

CS6750: Spotify ‘Car Mode’ Study

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Abstract— Given the diverse contexts in which people listen to music while driving, optimizing the user interface for safety, convenience, and functionality is crucial. This study focuses on improving Spotify’s Car Mode. The project was part of my **Human-Computer Interaction (HCI)** course at Georgia Tech.

1 INTRODUCTION

1.1 Activity selection

An activity I perform in various contexts is **listening to music**. This is accomplished through a digital interface in a traditional computer, mobile phone, or smart home device. There are also many services (*Appendix: Figure 1.1*) that provide music. I will narrow my discussion to **Spotify on mobile phones**.

1.2 Context discussion

The type of music I listen to and how I listen to it often depends on the context: What I’m doing and where I’m doing it. Moreover, each context imposes different constraints and challenges on the interface design. A successful design should recognize the diversity of user experiences and the need for flexibility.

1.2.1 *Full engagement*

Unsurprisingly, Spotify works best when I’m **fully engaged** with the app at home. I have the freedom to explore the standard interface and take advantage of all the features. The only challenge for the interface is giving me an experience that meets my needs and keeps me coming back.

1.2.2 *On the move*

Managing music while driving requires me to intermittently divide my attention between audio control and road awareness. Spotify’s **Car Mode** (*Appendix: Figure 1.2*) introduces a simplified playback interface for safer use while driving, enlarging playback buttons and minimizing distractions by removing less essential content. This mode can be toggled on or off in the settings. Despite these

adjustments, I often find myself switching back to **Standard Mode** (*Appendix: Figure 1.2*) due to its familiarity and the absence of new, useful features in Car Mode. This transition demands acclimatization without offering additional value, raising the question of its necessity. To truly enhance the road experience, Spotify could integrate more practical features for on-the-go use. Given the reduced content in Car Mode, there's ample opportunity to incorporate these enhancements without cluttering the interface. For this study, I'll be primarily focusing on the **Android** version of the app. The **iOS** version of Car Mode is mostly similar, with a little extra functionality.

1.3 Interface comparison

Before diving into the study, it's important to understand the differences between Spotify's Standard Mode and Car Mode. It's also important to reiterate these for participants of the study (*Appendix: Figure 2.2*). All in all, Spotify's standard interface is a labyrinth of functionality, while its car interface is a beacon of simplicity.

1.4 Task identification

The fundamental task I'm studying is using Spotify's Car Mode to listen to and interact with music while driving. Generally, drivers may control playback, change songs/playlists/artists/albums, or even search for something using the keyboard. The ultimate goal is to redesign the Car Mode interface to predict these user needs.

1.5 Ideas to explore

These are ideas to actively consider when undergoing the **design life cycle** (*Appendix: Figure 1.3*). Together, they underscore why I'm interested in the task domain.

1.5.1 Consideration of contextual use

Not all driving situations are the same – driving in a busy city requires different interactions than cruising on a highway. Driving with passengers can be more distracting than solo trips. From my experience, driving in India is more chaotic than driving in the United States. What if you're not actually driving? What if you're stopped by a red light or engulfed by slow moving traffic? Under the hood, the context inevitably affects our cognitive load. To mitigate these

unpredictabilities the interface should emphasize essential content and offload subtasks.

1.5.2 User safety

Driving context is significant because it directly impacts user safety, safeguarding not only the driver but also passengers and other road users. An interface that is efficient and functional regardless of context can enhance driver focus, reducing the likelihood of accidents.

1.5.3 Interface familiarity vs. focus

There is a key tension between the familiarity of the standard interface and the focus provided by Car Mode. This is an excellent starting point for needfinding, as understanding why users might prefer the more complex, familiar interface over a simplified version could reveal insights into user behavior and preferences. It also opens up questions about what functionalities are essential for a car-specific mode and how they can be integrated.

1.5.4 Potential for new functionalities

Highlighting that Car Mode doesn't introduce new functionalities allows an opportunity to brainstorm what those could be. This could also extend to safety features.

1.5.5 Broad user base and accessibility

This project has the potential to impact a broad user base, including users of older cars without advanced infotainment systems. Moreover, although many people use Apple Car Play or Android Auto, not all car manufacturers provide this software, forcing you to use their native UI. It also touches on accessibility issues, as a well-designed Car Mode could better serve users with different abilities and preferences.

2 NEEDFINDING PLAN

2.1 Objective

The aim of this needfinding study is to delve into the user experience of Spotify's Car Mode, focusing on its safety, enjoyment, and alignment with user needs. The goal is to uncover deep insights that can inform potential improvements, making the interaction with Car Mode as seamless and user-friendly as possible.

2.2 Heuristic evaluation

To prepare a practical user survey, I first conducted a **heuristic evaluation** (Moran & Gordon, 2024) of Spotify's Car Mode interface, leveraging established principles from **Jakob Nielsen's** ten usability heuristics (Nielsen, 2024). This evaluation focused on five of the heuristics:

2.2.1 User control and freedom

Assessing how effectively Car Mode enables users to make their desired actions and easily reverse them if needed, which is crucial for minimizing distractions while driving.

2.2.2 Consistency and standards

Examining whether Car Mode adheres to familiar conventions and standards, ensuring users' expectations are met and reducing the learning curve.

2.2.3 Flexibility and efficiency of use

Evaluating how Car Mode accommodates both novice and experienced users, providing shortcuts or customizable options that enhance the driving and listening experience.

2.2.4 Recognition rather than recall

Analyzing the extent to which the interface allows users to recognize functions and features effortlessly, reducing the cognitive load and need to remember information from one part of the interaction to the next.

2.2.5 Aesthetic and minimalist design

Reviewing the interface to ensure it includes no irrelevant information, focusing on essential functionalities that aid in safe driving without overwhelming the user.

2.3 User survey

To gather a diverse array of perspectives, I recruited classmates by posting a **survey** (*Appendix: Figure 2.1*) on my course's **Ed Discussion** page. This survey even featured introduction slides (*Appendix: Figure 2.2*) comparing Standard Mode with Car Mode. All students were offered course participation points as an incentive, encouraging earnest and thoughtful responses. Utilizing **Peer Survey**

as my platform, I was able to efficiently collect and organize all feedback, laying the groundwork for a robust analysis of user engagement with Car Mode.

3 NEEDFINDING RESULTS

3.1 Heuristic evaluation execution

I carefully examined the Car Mode interface, comparing it not only with Spotify's Standard mode but also with the broader application to ensure a comprehensive analysis. I documented my **findings** (*Appendix 3.1*) and cross-referenced them with the survey results to confirm that my findings resonated with user experiences and were not solely based on my individual perspective.

3.2 Heuristic evaluation findings

3.2.1 *User control and freedom*

It was evident that while Car Mode does offer a dedicated exit button and swipe-down gesture to return to the background screen, users might encounter difficulties when trying to access and interact with the background content while driving. This complication undermines the principle of user control and freedom, as drivers should ideally focus on the road rather than fiddle with the interface. Likewise, exiting car mode leaves the user stranded in Standard Mode for the duration of the drive. The only way to restart the drive is closing the app or reconnecting the phone. To address these concerns, the interface could be refined to allow interaction with background content without necessitating a mode exit. On top of this, a better way to hop in and out of car mode could foster a safer interface overall.

