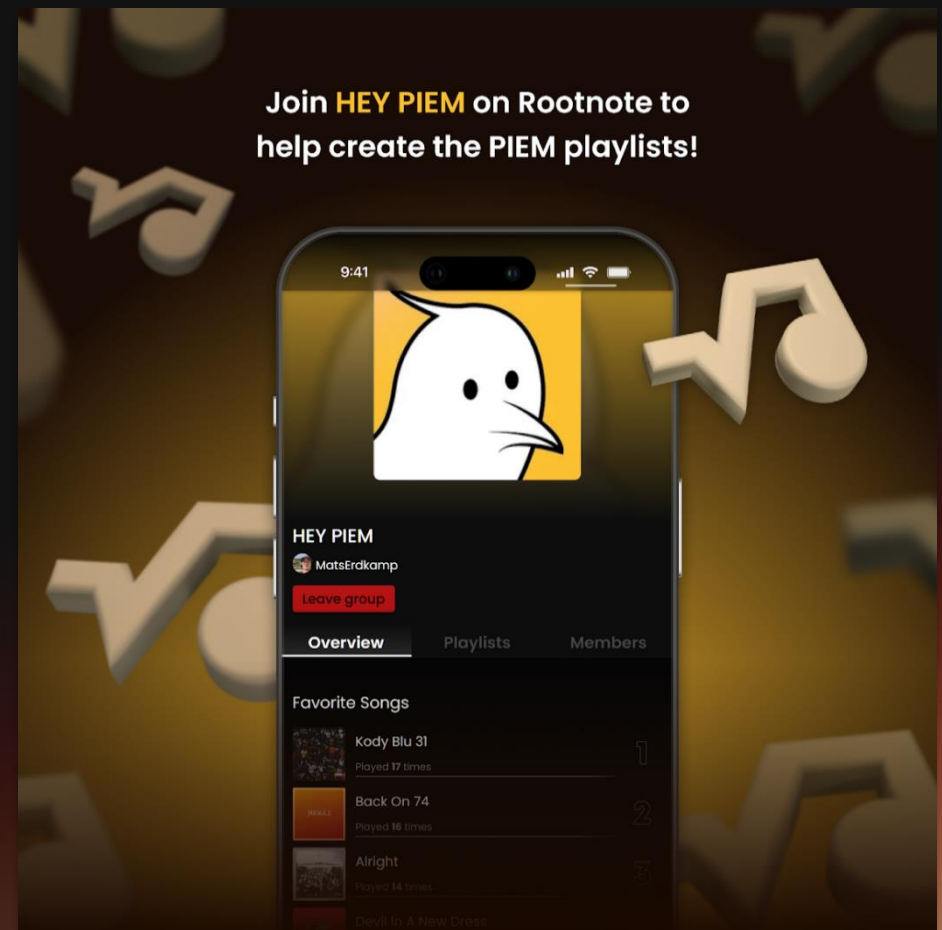


Figure 28: Quiz idea proposed to Trackstar*.

Trackstar*

Trackstar* is a music quiz by the content creators of Public Opinion. Within this music quiz, random New Yorkers get to listen to a song. If they correctly guess the artist, they win \$2, with each subsequent correctly guessed artist doubling the prize money. A wrong answer means leaving the quiz empty handed.

While watching Trackstar* it became apparent to me that the value of the show lies just as much in the social interactions with the random New Yorkers as in the quiz. Often, the host will choose a style of music familiar to the participant. This made me wonder if Rootnote help personalize the quiz to an even greater extent. I created a concept for Trackstar* that would strengthen the social aspects of their design. This idea, as seen on the right, focuses on guessing your partner's top 5 artists.

The host of the show has responded enthusiastically to my idea, and they were eager to explore the concept, as well as possibly digitizing their current quiz concept. As of today, we are still in talks discussing what would work for both of us. For Trackstar*, this collaboration would be a case of brand extension, venturing into the gamification of their concept. Their interest has highlighted how specialized music-data-oriented tooling could offer another potential revenue stream for Rootnote. Rootnote could become a central hub, where music related games can be hosted. The benefits of this model are further discussed in the business plan.

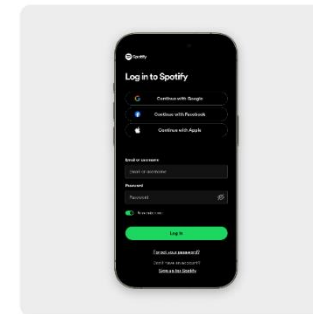
TOP 5 QUIZ INTERACTION FLOW



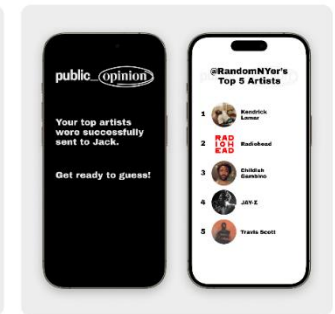
You guys show a QR code that the participant can quickly scan. Alternatively, they go to a custom domain such as <https://publicopinion.nyc>



The participant scans the QR code.



