

Case study

Car audio duo case

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Duo case	Duo Case 6: Car Audio
GIT Repository	Click HERE
GIT Application	Click HERE

Table of contents

Project Overview	3
Introduction	3
Problem Statement	3
Objectives	3
Methodology	3
Research	3
User Research	3
Research questions	5
Market Research	6
Common strengths and weaknesses	7
Key findings	7
Interviews	7
Secondary research (the people with disabilities method)	7
Tech Research	8
Ideation	8
Brainstorming and ideas	8
Design Process	9
Prototyping	9
User Testing	12
Iterations	13
Final Solution	14
Showcase the Final Design	14
Showcase the Final Code	15
Video demo	15
Features	15
Results	17
Successes and Learnings	17
Work division	17
Version control	17
Reference table	17

Project Overview

Introduction

This duo case is called “Car audio”. Every day car owners use their phones while driving in order to change their music. This unintentionally increases the chance of a road accident. Our duo case aims towards developing a product in 4 weeks which can help car owners change their music from their phone with as little interaction as possible.

Problem Statement

The main problem is that drivers have to be constantly focused on the road and be aware of their surroundings. If they use their phones while driving, they only have a higher risk of an accident happening. Our task for this project is to develop an application using the design thinking method, research and tests that could be used while driving, needing less attention than the existing competitors and be legal to use.

Objectives

Our main objective for this duo case is to develop a music application for car owners that minimizes interaction as much as possible.

Our second objective is to take examples of existing leading music applications, compare them and try to make our product as minimalistic and at the same time interactive as possible. All that while we still keep our product user-friendly.

Our third objective is to make the application legal to use for its intended purpose. The application’s main target audience is young drivers who cannot afford more expensive cars that have Apple CarPlay or Android Auto and they mostly rely on their phone for streaming music to their car’s speakers and skipping the tracks. However, using your phone while driving is illegal in the EU, but there are ways to avoid this. A part of our objective is to make use of this law loophole and ensure that using our application is legal while driving.

Methodology

In order to gather our necessary information, my partner and I decided to stick to the DOT framework research methods. Primarily we expected to use the AB testing methods, interviews, competitor analysis, eye tracking testing, lotus blossom method... Those are all prior methods we have used, however we decided to stick to them due to the reason that we could conduct them quicker thanks to their familiarity. This proved in the future to be a good decision due to our project time constraints.

Research

User Research

Questions and answers can be seen [HERE](#)

Do you drive an older car?

This question was asked in order to understand whether the user had a car with an already built in screen and audio system of the car or not. We use the word drive rather than own because also the majority of younger people are financially unable to own a car. All of our subjects drive or own older cars.

Do you listen to your own music using your phone or do you listen to your radio?

That way we can see if the user prefers listening to radio or listening to their own chosen songs. That question will help us determine whether we should add an internet radio. 3 / 4 Of our subjects preferred to listen to their music rather than radio, however there were still people that preferred radio which we found interesting.

What do you dislike about the music app you use?

With this question our aim is to discover our users' most common pain points. Generally people use no more than 3 of the total 6 main music streaming apps in our location so it is very common to have the same pain points. Discovering them will help us eliminate them from reoccurring in our app, thus making it less original and user-friendly. Most common answers: have to look often, small buttons, lack of podcasts, and surprisingly custom playlists that did not live up to our subjects' expectations.

What do you usually do if you try to use your phone when driving? Do you try to change the song or adjust the volume or repeat. Do you try to change the song or adjust the volume or repeat. Which of these actions do you do the most?

With this question we aim to see how often do our target users do the most common user interaction with a music application and if there is some change they'd like to see, thus helping improve interaction and user friendliness in our product. Skipping songs was the most common answer followed by volume adjustment. Surprisingly, the song shuffle didn't bother our users.

How do you use your phone when driving? Is it in your hand, do you have a holder or do you not interact with it?

Here we want to see what are the most common ways for our users to position their phones. That way helps us determine how to position certain ui elements and possible external hardware. People either have it on a holder or on rare occasions leave it on the seat or somewhere else.

What would you think about a bluetooth device that would be on the steering wheel allowing you to switch songs without much distraction.

Here we want to see possible external hardware and how the people will react to the idea, giving us an insight if there is reason to continue developing this idea. Surprisingly the majority of people did not like that suggestion so they preferred their methods.

How would you ideally like to change your music in your car? Is there any preference you have or do you recommend anything?

With this last question we want to see whether certain people have certain preferences in changing their songs, hopefully giving us ideas to further develop in order to minimize interaction. A surprising answer was “Ideally I would not change my music at all”. This was the answer that got us thinking about the mood playlists and made us further research them.

Research questions

How can we develop a music application for car owners that minimizes interaction as much as possible while maintaining user-friendliness and compliance with legal regulations?

With this question we aim towards our main task which is making an application which is minimal, uses minimal user interaction, is legal to use and is user friendly.