3.2.2 *Consistency and standards*

While retaining recognizable symbols and avoiding the introduction of entirely new functionalities maintains some level of consistency, notable discrepancies arise in interaction design and visual feedback. For example, playback buttons lack the clickable appearance present in Standard Mode, and mode indicators such as shuffle and repeat do not offer the same color-change feedback users expect. These inconsistencies can disrupt the user's experience, making it challenging to adjust between modes and potentially leading to premature exit from Car Mode. To improve, Spotify should ensure that Car Mode aligns more

closely with Standard Mode's interaction patterns and visual language, reducing the cognitive load and enhancing user familiarity.

3.2.3 Flexibility and efficiency of use

While Car Mode offers basic navigational gestures like swiping to skip tracks or access the artist page, it falls short in providing efficient pathways for more nuanced tasks, reflecting a gap in flexibility and efficiency. This limitation is particularly pronounced for users familiar with Spotify's broader functionalities, who might find Car Mode overly restrictive. Enhancing the interface with customizable shortcuts or gestures could address this gap, enabling quicker and more efficient user interactions that cater to both novice and experienced users without compromising safety.

3.2.4 Recognition rather than recall

The evaluation revealed that navigating within Car Mode demands significant recall effort, particularly for accessing recently played artists or specific functionalities not directly available on the main interface. The mode predominantly serves as a playback interface, with more complex interactions requiring detours to the background screen. Such design choices heighten cognitive demands and detract from the driving experience. Simplifying access to recent activities and streamlining navigation can significantly reduce the need for recall, making the interface more intuitive and driver-friendly.

3.2.5 Aesthetic and minimalist design

The minimalist ethos of 'Car Mode' successfully removes extraneous content, focusing attention on essential playback controls. However, the design does not always effectively prioritize or differentiate critical information, potentially cluttering user experience. For instance, uniform button sizes and an undistinguished playback slider can hinder quick access to needed controls, especially while driving. A redesign that emphasizes key functionalities with clear visual cues and considers the distraction potential of background color variations could enhance both aesthetic appeal and functional clarity, fostering a safer and more enjoyable user experience.

3.3 Survey execution

I successfully adhered to the outlined plan, garnering 21 comprehensive responses (*Appendix 3.2*). This collection offers a substantial dataset for analyzing user experiences and perceptions regarding Spotify interaction.

3.4 Survey findings

3.4.1 Engagement with car mode

Some respondents actively use 'Car Mode' while driving, suggesting a level of acceptance or preference for its streamlined features. In contrast, others prefer the standard interface, possibly indicating a gap in 'Car Mode's' ability to meet all driving-related user needs or a simple resistance to change from the familiar standard interface.

3.4.2 Listening behaviors

Many users lean towards using pre-made playlists and shuffle features to minimize distraction, indicating the importance of ease of access to preferred content. The use of voice assistant commands and built-in car controls by some respondents also underscores the desire for safer interaction options that allow drivers to keep their focus on the road.

3.4.3 Interface challenges and requests

Difficulties with navigating playlists, changing music, or accessing certain controls in 'Car Mode' suggest that the current design may not fully align with driver needs for simplicity and efficiency. The expressed interest in features like quick access to recently played music and more robust voice command functionality points toward specific enhancements that could improve user satisfaction and safety.

3.5 Integrated insights

3.5.1 Usability through consistency and simplicity

The heuristic evaluation revealed that inconsistencies in design between Car Mode and Standard Mode create user confusion, a finding echoed by survey respondents who favored the familiar functionality of Standard Mode. This dual feedback signals a clear directive to refine 'Car Mode' by not only harmonizing it with the well-understood features but also simplifying its UI to enhance instinctive use. By streamlining interactions and maintaining a consistent design

language, Car Mode can evolve into a more user-friendly platform that naturally extends the ease of familiarity into the driving context.

3.5.2 Safety-centric design

Combining the heuristic evaluation's identification of potential distractions within 'Car Mode' with survey respondents expressing safety concerns, such as the challenge of navigating playlists or changing settings while driving, highlights the imperative for a safety-centric design. The convergence of these insights calls for an urgent redesign focused on minimizing cognitive and visual distractions, ensuring that 'Car Mode' users can maintain their primary focus on driving, enhancing overall user safety and compliance with best practices in driving-focused UI design.

3.5.3 Intuitive access

Survey participants indicated that finding and using some features within 'Car Mode' was not straightforward, particularly when it involved interactions beyond basic playback. This aligns with heuristic evaluation observations that emphasize the effortful recall required for navigating the interface. The coherent message from both sets of data suggests a pressing need to reconfigure 'Car Mode' to ensure key functions are easily accessible and recognizable, facilitating a more user-friendly experience that allows drivers to utilize Spotify's features with minimal distraction and effort.

4 BRAINSTORMING PLAN

4.1 Objective

The objective of the brainstorming session was to ideate potential design solutions addressing the key insights identified during the needfinding phase. The aim was to generate creative designs that would enhance the usability, safety, and experience of Spotify's Car Mode.

4.2 Methodology

The brainstorming session was structured yet allowed for the free flow of ideas, remaining grounded in the context of driving and Spotify usage. The following methods were employed:

4.2.1 Solo Brainstorming

I conducted an initial solo brainstorming session, leveraging insights from the needfinding phase to establish a format (*Appendix 4.1*) for what constitutes a design alternative.

4.2.2 AI-Assisted Brainstorming

ChatGPT was utilized to generate additional ideas and perspectives based on my proposed format. This conversation (*Appendix 4.2*) helped me explore unconventional solutions and expand the idea pool.

4.2.3 Idea Convergence

This pool was evaluated based on feasibility, relevance to identified user needs, and potential impact on user experience. The most promising ideas were abstracted into a set of design alternatives.

5 BRAINSTORMING RESULTS

5.1 Overview

The **format** I used consisted of a **heuristic** and matching **design alternative** with a **definition** and notable **features**. I gave ChatGPT the project description and access to the lecture notes. Afterward, I prompted it to generate ideas for my five heuristics based on my chosen format. After verifying the ideas, I asked ChatGPT to consolidate them into simple bullet points. I then borrowed from these ideas to craft three design alternatives to bring to the prototyping stage.

5.2 Ideas generated

My brainstorming specifically aligned with the heuristics identified during the needfinding phase. Ideas were generated to improve user autonomy, allowing for easy reversibility of actions and seamless mode transitions. Design alternatives aimed to align Car Mode more closely with users' expectations and familiar interaction patterns, enhancing learnability and comfort. Concepts were developed to offer more adaptable and efficient ways for users to interact with Car Mode, catering to both novice and experienced users. The brainstorming also explored ways to make the interface more innate, reducing the cognitive load and helping users quickly find and access desired features. I focused on

simplifying the visual design, prioritizing essential information, and minimizing distractions to enhance safety and focus while driving.

5.3 Design alternatives

These design alternatives represent a thoughtful progression from a refined version of the current Car Mode to more feature-rich prototypes. By incrementally introducing new functionalities and focusing on user-centric design, these alternatives aim to explore the balance between simplicity and functionality, ensuring that any added features enhance rather than detract from the driving experience.

5.3.1 *Prototype 1*

This design aims to preserve the format of the current Car Mode interface, but fine-tunes the visual components to **enhance clarity and minimize clutter**.

5.3.2 *Prototype 2*

Prototype 2 keeps the design of Prototype 1 but adds the ability to view and play music from **recently listened to artists** via a **hidden tray** (menu).