The participant is prompted to log in to their Spotify account.



The top songs/artists/albums are sent to Jack (or whoever is conducting the interview) without the participant seeing.



Couples could play together to guess their significant other's top songs/artists/albums.

Meeting with Founders

Throughout this project, I have contacted other founders for their advice. Within this section, I will lay out my reason for consulting with them, as well as summarize the insights gained during these meetings.

Meeting Twan Muste

Twan is a recent TU/e ID alumnus whose graduation project, SoundSeeker, aims to simplify music creation for the new generation through the creation of a app that uses novel technologies to simplify the art of sampling. With this project direction being somewhat related to mine, it seemed like a smart decision to speak with Twan to talk about what he had learnt on his journey. Additionally, in my search for a potential cofounder, Twan seemed like a smart bet.

First off, Twan's expertise in how generation Z listens to music was very useful. In his experience, virality (through TikTok) is more important than ever. He argues that this would also translate to use of the Rootnote platform, and strongly suggested to focus part of the gamification efforts on games that have potential to go viral. Therefore 'shareability' was included in the product design philosophy (appendix A). This insight led to the creation of the aforementioned 'Rhythm Roast' and 'Artistrology'.

After explaining the entire concept and vision of Rootnote to Twan, he was potentially interested in joining. Twan has a lot of business expertise, and would be a great fit as head of growth. For now, the appointment of a head of growth is a bit premature. If I can get the concept to scale, Twan will be the first person contacted to join.

Meeting Victor Donker

Victor Donker is the founder and CEO of Usono. Additionally, he is the main lecturer for various business courses within the TU/e's faculty of Industrial Design. He himself is also an alumnus of the same faculty. The goal for meeting with Victor was mainly to get a better understanding of the steps that are needed to convert a proof-of-concept to a fully functioning company. To get him up to speed, I gave him a presentation akin to one that might be given during an investment pitch, but with less financial details (since that was what a lot of my questions would be about).

Victor mostly stressed the need for having two committed cofounders. This was, according to him, the most important part of his own journey. Struggling to find (committed) cofounders myself, he helped me to get a connection at The Gate. Moreover, we are also in talks to promote Rootnote at Fontys Eindhoven. The details are not set in stone, but this could manifest itself as a presentation in front of a crowd of software engineers, trying to convince someone to join me on this venture. Alternatively, Rootnote could become an 'engineering case' within one of the courses given at the faculty. Lastly, Victor stressed to use various channels to reach users to increase the weekly active users. He recommended sending out weekly summaries of listening insights to users, through email or through WhatsApp for Business. The idea of providing an emailing list was added to the short term future plans.