What are the common pain points and preferences of car owners when it comes to changing music while driving, and how can we address these in our application's design?

In order to fulfill our task of making an application that minimizes user interaction we have to first find our user's most common pain points in order to remove them or think of proper alternatives.

How do we make our product stand out from the competition?

With this question we aim towards a proper competitor analysis in order to gain intel on what specifically to focus on and what we should do in order to achieve more originality and make our product stand out from its competition.

Market Research

	Spotify	Apple Music	Amazon music	YouTube music	Tidal	General	Our app
Users	551 million	88 million	80 million	50 million	1 million		-
Target Audience	Spotify's target audience includes music enthusiasts of all ages, especially Millennials and Gen Z, who prefer digital music streaming on mobile devices, have diverse musical tastes, and may also be interested in podcasts.	Apple Music's target audience includes a broad range of music lovers, Apple device users, and individuals interested in a seamless integration with the Apple ecosystem.	Amazon Music's target audience includes music enthusiasts, streaming subscribers, and Amazon Prime members looking for a diverse catalog of songs, playlists, and personalized music recommendations.	YouTube Music's target audience is music enthusiasts of all ages who enjoy streaming and discovering a wide range of music genres, artists, and music-related content online.	Tidal's target audience is music enthusiasts and audiophiles who prioritize high-quality audio streaming and exclusive content.		Car owners of older vehicles that don't have navigations/car media supporting carplay or android auto
Free service	Yes	No	Yes	Yes	No		yes
Subscription cost	\$10.99	\$9.99	\$9.99	\$10.99	\$9.99		\$9.99
Available on	Android, IOS	IOS	Android, IOS	Android, IOS	Android, IOS		Android
Voice assistant	Google	Apple Siri	Alexa, Google(?)	Google, Apple Siri	Google		Google
Main selling point	music and podcasts	Apple users Audio app hi res audio	music and podcasts	All the music with videos	HiFi Audio		Interfere as little as possible with driver
Integration	Google Home, Waze, Google maps, android wear, garmin wear	Waze	amazon alexa	google voice assistant	Google assistant, Android wear, Garmin		Google (for now)
UI complexity	Not complex	A little bit complex	A little bit complex	Not complex	A little complex but easily gets used to		Not complex
Offline mode	Yes	Yes	Yes	Yes	Yes	Extras	yes
Max Audio Quality (higher is better)	320kbps	2304kbps	320kbps	256kbps	5000+kbps		yes
Video support	Yes	No	No	Yes	Yes		Optional for Awareness
Family plans	Yes	Yes	Yes	Yes	Yes		yes
Family plans	Yes	Yes	Yes	Yes	Yes		yes
Free trial period	Yes	Yes	Yes	Yes	Yes		yes
Trial period	90 Days	90 Days	30 Days	30 Days	30 Days		30 days
Landscape car mode	Yes	Yes	Yes	Yes	No		yes
Podcasts	Yes	Yes	Yes	Yes	Yes		yes
Lyrics display	Yes	Yes	Yes	Yes	Yes		no
Equalizer	Yes	Yes	Yes	No	Yes	Disability support	yes
Wakelocks	Yes	No	No	Yes	No		yes
Colorblind mode	No	No	No	No	No		yes
Voice control	Yes	Subscription	Yes	Yes	No		possible
Voice control by default	No	Subscription	No	Yes	No		yes
Customizable text	No	No	No	No	No		yes
TTS	Yes	Yes	No	Offers third party services	Unknown		yes
Equalizer	Yes	Yes	No	Yes	Yes		yes
Alternative text for image							yes
Gestures support	No	No	No	Android only	Removed		yes
Gesture customization	No	No	No	No	No		yes

A thorough research was conducted regarding the most common platforms for music (competitor analysis). That way we wanted to see the common strengths and weaknesses with our competitors. Our application's originality comes with its flexibility for customization and its more specific target audience.

Common strengths and weaknesses

All applications have different extras but are rarely consistent. Another point is that they are not very customizable and not disabled user friendly (although not a target audience is still important to point out). Not surprisingly the more extras an app offers the bigger the following it has. An application that stands out for me is Tidal. Only this app has a more specific target audience and still manages to gather significant following and it is still growing. However Spotify is the number one choice because it offers something for everyone. And yet 80+% of them lack text customizability, colorblind mode, voice control (very crucial), gestures and TTS.

Key findings

Interviews

The majority of our research came with expected results. However, the interesting part was our interviews. The majority of questions were general and so called “small talk”(making the person more comfortable thus giving better answers due to lack of nervousness). However, quite a few of the answers were a bit different than we thought. For example our users usually prefer the same style of phone holder, however interaction with each is different. Either preferring to risk their attention to skip a song or using the built in voice assistant. Another thing we found interesting was that our users preferred to use the car’s radio volume knob rather than their phone’s.