5.3.3 *Prototype 3*

Prototype 3 keeps the design of Prototype 1 and the hidden tray of Prototype 2 but adds the ability to view and play music from **recently listened to playlists and albums**. It also features **enhanced artist interaction**

6 INITIAL PROTOTYPING

6.1 Overview

Using **Apple's Keynote**, I developed static low-fidelity prototypes to visualize the brainstormed concepts. These were assembled using a combination of cropped screenshots from the original interface, shapes, color-opacity, and layering. The prototypes depict the suggested features and layout changes without interactive elements, illustrating the proposed enhancements in Car Mode's design.

6.2 Prototype rundown

6.2.1 Prototype 1

The goal with prototype 1 was to not only preserve the simplicity of Car Mode, but also reduce clutter and enhance clarity. The buttons are big, circular, and round for added visibility. Unlike the current car mode, the user can visibly see the touch radius. These buttons also have haptic feedback to mimic user interaction with physical buttons in a car. The playback slider is moved in an attempt to make it less intrusive and easier to access. The playback modifiers (shuffle, repeat, and add/like) feature a bright green border to indicate activation. The album cover is enlarged, and the opacity is reduced. Moreover, the visibility of the background screen is removed. This is all to make Car Mode more immersive. Finally, it includes a new voice assistant button that allows for hands-free interaction while driving. Overall, the design simplifies user actions, ensuring that controls are legible and feedback is clear, aligning with principles that prioritize user autonomy and ease of use in a driving context.

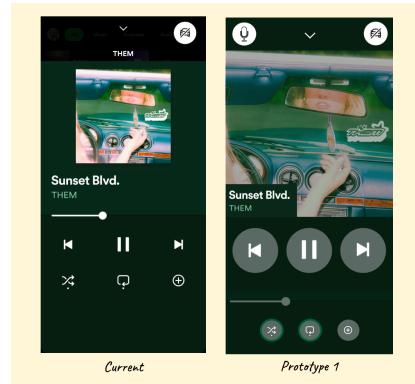


Figure 6.2.1—Current Interface vs Prototype 1

6.2.2 Prototype 2

The goal with prototype 2 was to not only preserve the simplicity of Car Mode, but also add hidden functionalities for expert users. The hidden tray allows users to swipe up to reveal a horizontally scrollable list of recently played artists. Clicking on an artist will start playing popular songs by that artist. Note: The album cover and button sizes have been reduced to make space for this functionality. The Voice Assistant and Exit 'Car Mode' buttons are also hidden to prevent information overload. Swiping down will close the tray and return to the simplified view. Overall, This design exemplifies adaptive and responsive design principles, offering users more control and flexibility without overwhelming them with too many options at once.

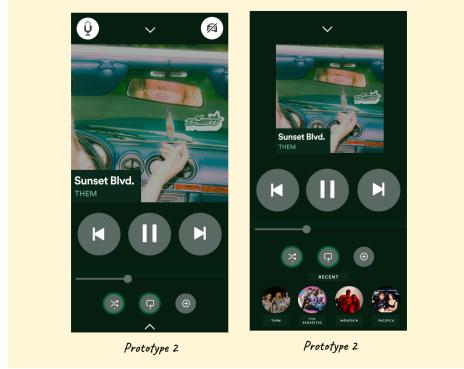


Figure 6.2.2—Prototype 2

6.2.3 Prototype 3

Prototype 3 follows the footsteps of prototype 2, but now with a row displaying recently played playlists/albums. Like in prototype 2, selecting an artist will play popular songs by that artist. However, prototype 3 also has advanced artist interactions. When an artist is selected, their albums will also be displayed and selectable. This gives the user new ways to explore music all from the comfort of Car Mode. Overall, the design supports user expectations for quick, effortless interaction, which is crucial in minimizing cognitive load while driving.

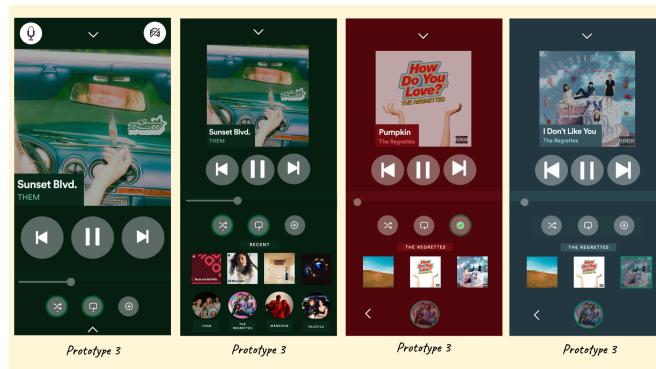


Figure 6.2.3—Prototype 3

7 EVALUATION PLANNING

The primary aim of this evaluation was to assess user preferences, perceptions, and perceived usability of three distinct prototypes designed to enhance Spotify's Car Mode. The evaluation focused on identifying which prototype features were most appealing to users and which design was preferred for enhancing the driving experience while using Spotify.

7.1 Methodology

Once again, I recruited classmates by posting a **survey** (*Appendix: Figure 7.1*) on my course's **Ed Discussion** page. All students were offered course participation points as an incentive. To cast a wider net, I also sent the **Peer Survey** link to a couple friends. This survey aimed to capture both qualitative and quantitative insights into how each prototype was perceived in terms of its usability, safety, functionality, and overall user experience.

7.2 Survey design

The survey included introductory slides (*Appendix: Figure 7.2*) to ensure participants understood the context and the prototypes being evaluated. Respondents were asked to review slides detailing the current Car Mode and the proposed prototypes. Following this, the survey comprised multiple-choice questions and open-ended questions where participants could elaborate on their preferences and suggestions.

Key areas explored in the survey included:

- Appeal of specific features in Prototype 1.
- Comparative effectiveness of Prototype 1 against the current Car Mode.
- Intuitiveness of the hidden tray interaction in Prototypes 2 and 3.
- Usefulness of the recently listened artists, playlists, and albums in Prototypes 2 and 3.
- Overall preference among the current Car Mode and the prototypes.
- Open-ended feedback on feature additions or removals.

7.3 Data analysis plan

Quantitative data from the survey responses will be analyzed using descriptive statistics to identify trends and preferences among the participants. This analysis

will include calculating mean ratings for the effectiveness, intuitiveness, and usefulness questions and determining the overall preference distribution.

Qualitative responses will be analyzed to extract common themes and insights related to the user experience, feature preferences, and suggested improvements. This thematic analysis will help to contextualize the quantitative findings and provide deeper insights into user expectations and needs.

8 EVALUATION RESULTS

8.1 Evaluation execution

The enhanced survey was distributed among a wider participant pool, successfully garnering feedback (*Appendix: Figure 8.1*) from 19 individuals. This expanded group, comprising classmates and friends, provided a diverse set of perspectives on the use of Spotify's Car Mode, particularly focusing on the introduced prototypes.

8.2 Quantitative analysis

8.2.1 Effectiveness of prototype 1

Participants were asked to rate the effectiveness of Prototype 1 relative to the current Car Mode. The responses were encoded numerically for analysis, with ratings ranging from 2 (Slightly worse) to 5 (Much better).

A **one-sample t-test** was conducted to determine whether the mean rating for Prototype 1's effectiveness significantly differed from the neutral rating of 3 (Equivalent).