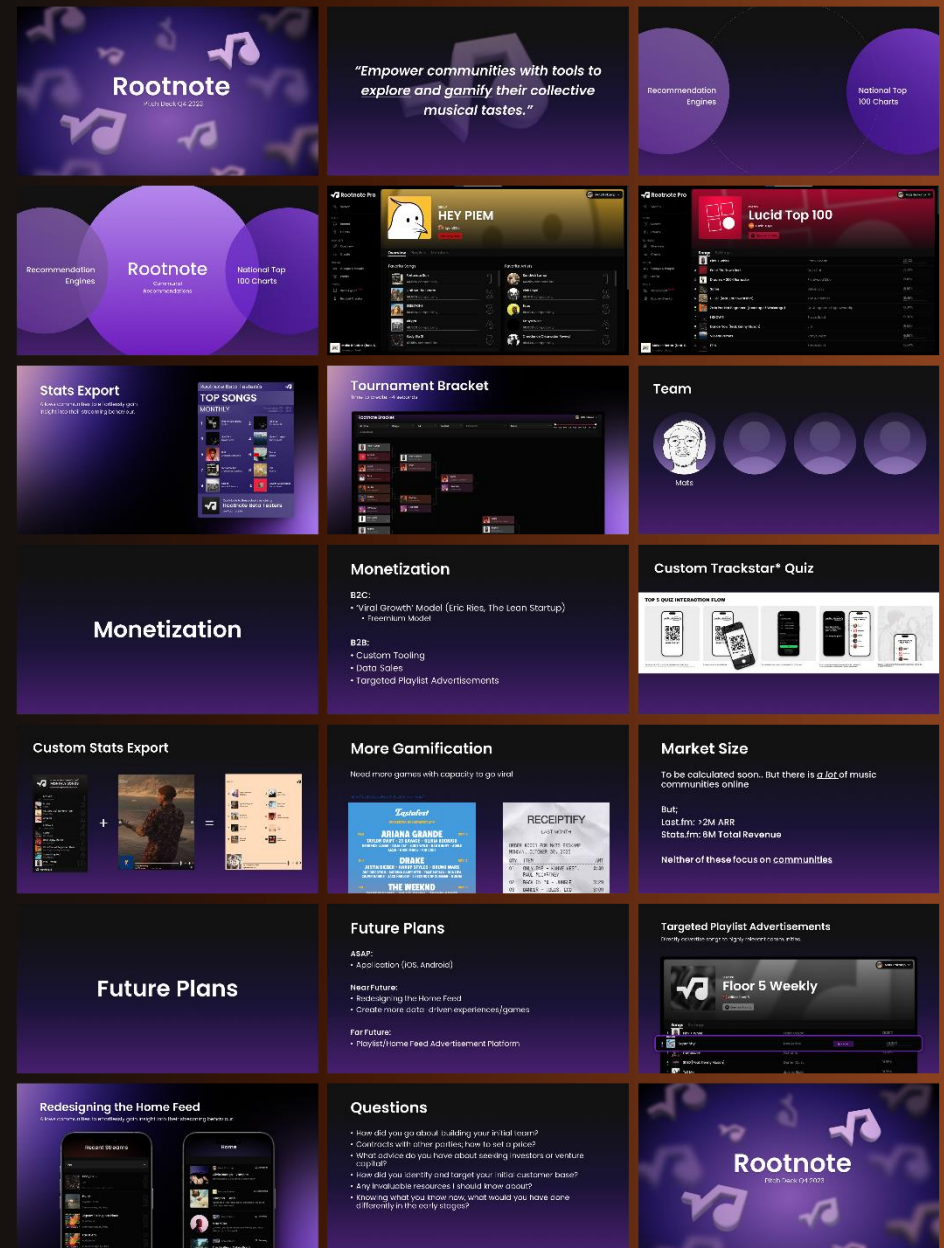


Figure 29: The presentation given to Victor Donker.

Revenue Streams

While Rootnote's initial public launch was met with positivity, it was fully free to use at the time. If I want Rootnote to become a viable commercial business, there will need to be revenue streams. Within this section, the research done on various potential revenue streams is summarized.

Rootnote can best be described as a software-as-a-service company (SaaS). SaaS is a method of software delivery and licensing where software is accessed online (optionally) via a subscription rather than bought and installed on individual computers. In SaaS, customers typically pay a regular subscription fee to access the service, which ensures a steady revenue stream for the company.

Currently, a lot of companies opt for a 'freemium' business model. Harvard Business Review describes freemium as today's dominant software business model (Kumar, 2014). There are two major positives to a freemium model that are crucial for Rootnote. The first being the low barrier to entry and its positive affect on viral growth. Since Rootnote's core functionalities relay on social connections, it should be made as easy as possible to convince others to join (Ries, 2014). Furthermore, since groups are meant to reflect a group's collective musical hivemind, we need a statistically significant set of users to join as quickly as possible. Freemium provides the most frictionless way for these users to join.

A freemium model raises the question: which features should be made paid features? The number of features included within the free tier can be described as the 'freemium-premium fit' (Wagner et al., 2014). With high freemium-premium fit meaning a high percentage of features being included within the free tier.

This leads us to the following two main questions that need answering to create an effective freemium model:

1. How many features should be premium-only?
2. What features should be premium-only?

The first question depends on the desired target conversion rate. Many startups seem to aim for a premium conversion rate between 2% and 5% (Kumar, 2014). For the second question, I mapped out the (future) functionalities of Rootnote, annotating them with how well-fitted I perceive them as potential premium features (appendix A). Based on the literature, good premium-only features should not inhibit viral growth (Ries, 2014). Meaning that not only socially oriented features should be free, but also that features that are likely to lead to word-of-mouth marketing.

Business Plan

All the research presented within the business section of this report has been formalized into a business plan. This business plan is a standalone document from this report. Its main goal is to communicate the companies' goals, and how I aim to achieve them. This has proven both valuable to communicate the ideas to other people, as well as helping me get more clarity of mind on the details.

Figure 30: The front page of the business plan.