However a bigger discovery we made was that people like to use the automatically made playlists for their taste. Our users regularly give the app a new chance to surprise them, despite the fact that they are rarely satisfied with the music the app proposes using these mood playlists. So this was a field we would like to further explore.

Another pain point was podcasts and surprisingly the lack of radio in the majority of mainstream music apps.

And the last discovery we really liked was when we asked how ideally our users would interact with the phone, the answer we got was “ideally I would not interact with the phone at all”(not having to touch it). So those became one of our bigger goals to overcome.

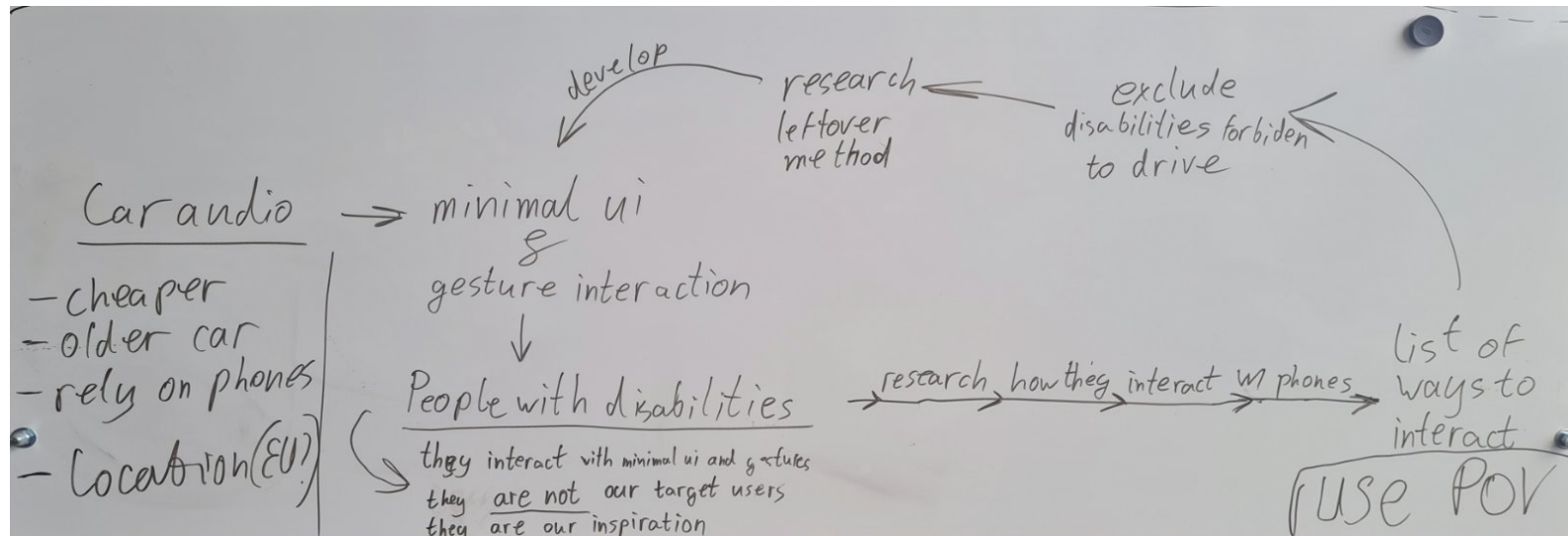
Interview questions and answers can be seen [HERE](#)

Secondary research (the people with disabilities method)

A more original method me and my colleague tried to do was researching people with disabilities and the most common ways they interacted with their phones. I thought that this way we could get inspiration from them without them actually being our target audience. Reason being is that they interact with their phones in a minimalistic manner and needed (supposedly) less concentration in doing so, however here I was wrong. Nonetheless after exploring the ways people interacted and then filtered out only the ways permitted to do so while driving we were left only with voice assistance. We thought we could come up with more ideas but something we did not consider was that if a disabled person had to use assistance for their phone interaction, therefore it is highly unlikely this person is legally permitted to drive a whole vehicle.

Although this method was not as successful as we expected it gave us plenty of inspiration. At the end we got another answer we did not take that much into consideration and that was

haptics. So Voice assistance and haptics was the answer. This research however helped us with the development of our UI. Bigger buttons was the most common answer and alternative tags for text to speech support.



Tech Research

We looked into existing products that help drivers. Such ones are Android Auto UI and Spotify's car thing. We got quite a bit of inspiration from them which came in handy when making the UI of the application.

Michael's Kotlin workshop helped us kickstart our getting-familiar-with-Kotlin experience and provided us with the necessary basics for our app development.

Ideation

Brainstorming and ideas

We used the lotus blossom method in order to brainstorm different functionalities of our application. Those ideas later helped us with both the layout and functionalities of our application. We decided to use this method because we had prior experience with it, it is fast, doesn't take many resources to fulfill it and can be easily edited and more importantly easily analyzed.