Results: The analysis yielded a t-statistic of 5.848 and a p-value of 0.0000154.

Interpretation: The mean effectiveness rating for Prototype 1 was 4.0, indicating a consensus among participants that Prototype 1 is "Slightly better" than the existing Car Mode. The low p-value suggests that this result is statistically significant, providing strong evidence that participants perceived Prototype 1 as an improvement over the current system.

8.2.2 Hidden tray usability

The intuitiveness of the hidden tray feature in Prototypes 2 and 3 was assessed to gauge how seamlessly users could interact with this added functionality.

A **one-sample t-test** assessed whether the average intuitiveness rating significantly differed from the neutral assessment value of 3.

Results: The t-statistic was 0.615, and the p-value was 0.546.

Interpretation: The mean rating for the hidden tray's intuitiveness was approximately 3.16, slightly above the neutral point, indicating a marginally positive reception. However, the high p-value suggests that this result is not statistically significant, indicating no strong consensus among users regarding the tray's intuitiveness being greater than neutral. This outcome suggests that while some users found the feature to be intuitive, there was not a unanimous agreement on its intuitiveness, pointing towards a potential area for refinement in future iterations.

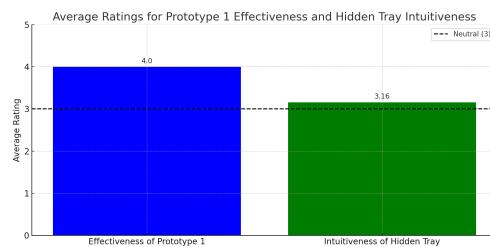


Figure 8.2 – Quantitative Analysis on Prototypes Survey

8.3 Qualitative analysis

Participants also provided narrative feedback, which was analyzed for recurring themes and insights:

8.3.1 Design and usability

Feedback highlighted appreciation for specific enhancements in Prototype 1, such as increased visibility and interactive feedback through button designs, indicating a clear preference for features that enhance interaction simplicity and clarity.

8.3.2 Improvement suggestions

Some participants suggested further refinements, emphasizing the need for even greater intuitive interaction and highlighting areas where user experience could be streamlined or enriched.

8.4 Integrated insights

The quantitative and qualitative feedback from this expanded pool of participants reinforces the direction of the proposed enhancements to Spotify's Car Mode. The significant preference for Prototype 1, backed by statistical evidence, validates its design approach, emphasizing the importance of intuitive, user-friendly enhancements in the automotive context.

9 SECOND ITERATION PLANNING

9.1 Reflection and analysis of initial findings

The evaluative feedback garnered from the initial deployment of prototypes offered crucial insights into user preferences and usability perceptions, delineating clear pathways for enhancement. Prototype 1 garnered commendable accolades for its streamlined clarity and ease of interaction, marking it as a user-preferred interface. Concurrently, specific features in Prototype 3 received favorable recognition, particularly for its innovative yet non-intrusive functionalities that did not compromise the interface's overall simplicity.

On the other hand, Prototype 2, despite being rated above the existing Car Mode, did not resonate as strongly with the users as Prototypes 1 and 3. Given that Prototype 3 integrates the lauded simplicity of Prototype 1 with additional, hidden functionalities, it emerges as a compelling blueprint for further development. Advancing with **Prototype 3** as a foundational model proposes a pragmatic avenue to achieve an optimal equilibrium between minimalism and functional richness, aiming to cater to diverse user preferences and enhance the overall user experience significantly.

9.2 Design adjustments and prototyping

Adjustments in this phase will focus on enhancing interactive elements and integrating user feedback to improve ease of use and engagement. A revised medium-fidelity prototype will be developed, emphasizing intuitive interactions and clear visual cues. This prototype will set the groundwork for transitioning to

a higher fidelity version, incorporating animations and refining existing features for a more immersive user experience.

9.3 Evaluation and preparation for high-fidelity prototyping

The revised Prototype 3 will undergo user testing to assess enhancements and gather detailed feedback. Based on these insights, the project will advance to a higher fidelity prototype, aiming to replicate the final product closely. This phase will refine animations, interaction details, and feature implementations, ensuring a polished and user-centric design ready for final evaluation and feedback collection.

Through this streamlined approach, the second iteration focuses on critical enhancements and sets a clear path towards a comprehensive high-fidelity prototype, ensuring that Prototype 3 evolves into a well-validated, engaging, and intuitive alternative to Spotify's current Car Mode.

10 FINAL PROTOTYPE

10.1 Walkthrough



The journey of iterative design culminates in the creation of the final prototype, meticulously realized using **Figma** to embody the envisioned user experience for Spotify's Car Mode.

<https://www.figma.com/proto/cNwT22TWlyFrxmlst7Y6aJ/Car-Mode-Redesign?type=design&node-id=3-34&t=kJjCAOyuMDXnoSD3-1&scaling=scale-down&page-id=0:1&starting-point-node-id=3:34>

This prototype transitions from the static layouts of Keynote into a dynamic, interactive model, emphasizing fluid animations and intuitive interactions that bring the digital interface vibrantly to life.

Enhanced Visual Design: The visual appeal has been significantly refined, with the voice assistant and Car Mode icons redesigned to align with the transparent aesthetic of other interface elements, ensuring a cohesive and modern look.



Interactive Voice Assistant: Engaging with the voice assistant now triggers a captivating animation, visually representing the system's active listening state and enhancing user feedback during voice interactions.



Seamless Mode Transition: A newly integrated button within the Standard Mode facilitates effortless toggling between the standard and Car Mode interfaces, streamlining the user experience and encouraging utilization of the Car Mode's enhanced safety features.



Dynamic Button Activation: Visual feedback for button interactions is accentuated by a vivid green outline, clearly signaling activation and providing immediate user acknowledgment. While the current implementation responds to click-based interactions, plans to incorporate gesture recognition are set to further enrich the interactive landscape.



Advanced Hidden Tray Functionality: Building upon the user-acclaimed hidden tray feature, additional layers of functionality have been integrated. Users can now delve deeper into an artist's repertoire by selecting the artist to explore not just albums but also singles and EPs, enriching the music discovery and selection process within the Car Mode environment.

This final prototype represents a synthesis of user feedback, design innovation, and technical refinement, embodying a forward-thinking approach to enhancing the Spotify Car Mode experience. By prioritizing intuitive navigation, engaging visuals, and comprehensive feature accessibility, the prototype stands as a testament to the project's commitment to delivering a superior user-centric solution.

11 VIDEO PROTOTYPE

11.1 Showcase



<https://www.youtube.com/watch?v=6i7qYM-bE3I>

The progression from static images and interactions to a fully dynamic and interactive prototype culminates in the creation of a video prototype, a pivotal component that vividly demonstrates the final prototype's functionality, user flow, and interactivity. This video prototype serves as a bridge between design concepts and real-world application, offering stakeholders a comprehensive and immersive view of the user experience.

Narrative Context: The video prototype is set against a narrative backdrop that showcases typical user scenarios, illustrating how the enhanced Car Mode interface seamlessly integrates into the experience. By situating the prototype within realistic contexts, the video highlights the interface's practical utility and user-centric design.