Section Four

The Conclusion

Conclusion

Through various feature creations and improvements, Rootnote has surpassed its minimum viable product functionalities. A product design philosophy has been formalized, which is graphically presented through the user connection graph. This graph provides a basis against which product ideas can be tested.

The business part of this report has focused on how Rootnote might start to generate income. The product of this research has culminated into a separate business plan, that aims to provide a clear path forward for Rootnote, giving both a sense of internal clarity, as a proper way to communicate the envisioned future to external parties.

Discussion

Inspired by the most common practices in SaaS development, I initially set out to validate the design through a more data-driven approach. By monitoring how users use the platform, insights would be gained from the user base at large. Additionally, these users could be asked about their favourite features, and changes that they would make. The engineering effort needed to onboard the next 1000 users was severely underestimated, however. As a result, most concept validation has happened by contacting users known by the researcher. Further validation needs to be done with

online communities, to verify that the product design philosophy holds true in these groups. I expect that the general lessons remain true, but that there will be changes in execution due to the pseudo-anonymous nature of many online communities.

Due to the expectation that larger online deployments would follow, the tests performed were quite informal in nature. Mostly meant as a means to gather ideas. Ultimately, the project could have benefitted from verifying some findings in a more rigorous manner. I plan to validate all the newly designed functionalities in a more scientific manner.

Moreover, the explorations with Hey Piem and Trackstar* have not yet fully materialized. This can of course happen, since businesses move at their own time. Since we are still in talks, and will hopefully still work with both parties, I hope to learn from these experiences and will update the business plan accordingly.

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Appendices

Appendix A: Product Design Checklist

1. Musical Insight

1.1 Insights

Does the product offer usable insights for the user?

1.1.2 Personal Insights

Does the product offer personal insights?

1.1.2 Interpersonal Insights (inc.)

Does the product offer interpersonal insights, that include the user?

1.1.2 Interpersonal Insights (exc.)

Does the product offer interpersonal insights, that exclude the user?

1.1.3 Total Insights

Does the product offer insights about the group as a whole?

1.2 Digestibility

Are the insights presented in a digestible, interesting manner?

1.2.1 Visual Appeal

Are the insights presented in an engaging manner?

1.3 Customizable

Can the insights be sufficiently customized?

2. Social Connection

2.1 Group Dynamics

Does the product strengthen the sense of community?

2.1.1 Engaging Content

Is the product likely to spark discussions?

2.1.2 Interaction

Does the product encourage interaction amongst users?

2.1.3 Shareable

Is it easy to share the product on other platforms?

2.2 Personalized

Is the product different for each user/group?

2.2.1 Social Graph

Is a social graph used for smarter personalization?

2.3 Translucent

Can the reason for inclusion be explained?

2.3.1 Identifiable

Are the users identifiable? (Bob listened [...] not a user listened [...])

2.3.2 Explainable

Can the reasons for inclusion be found out?

2.4 Customizable

Can the features be chosen based on personal criteria?

2.4.1 Features

Can features be based on personal (social) criteria? (in-jokes, meaningful dates, etc.)

2.4.2 Visuals

Can the visuals be customized to fit the group's wishes?

Appendix B: Premium-only features?

score column is the product of viral growth score and desirability.
Higher is better.