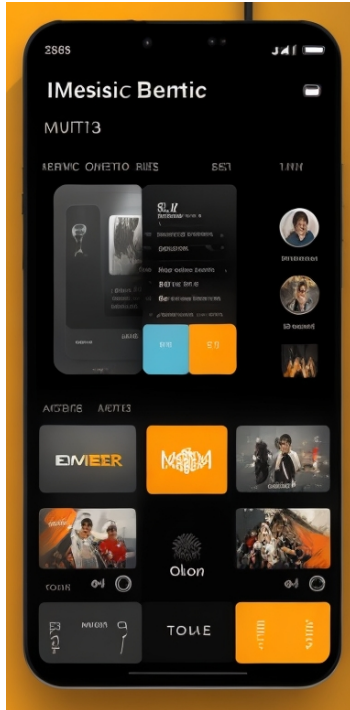
	Vocal recognition	Hey "App Name" to start	Phone holder	Steering wheel incl bikes thing	Arduino		Copy the headphones Gesture thing	Large swiping motions
	Vocal interaction	Customize call out/train voice assistant	Voice activation/com mand	Physical interaction	Swipe gestures while the phone is on the steering wheel		Gestures	Should be customizable
Video https://www.youtube.com/watch?v=V-WCzgXqkA	Tutorials with safety maybe this	Small warning or awareness of distracted driving	Vocal interaction	Physical interaction	Gestures	Both landscape and vertical UI	Easy navigation	Play/pause/skip/volume buttons
Different skipping presets	Extras	Lower volume when GPS talks	Extras	Car audio Ideas	Simple UI	Large text High contrast and icons	Simple UI	Album cover view on/of button (no distraction)
Potentially dim screen to reduce distraction	Preset playlists both for music and podcast	Screen Reader alternative tag for disabilities	Podcasts	Loopholes with the in the EU	Camera Use	GPS could be a shortcut as an app in the ui (Apple)	Shuffle repeat	Do car mode for different simplified ui
				Phone cannot be in hand	Cameras check	Eye tracking	Body gestures	
	Podcasts	Different UI from music page		Loopholes within the EU	Bluetooth is allowed car phone systems	Looking down at the phone automatically switches to maps	Camera Use	
	UI could show random unwatched podcasts of channels user like	Ask what podcasts the user is interested in when registering		Red light allows changing song or radio	Some EU countries have banned handsfree for younger drivers		Scan mood and suggest playlist	

To summarize, our research was quite exhausting. The entire topic of the project is not really general but the ideas that hit you are very common. Design thinking demands us to be creative. And so we took the research a step further - turning towards people with disabilities, more exact target audience and bigger competitor research. We stumbled upon quite a few unexpected target user demands especially when it came to the overall app interaction, however thanks to the thorough research we managed to overcome almost every problem.