Demonstration of Key Features: Through a series of carefully choreographed sequences, the video prototype spotlights each core feature, from the refined voice assistant animations to the intuitive access to the hidden tray functionality. Special attention is given to the fluidity of transitions, the responsiveness of

interactions, and the clarity of visual cues, emphasizing the prototype's usability and aesthetic appeal.

Technical Commentary: Accompanying the visual demonstration, a technical commentary elucidates the design rationale, the decision-making process behind feature implementation, and the anticipated impact on user experience. This commentary provides valuable insights into the prototype's development, underscoring its alignment with user needs and design best practices.

Engagement and Evaluation: Ultimately, the video prototype is not just a demonstration tool but also an engagement instrument, inviting feedback from users, stakeholders, and the design community. It serves as a basis for evaluation, fostering discussions that can inform further refinements and validating the prototype's effectiveness in enhancing the Car Mode experience.

By presenting the final prototype in action, the video prototype articulates the project's vision, showcases the tangible outcomes of the design process, and sets the stage for the next steps toward implementation and real-world deployment.

12 FINAL EVALUATION PLANNING

The final evaluation of the developed prototype was meticulously planned to gain insightful feedback through a balanced mix of qualitative and quantitative research methods. This phase was pivotal in assessing the prototype's impact, usability, and overall user experience.

12.1 Evaluation process overview

Participants were enlisted to engage with both a video prototype and the interactive Figma demo, ensuring a comprehensive understanding of the prototype's functionalities. The recruited participants included classmates and external volunteers, all of whom contributed to a diverse feedback pool. External volunteers were fetched from friend circles and the [r/truespotify](#) subreddit. It's advertised as a place to discuss Spotify news and features.

12.1 Survey design

The evaluation encompassed:

1. Watching the video prototype to grasp the intended user flow and interaction design.
2. Interacting with the Figma prototype to experience the interface first-hand.
3. Responding to a survey that combined open-ended questions with quantitative metrics to capture a broad spectrum of user feedback.

12.3 Evaluation metrics

The evaluation focused on several key aspects:

- Feature appeal and perceived effectiveness.
- Integration and usability of voice interactions.
- Smoothness of transitioning in and out of Car Mode.
- Utility of the background screen adaptation.
- Balance between simplicity and functionality.
- Comparative safety assessment related to driving scenarios.

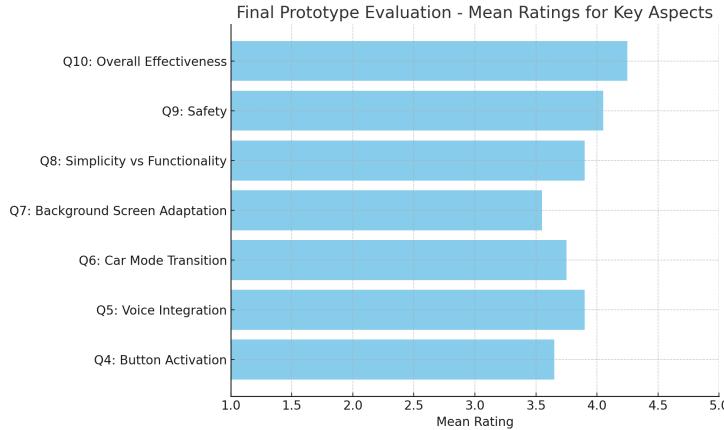
12.4 Data analysis

Quantitative data was analyzed using descriptive statistics to identify trends and user preferences. Comparative analysis, such as paired comparisons where applicable, helped explain the prototype's advancements over the existing Car Mode. Qualitative feedback underwent thematic analysis, extracting prevalent themes and sentiments that provided deeper insights into user experiences and perceptions.

13 FINAL EVALUATION RESULTS

The evaluation of the final prototype, engaged by 20 respondents through a video and an interactive Figma demo, provided essential insights (*Appendix: Figure 13.1*) into the prototype's reception, analyzing both quantitative and qualitative data. Furthermore, my Reddit post (*Appendix: Figure 8.2*) amassed more than 80 upvotes in a day! Some people even offered constructive criticism on the thread.

13.1 Quantitative findings



Button Activation Clarity (Q4): Achieved a mean rating of **3.65**, indicating clear but improvable visual cues for button activation.

Voice Interaction Integration (Q5): Received a favorable mean rating of **3.9**, demonstrating effective and seamless integration within the interface.

Car Mode Transition Smoothness (Q6): Gained a mean rating of **3.75**, suggesting smooth transitions with room for refinement.

Background Screen Adaptation Usefulness (Q7): Had a mean rating of **3.55**, pointing to beneficial yet optimizable user interaction adaptations.

Simplicity vs. Functionality Balance (Q8): Scored a mean rating of **3.9**, reflecting a well-executed trade-off between minimalism and necessary features.

Safety Assessment (Q9): Earned a mean of **4.05**, indicating a perception of enhanced safety compared to the current Car Mode.

Overall Effectiveness (Q10): Received a high mean rating of **4.25**, signifying significant usability improvements over the existing interface.

Qualitative Tests done by chatGPT (*Appendix: Figure 13.3*)

13.2 Qualitative feedback

- Key features like the dedicated Car Mode button, enlarged button designs, and voice interaction received high praise for enhancing usability.

- Smooth transitions and adaptive background functionalities were highlighted as critical for improving interaction and contextual awareness.
- Some feedback suggested the need for better guidance within the interface, especially for new users or for clarifying advanced features like the artist selection process.
- The prototype was commended for its user-centric design, balancing functionality with a streamlined approach, though some areas were identified for further clarity enhancement.
- The evaluation synthesizes users' perspectives on the prototype's design successes and potential enhancements, laying a robust foundation for future iterations or implementation stages.

14 REFERENCES

Moran, K., & Gordon, K. (2024, February 20). How to conduct a heuristic Evaluation. Nielsen Norman Group.

<https://www.nngroup.com/articles/how-to-conduct-a-heuristic-evaluation/>

Nielsen, J. (2024, February 20). *10 Usability heuristics for user interface design*.

Nielsen Norman Group.

<https://www.nngroup.com/articles/ten-usability-heuristics/>

15 APPENDICES



Figure 1.1—An assortment of popular music platforms.

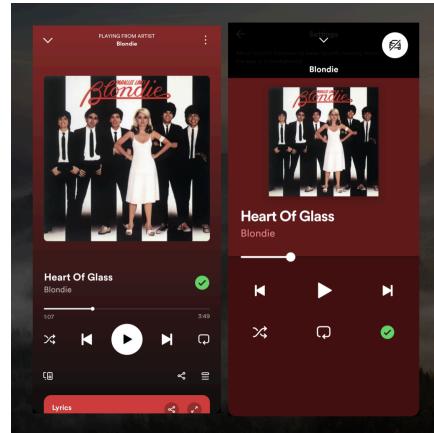


Figure 1.2—Standard Mode (LEFT) vs Car Mode (RIGHT)

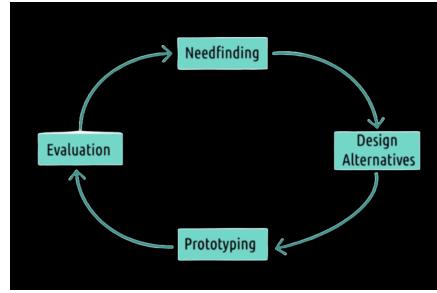


Figure 1.3—Design Life Cycle used in CS6750

Spotify 'Car Mode' (Needfinding)

Seeking input from any Spotify users! This study aims to understand how drivers interact with Spotify while driving, focusing on the usability aspects of the current 'Car Mode' interface. I seek to identify user behaviors, preferences, and areas for improvement to make listening to music while driving both safer and more enjoyable.