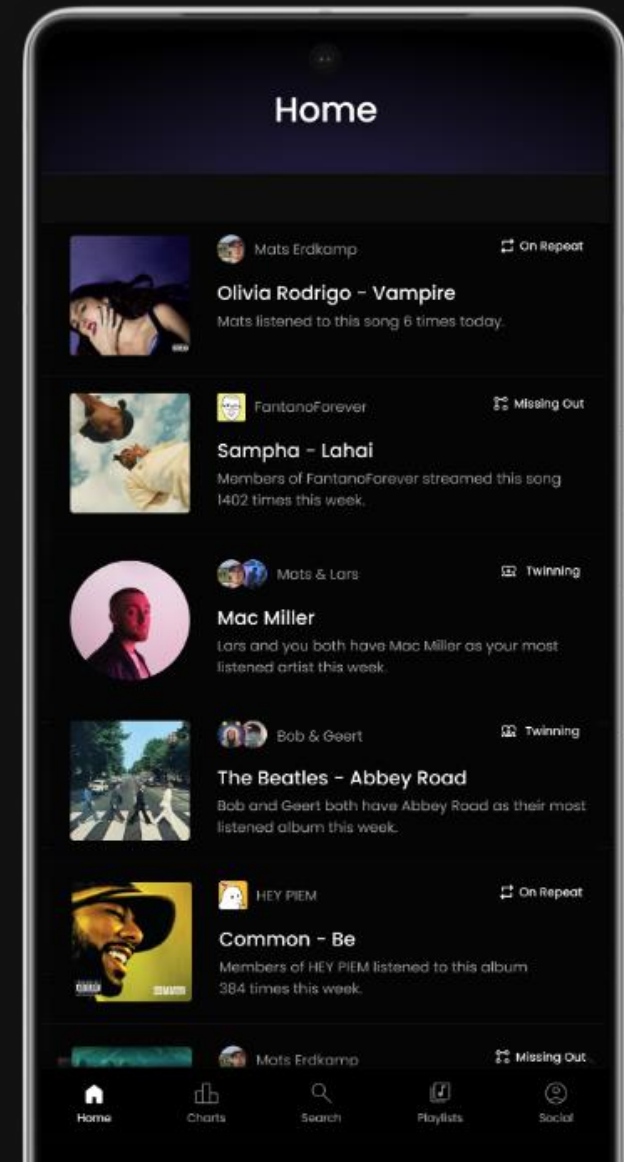
Product	Feature/Limitation	Prohibits viral growth? (1-5)	Estimated desirability? (1-5)	Score
Playlists	playlist ads	1	4	16
Beta	early access to features	1	4	16
Ads	show ads	1	3	12
Stats Export	more themes	2	4	12
Playlists	maximum amount	2	4	12
Playlists	song limit	2	4	12
Filters	custom time range	1	3	12
Share Target Remix	daily cap	1	3	12
Profile	customization	1	3	12
List creator	maximum amount	2	4	12
Text-to-nodes	maximum amount	1	3	12
Group	custom dashboard	2	4	12
Stats Export	Partial social features	2	4	12
Stats Export	automatic export	3	5	10
Playlists	creation	3	5	10
Group	max members	3	5	10
Stats Export	more dimensions	2	3	9
Insights	usage	2	3	9
Playlists	update frequency	3	4	8
Stream Import	Import	3	4	8
Text-to-nodes	creation	3	4	8
Bracket Creator	customization	3	3	6
AI Games	maximum amount	2	2	6
Share Target Remix	usage	3	3	6
Group	tags	2	2	6
Stats Export	limit	3	2	4
AI Games	creation	4	4	4
Stats Export	creation	5	4	0
Bracket Creator	creation	5	4	0
Group	creation	5	5	0

Appendix C: Open-ended conversation stats export

1. How have you experienced the printouts?
 - a. What did you like about them
 - b. What could be better? [after 2 users answered social insight here, additional questions were added for others]
2. Are there any social features you would like to see included?
 - a. What kind of highlights would be cool to see? [examples are shown]
 - b. From which people would you like to see them?
3. Any additional comments?

Appendix D: Open-ended conversation Insights Page

1. Ask users about their current usage of the Recent Tab
 - a. What do they use it for?
 - b. What is good about it?
 - c. What is bad about it?
2. Present users with the proposed new insights page.
(pictured on the right)
 - a. What do you think of the current ideas?
 - b. Any one you like in particular?
 - c. Any improvements you would make?
 - d. Any ideas for additional types of insights?
3. Do you think you would use this page more than the recent tab ?
4. Any additional comments?



Appendix E: Node graph nodes

Name	Node Type	Inputs	Output	Settings
streams	input	-	streams	user/group, demographic*, timeframe
playlist	input	-	songs	playlist ID
playlist	output	songs	result	name, image, update frequency, output account
stats export	output	songs, artists, albums	result	name, color, update frequency, social features?
tournament bracket	output	songs, artists, albums	result	name, size, seeded/ordered?
group by	group by		list	songs, artists, albums, user.
order by	order by		list	**
filter	filter		list	***
exclude	exclude	list, exclusion list	list	
combine	combine	2 lists,	list	interweave, A+B, B+A, shuffle, merge duplicates
expand****	Expand	list	list	amount
user filter	filter	list	list	(all kinds of demographic info; consider privacy), streams, minutes listened
user order	order by	list	list	streams, minutes listened, alphabetically,

* meaning: 'users younger than 25', 'users located in Brazil', etc.

** ** shuffle, streams, compatibility, release year, popularity, BPM, [all spotify audio features], duration, similarity, alphabetically, TOD bias, day bias

*** streams, compatibility, release year, popularity, BPM, [all spotify audio features], duration, similarity, genre, song/album/artist whitelist, TOD bias, day bias

**** uses a hybrid of collaborative and content-based filtering to expand the songs present in a list.

Spotify Audio Features: acousticness, danceability, energy, instrumentalness, *key*, liveness, loudness, *mode*, speechiness, tempo, *time signature*, valence.