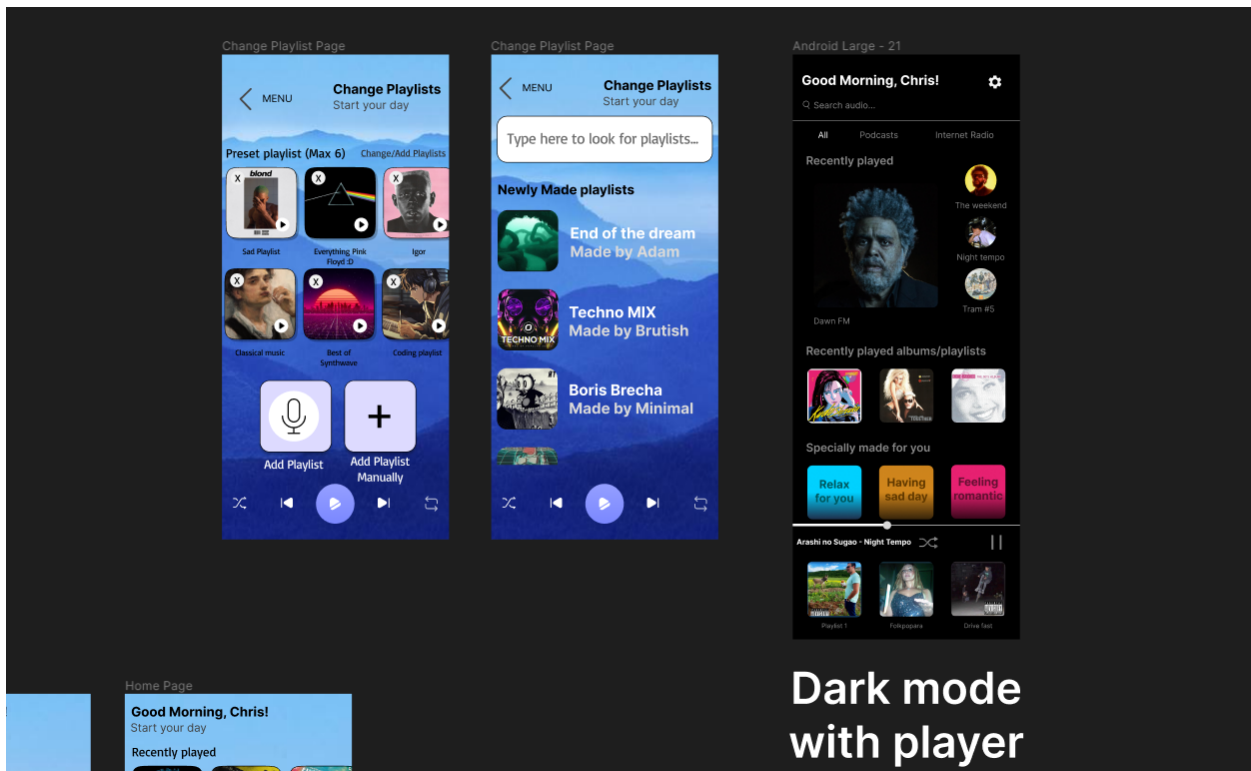
Design Process

Prototyping

We started by brainstorming UI's and researching more unknown applications trying to get inspiration from them. At the end I used AI image generation to get inspired regarding the layout. An image that stood out to me was the following. I decided to build my version of the UI on top of it. We also used color pallets from adobe color to inspire us.



Prototyping was pretty much straightforward but not before we decided on the general ui layout. I kept mine more dark and my colleague preferred bigger buttons and maximum use of screen estate. So we decided to test our ui's.