*Required

Overview: Review the following slides and confirm below! *

I have read the slides and understand the purpose of this study and survey.

Have you ever used Spotify's 'Car Mode' while driving?*

Yes

No

When driving and needing to pause, play, or skip a song, which of the following options would you likely choose? Please consider ease of use, safety, and convenience in your response.*

The familiarity of 'Standard Mode'

The focus of 'Car Mode'

While driving, how do you typically listen to music on Spotify? (Select all that apply)*

- Pre-made Playlists
- Shuffle
- Search Tab
- Voice Assistant Commands
- Hands-on Interaction with the Device
- Car's Built-in Controls (if applicable)
- Set my music before starting to drive and rarely change it
- Other

Please specify if you chose 'Other'

Type answer here...

For those who have used 'Car Mode', have you encountered difficulties with its features while driving? For those unfamiliar, do any aspects seem like they might be challenging to use while driving?*

Type answer here...

How do you feel about Spotify simplifying the 'Car Mode' interface by removing certain features in favor of a more streamlined experience, without introducing any new features? Please rate your satisfaction on a scale from 1 to 5.*

- 1: Very Dissatisfied - The removal of features without adding new ones diminishes my user experience
- 2: Somewhat Dissatisfied - While I understood the need for simplicity, the absence of new features and the removal of existing ones is disappointing
- 3: Neutral - The changes have minimal impact on my usage, and I am indifferent to both the simplification and the lack of new features
- 4: Somewhat Satisfied - I appreciate the focus on a streamlined interface for safety
- 5: Very Satisfied - The simplified interface meets my needs for driving, and I do not feel the need for additional features.

What new feature or improvement would make 'Car Mode' the 'go-to' for driving, whether you've used it or not?*

- Quick access to recently played artists
- Ability to search music by the current artist
- Quick access to recently played playlists & albums
- Search by voice button
- Haptic feedback for buttons
- Other

Please specify if you chose 'Other'

Type answer here...

Considering the streamlined nature of Spotify's 'Car Mode' that simplifies the interface by removing some features, how do you believe this affects your ability to maintain focus on driving? Please rate on a scale from 1 to 5.*

1: Significantly decreases my ability to focus - I find myself distracted by the absence of certain features
 2: Somewhat decreases my ability to focus - The simpler interface requires adjustments that occasionally distract me
 3: No impact - The changes in the interface do not affect my driving focus
 4: Somewhat increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
 5: Significantly increases my ability to focus - The streamlined interface greatly reduces distractions, enhancing my focus on the road

Figure 2.1—Needfinding Survey



Figure 2.2—Needfinding Slides

<https://drive.google.com/file/d/12mgD0z1v2kuL4erUagfeeC0twodJMSBO/view>

Nielsen Norman Group

Heuristic Evaluation Workbook



- Used in my needfinding to prep for user survey.
- Used findings to develop intro guide for survey participants.

EVALUATOR: Vasanth Banumurthy

DATE: February 2024

PRODUCT: Spotify 'Car Mode'

TASK: Using Spotify's Car Mode to listen to and interact with music while driving

Figure 3.1—Heuristic Evaluation Findings

<https://drive.google.com/file/d/1UjZ89vIgoNdDsOnrj4jY-bDWXlvIeLKK/view?usp=sharing>

Overview: Review the following slides and confirm below!

1. I have read the slides and understand the purpose of this study and survey
2. I have read the slides and understand the purpose of this study and survey
3. I have read the slides and understand the purpose of this study and survey
4. I have read the slides and understand the purpose of this study and survey
5. I have read the slides and understand the purpose of this study and survey
6. I have read the slides and understand the purpose of this study and survey
7. I have read the slides and understand the purpose of this study and survey
8. I have read the slides and understand the purpose of this study and survey
9. I have read the slides and understand the purpose of this study and survey
10. I have read the slides and understand the purpose of this study and survey
11. I have read the slides and understand the purpose of this study and survey
12. I have read the slides and understand the purpose of this study and survey
13. I have read the slides and understand the purpose of this study and survey
14. I have read the slides and understand the purpose of this study and survey
15. I have read the slides and understand the purpose of this study and survey
16. I have read the slides and understand the purpose of this study and survey
17. I have read the slides and understand the purpose of this study and survey
18. I have read the slides and understand the purpose of this study and survey
19. I have read the slides and understand the purpose of this study and survey
20. I have read the slides and understand the purpose of this study and survey
21. I have read the slides and understand the purpose of this study and survey
22. I have read the slides and understand the purpose of this study and survey

Have you ever used Spotify's 'Car Mode' while driving?

1. Yes
2. Yes
3. No
4. Yes
5. No
6. No
7. Yes
8. No
9. Yes
10. Yes
11. No
12. Yes
13. No
14. Yes
15. Yes
16. No
17. Yes
18. No
19. Yes
20. No
21. Yes
22. Yes

When driving and needing to pause, play, or skip a song, which of the following options would you likely choose? Please consider ease of use, safety, and convenience in your response.

1. The focus of Car Mode
2. The focus of Car Mode
3. The focus of Car Mode
4. The focus of Car Mode
5. The focus of Car Mode
6. The focus of Standard Model
7. The focus of Car Mode
8. The focus of Standard Model
9. The familiarity of Standard Model
10. The familiarity of Standard Model
11. The familiarity of Standard Model
12. The familiarity of Standard Model
13. The familiarity of Standard Model
14. The familiarity of Standard Model
15. The focus of Car Mode
16. The focus of Standard Model
17. The focus of Car Mode
18. The focus of Standard Model
19. The familiarity of Standard Model
20. The familiarity of Standard Model
21. The focus of Standard Model
22. The focus of Car Mode

While driving, how do you typically listen to music on Spotify? (Select all that apply)

1. Pre-made Playlists/Spotify
2. Music from my car's built-in Controls (if applicable) set my music before starting to drive and rarely change it
3. Cars Built-in Controls (if applicable)
4. Music from my phone
5. Pre-made Playlists/Spotify set my music before starting to drive and rarely change it
6. Pre-made Playlists/Spotify's Built-in Controls (if applicable) set my music before starting to drive and rarely change it
7. Spotify app on my phone
8. Car's Built-in Controls (if applicable) set my music before starting to drive and rarely change it
9. My car's built-in controls (if applicable) set my music before starting to drive and rarely change it
10. Pre-made Playlists/Spotify's Built-in Controls (if applicable)
11. Music from my car's built-in controls (if applicable)
12. Pre-made Playlists/Spotify set my music before starting to drive and rarely change it
13. Music from my car's built-in controls (if applicable)
14. Pre-made Playlists/Search Tab/Hands-on Interaction with the Device/Other
15. Hands-on
16. Other
17. Pre-made Playlists/Cars Built-in Controls (if applicable)
18. Pre-made Playlists/Spotify
19. Pre-made Playlists/Spotify's Assistant Commands/Built-in Controls (if applicable)
20. Pre-made Playlists/Spotify's Assistant Commands/Built-in Controls (if applicable)
21. Pre-made Playlists
22. Pre-made Playlists

Please specify if you chose 'Other'

- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22

For those who have used 'Car Mode', have you encountered difficulties with its features while driving? For those unfamiliar, do any aspects seem like they might be challenging to use while driving?