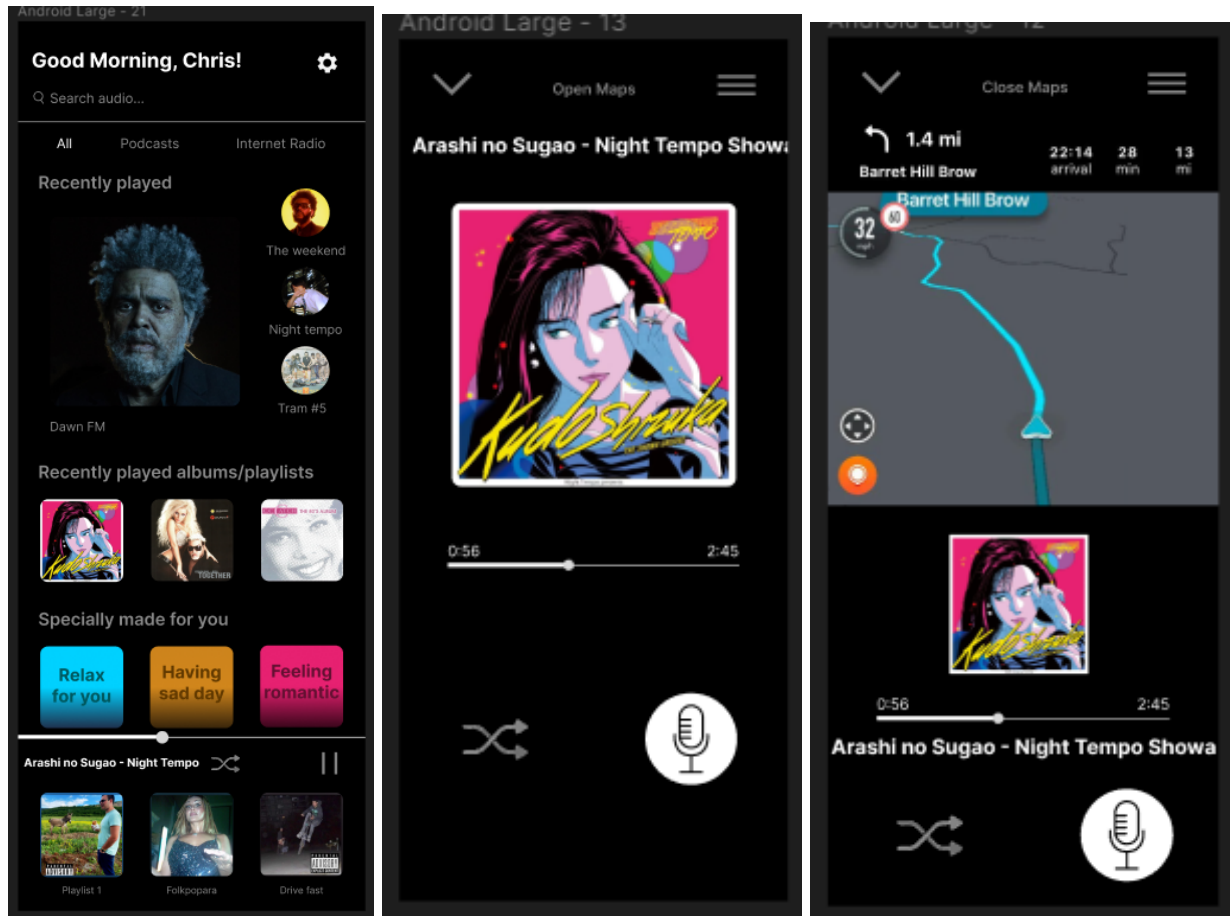


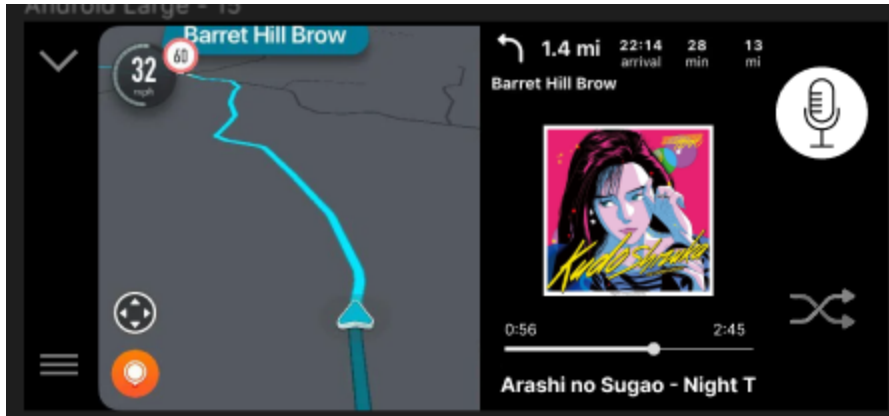
The test was conducted with 5 people and the majority of them preferred my layout of the prototype but not before first asking them what they like in both versions. This was a testing

similar to AB testing, but we will call it more hybrid.

After that we focused on finishing my version of the app's layout, paying extra attention to the player and making different versions of it but not before settling on the last one. We wanted to have more flexibility - adding custom playlists, automatically generated ones (the ones people liked experimenting with), recently played internet radio and podcast sections. I also added an Android auto/landscape view of the prototype since this was also a goal we set.

Here are the other main layouts. **The prototype itself can be seen and tested by clicking [HERE](#)**





We settled on this design because it is dark, it doesn't disturb the driver, it is easy and familiar to read, buttons are big and easily accessible and the user isn't overflowed with unnecessary information.

User Testing



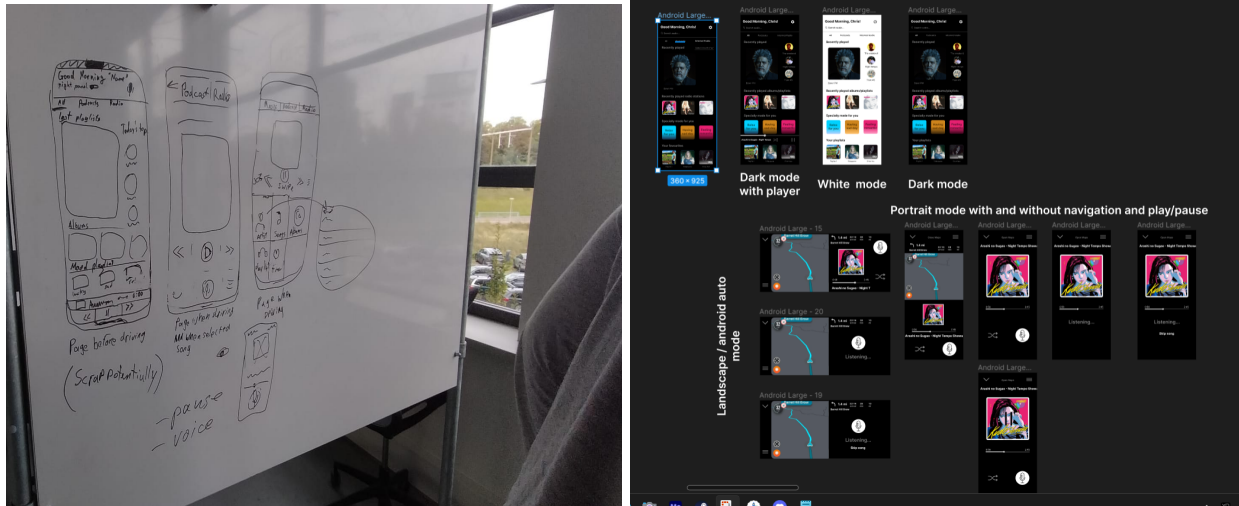
NOTE: My tutor Petra gave me her consent to use the image on the right in this document

For the testing I decided to use a makeshift driving simulator. I borrowed a G29 steering wheel with pedals and a phone stand. I installed Assetto Corsa (the most realistic driving simulator) and hooked everything up. The idea behind this was so I could ask questions while the test subjects were driving and were fully focused on the game. While driving I would present them both prototypes and count how many times they would peek at each one. The results came back after 4 different tests. All of the subjects preferred my version of the prototype and on average took them 2 peeks to start/skip a song as compared to my colleague's prototype which was around 5 peeks. The phone was laying on a stand right from the steering wheel roughly where the air vent of every car is located (most common placement regarding our interviews'

feedback).