1. Selecting downloaded playlists
2. Playing songs with changing playlists, since the interface is a more simplified version
3. Just having to focus on the phone screen and press the buttons might still be problematic, voice commands could be safer
4. I have no car or mode
5. I have no car or mode
6. I have no car or mode
7. I have no car or mode
8. I have no car or mode
9. I have no car or mode
10. I have no car or mode
11. I have no car or mode
12. I have no car or mode
13. I have no car or mode
14. I have no car or mode
15. I have no car or mode
16. I have no car or mode
17. I have no car or mode
18. I have no car or mode
19. I have no car or mode
20. I have no car or mode
21. I have no car or mode
22. I have no car or mode
23. I have no car or mode
24. I have no car or mode
25. I have no car or mode
26. I have no car or mode
27. I have no car or mode
28. I have no car or mode
29. I have no car or mode
30. I have no car or mode
31. I have no car or mode
32. I have no car or mode

How do you feel about Spotify simplifying the 'Car Mode' interface by removing certain features in favor of a more streamlined experience, without introducing any new features? Please rate your satisfaction on a scale from 1 to 5.

1. Somewhat Satisfied - I appreciate the focus on a streamlined interface for safety
2. Satisfied - I appreciate the focus on a streamlined interface for safety
3. Somewhat Satisfied - I appreciate the focus on a streamlined interface for safety
4. Satisfied Satisfied - I appreciate the focus on a streamlined interface for safety
5. A lot Satisfied - I appreciate the focus on a streamlined interface for safety
6. Neutral - The changes have minimal impact on my usage, and am indifferent to both the simplification and the lack of new features
7. Somewhat Dissatisfied - I appreciate the focus on a streamlined interface for safety
8. Neutral - The changes have minimal impact on my usage, and am indifferent to both the simplification and the lack of new features
- 9.3 Neutral - The changes have minimal impact on my usage, and am indifferent to both the simplification and the lack of new features
- 10.3 Neutral - The changes have minimal impact on my usage, and am indifferent to both the simplification and the lack of new features
- 11.3 Neutral - The changes have minimal impact on my usage, and am indifferent to both the simplification and the lack of new features
- 12.3 Neutral - The changes have minimal impact on my usage, and am indifferent to both the simplification and the lack of new features
- 13.4 Somewhat Satisfied - I appreciate the focus on a streamlined interface for safety
- 14.4 Somewhat Satisfied - I appreciate the focus on a streamlined interface for safety
- 15.1.3 Somewhat Satisfied - The removal of features without adding new ones detracts to my user experience
- 16.3.3 Somewhat Satisfied - The simplified interface meets my needs for driving, and do not feel the need for additional features
- 17.4.4 Somewhat Satisfied - I appreciate the focus on a streamlined interface for safety
- 18.3.3 Somewhat Satisfied - While I understood the need for simplicity, the absence of new features and the removal of existing ones is disappointing
- 19.4.4 Somewhat Satisfied - I appreciate the focus on a streamlined interface for safety
- 20.3.3 Somewhat Satisfied - The changes have minimal impact on my usage, and am indifferent to both the simplification and the lack of new features
- 21.3.3 Somewhat Satisfied - While I understood the need for simplicity, the absence of new features and the removal of existing ones is disappointing
- 22.3.3 Somewhat Satisfied - The simplified interface meets my needs for driving, and do not feel the need for additional features

What new feature or improvement would make 'Car Mode' the 'go-to' for driving, whether you've used it or not?

- 1.Quick access to recently played artists
- 2.Quick access to recently played artists/Quick access to recently played playlists & albums
- 3.Search by voice button
- 4.Search by voice button
- 5.Quick access to recently played artists/Search by voice button
- 6.Search by voice button/Other
- 7.Quick access to recently played artists/Quick access to recently played playlists & albums/Search by voice button
- 8.Quick access to recently played artists/Ability to select other music by the current artist/Quick access to recently played playlists & albums/Search by voice button
- 9.Quick access to recently played playlists & albums/aptic feedback for buttons
- 10.Search by voice button
- 11.Quick access to recently played artists/Ability to select other music by the current artist/Quick access to recently played playlists & albums/Search by voice button
- 12.Quick access to recently played playlists & albums/Search by voice button
- 13.Able to select other music by the current artist/Quick access to recently played playlists & albums
- 14.Quick access to recently played artists/Ability to select other music by the current artist/Search by voice button
- 15.Search by voice button
- 16.Search by voice button
- 17.Quick access to recently played artists
- 18.Quick access to recently played playlists & albums
- 19.Quick access to recently played artists/Ability to select other music by the current artist
- 20.Quick access to recently played playlists & albums
- 21.Other
- 22.Quick access to recently played artists/Search by voice button

Please specify if you chose 'Other'

1. Any files that are downloaded - I regularly drive in areas with out cell service
2. Quick access to recently played artists
3. Search is good, but also skip song voice command, play different playlist
- 4.
- 5.
6. It just remembers all my settings and preferences and plays something based on that, when i start driving, without any set up required each time
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20.
21. The ability to add a song to a playlist or like it when in Car Mode
- 22.

Considering the streamlined nature of Spotify's 'Car Mode' that simplifies the interface by removing some features, how do you believe this affects your ability to maintain focus on driving? Please rate on a scale from 1 to 5.

- 1.4. Somewhat increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 2.4. Somewhat increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 3.5. Somewhat increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 4.4. Somewhat increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 5.4. Somewhat increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 6.3. No impact - The changes in the interface do not affect my driving focus
- 7.3. No impact - The changes in the interface do not affect my driving focus
- 8.4. Somewhat increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 9.4. Somewhat increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 10.3. Somewhat decreases my ability to focus - The simple interface requires adjustments that occasionally distract me
- 11.3. Significantly decreases my ability to focus - I find myself distracted by the absence of certain features
- 12.3. The changes in the interface do not affect my driving focus
- 13.3. No impact - The changes in the interface do not affect my driving focus
- 14.3. Significantly decreases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 15.3. Significantly decreases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 16.3. Significantly decreases my ability to focus - The streamlined interface greatly reduces distractions, enhancing my focus on the road
- 17.3. Significantly increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 18.3. Significantly increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 19.4. Somewhat increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 20.4. Somewhat increases my ability to focus - The removal of features minimizes my interaction with the interface, allowing better concentration on driving
- 21.4. Significantly increases my ability to focus - The streamlined interface greatly reduces distractions, enhancing my focus on the road
- 22.3. Significantly increases my ability to focus - The streamlined interface greatly reduces distractions, enhancing my focus on the road

Have you ever used Spotify's 'Car Mode' while driving? When driving and needing to pause, play, or skip a song, which 'Mode' do you prefer?