My tutors really liked the idea and I was generally satisfied with the result. I also received some small design feedback.

Iterations



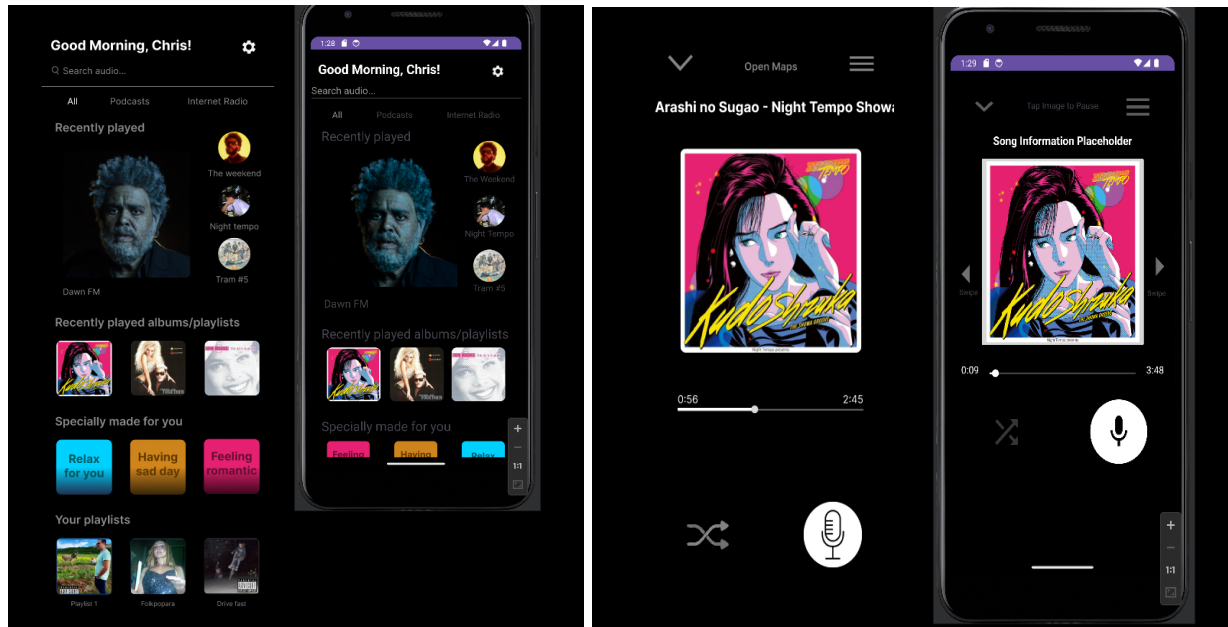
We went through quite a few iterations for our product mainly because my partner and I had different views but after some testing, prototyping and debating we settled on one general prototype. On the image on the left you can see the different versions of the player and the image on the right is the final version of that player.

To summarize, the design process of the development of our application was not an easy task. We did not have many iterations. Both me and my partner had different views in our heads, however thanks to some testing we managed to step on solid grounds with one main view. This part consumed quite a bit of our time which was unexpected, however the outcome did live up to the expectations of us and our tutors.

Final Solution

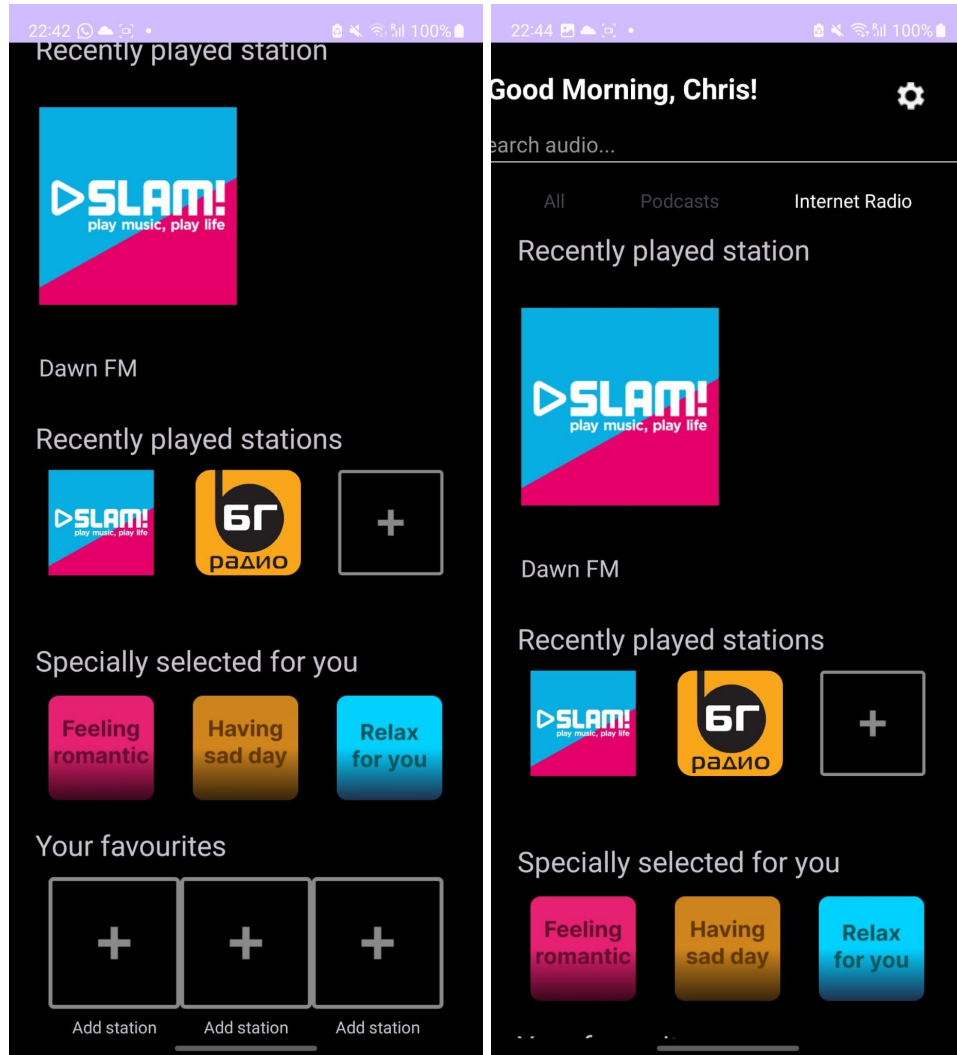
Showcase the Final Design

Our final design is an exact copy of our Figma prototype. Reason being is that we wanted to focus more on the coding part of the project and decided that we spent way too much time on the design and research. Below you can see an exact comparison between the prototype and our product.



The arrows in the player were later replaced. They were a result of a feedback: “help the user understand they can swipe to skip”. Another addition compared to the original prototype was a dedicated internet radio page. This page was added in a later stage and this is the reason it looks undeveloped. However it still includes the necessary sections.

The radio page was the only addition to the final version that did not exist in the prototype. This page features more empty layout and user customization.



Showcase the Final Code

The final code of the application can be seen [HERE](#). Please note in our duo repository we have 2 Android studio projects but the one that is named “Application_second_pages” is our main working stable app.

Video demo

The demonstration of the application can be seen [HERE](#).

Features

All of the features are based on the outcomes and results of our full research, analysis and interviews. These features are aimed towards making the application user-friendly and eliminating the common pain points. The ones listed on the left are everything we tried to implement.

Feature	Implementation
Minimalistic UI	Yes
No more than 1 interaction to achieve goal	Yes
Dark theme	Yes
Internet radio	Yes
Custom user playlists	Yes(Hardcoded)
Mood Playlists (Auto-generated)	Yes(Hardcoded)
Maps integration	No
Landscape or Android Auto mode	Yes
Customizability settings	No
Music Player	Yes
Queue	Yes(Hardcoded)
Song length bar	Yes
Skip songs with peripherals	No(untested)
Tap to pause	Yes
Swipe to skip	Yes
Haptics	No
Podcasts	Yes(Hardcoded)
Voice assistant	Yes(Semi-working)

Features that were harder to implement were: progress bar, main player activity, getting internet radio to work and the voice recognition.

Results

Successes and Learnings

Work division

The entire application wasn't easy to make, especially for a newcomer in programming. I had a difficult time adjusting to the Kotlin/Android studio ecosphere. The way we divided the work was the following: I did the main pages layout, alignment, the layout of the players. Back-end I made the main page, the night tempo players, play/pause and auto play/pause function, internet radio player/streamer. Sunny focused on the skipping part, made the extra player pages for the dawn fm album and worked with the voice control integration. We both tried to integrate haptics into our app but to no success.

Version control

GIT was used as our main version control. Not excluding local notepad documents with code snippets. We had 4 branches - one for work in the main pages, one for the secondary pages, a main branch and a stable version branch. We had quite a few merge conflicts and that was when we decided to make the stable versions branch.

I was the one responsible for working in the main pages branch, ensuring the layout and everything is up to date. Another task of mine was to ensure that the version is stable and with every big change I had to update the stable version branch in case of a merge accident.

Reference table

Figma last prototype demo	HERE
Figma prototype variations	HERE
Figma brainstorming, interviews and competitor analysis	HERE
GIT Repository	HERE
GIT Repository Android Studio Project	HERE
Video demonstration of the finished product in YouTube (note audio may be striked)	HERE