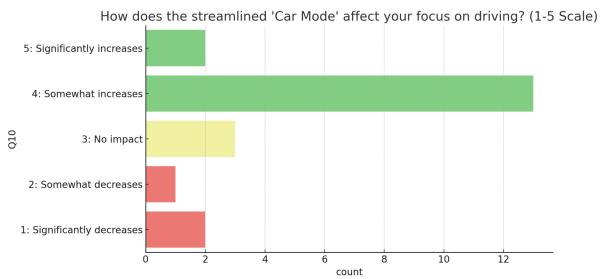
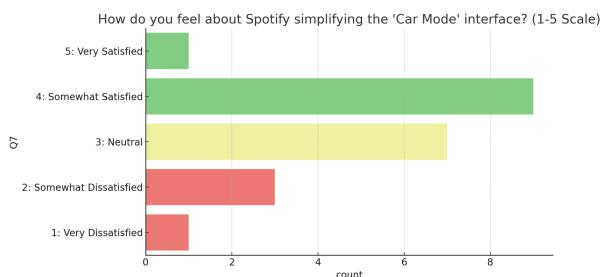
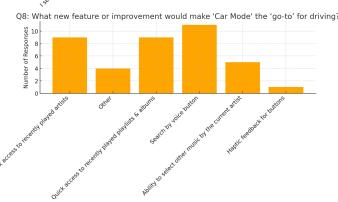
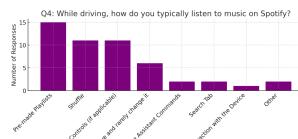
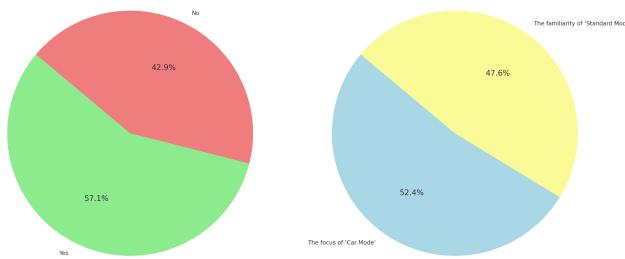


Figure 3.2—Needfinding Survey Responses

Aesthetic and Minimalist Design

Design Alternative 1: Minimalist Visual Design

- Streamline the visual design of Spotify's Car Mode to enhance clarity and minimize clutter, focusing on large, legible typography and essential controls only. This approach reduces cognitive load and visual distractions.

Features:

- Use high-contrast color schemes and simplified iconography to ensure key information and controls are immediately apparent.
- Optimize the layout to prioritize play/pause, track skipping, and voice command features, ensuring they are easily accessible without looking away from the road.

Design Alternative 2: Simplified Interface with Hidden Menus

- Maintain a clean main interface while providing access to additional features through context-sensitive hidden menus that appear with gesture or voice commands, reducing on-screen elements until they are needed.

Features:

- Implement a gesture or voice-activated menu that allows users to access recently listened-to artists, playlists, or albums, ensuring that users can access a broader range of content without navigating through multiple screens.
- Design the hidden menus to be intuitive and easily dismissible, ensuring that users can quickly return to the primary interface.

Design Alternative 3: Enhanced Voice Interaction

- Revamp the Car Mode to prioritize voice interaction, enabling users to control playback, search content, and access settings entirely hands-free, aligning with the need for minimal driver distraction.

Features:

- Develop robust voice command recognition that can understand and execute a wide range of commands, including artist and song selection, playback control, and navigation within the app.
- Integrate auditory feedback and confirmations for voice commands to ensure users receive clear responses to their inputs, confirming the intended actions without needing to look at the screen.

Figure 4.1—Brainstorming Format

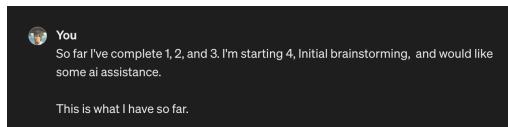


Figure 4.2—AI-Assisted Brainstorming

<https://chat.openai.com/share/50979e3e-a839-41c9-9258-25b6f10a84>

[3f](#)

Spotify 'Car Mode' (Prototypes)

Hey y'all! Seeking input from any Spotify user! My study aims to understand how drivers interact with Spotify while driving, focusing on the usability aspects of the current 'Car Mode' interface. This survey includes three prototypes developed based on my findings thus far.

Please confirm that you have reviewed the provided slides and understand the features and flow of interaction for both the current car mode and the proposed prototypes!*

https://drive.google.com/file/d/1zJdOvVHgD29L_d6wzRzHqNcIwvzphng/view

I've read

In Prototype 1, what features did you find appealing? (Select all that apply)*

Voice assistance
 Visibility of standard screen removed
 Buttons are enlarged and opacity reduced to blend in
 Circular buttons with haptic feedback
 A large border to indicate activation
 Less intrusive playback older
 Other

Please specify if you chose 'Other'

Type answer here...

How would you rate the effectiveness of Prototype 1 compared to the current Car Mode interface? Please consider aspects such as visual clarity, ease of access to controls, and overall usability.*

The current Car Mode... - Prototype 1 significantly detracts from overall user safety and driver relevance compared to the current Car Mode.
 Slightly worse - Prototype 1 offers a few improvements to the overall user experience, but it's not a game-changer.
 Moderate - Prototype 1 offers no discernible improvement or decline in comparison to the current Car Mode.
 Slightly better - Prototype 1 introduces subtle improvements in clarity and control access.
 Much better - Prototype 1 substantially improves the overall experience with clearer details and more intuitive controls.

Prototypes 2 and 3 feature a 'hidden tray' with added functionalities. Users can reveal and hide this tray anytime using swipe gestures. When the tray is hidden, the default interface is prototype 1. How intuitive is this interaction between simplicity and functionality? *

Not intuitive - The interaction between the hidden tray and main interface is confusing and hinders my usage.
 Slightly intuitive - I find the transition between the hidden tray and main interface somewhat understandable, but it requires multiple attempts to get right.
 Moderately intuitive - The transition mechanics are fairly straightforward and I can navigate it with a reasonable ease, though it could be more fluid.
 Very intuitive - I find the transition smooth and well-integrated, allowing for easy access to added functionalities without impacting simplicity.
 Extremely intuitive - The feature interaction is seamless, enhancing the user experience by elegantly combining simplicity with advanced functionalities.

In Prototype 2, how useful do you find the addition of recently listened to artists?

Not useful at all - I don't see the benefit of this feature in the context of driving.
 Slightly useful - It could be excessively helpful, but it's not a game-changer.
 Moderately useful - A decent feature that adds some value, but isn't essential.
 Very useful - It significantly enhances the music selection experience.
 Extremely useful - This feature is essential for an optimal user experience.

In Prototype 3, how useful do you find the addition of recently listened to playlists and albums?

Not useful at all - Adds no value and is unnecessary while driving.
 Slightly useful - Could make this feature make a major difference.
 Moderately useful - Beneficial and adds convenience to the music selection process.
 Very useful - Greatly improves ease of access to preferred content.
 Extremely useful - Indispensable for efficient music navigation and selection.

For Prototype 3, how do you rate the enhanced artist interaction in the hidden tray regarding its contribution to your overall user experience?*

No Contribution - The enhanced interaction does not improve the user experience at all.
 Minor Contribution - The interaction offers slight improvements that are barely noticeable.
 Moderate Contribution - The interaction makes a noticeable difference, contributing to the overall user experience.
 Significant Contribution - The interaction considerably enhances the user experience, making it more engaging and enjoyable.
 Critical Contribution - The interaction is pivotal in transforming the user experience, making it significantly more intuitive and pleasant.

Select the interface you prefer, considering aspects such as ease of use, visual clarity, functionality, and safety while driving. *

Current
 Prototype 1
 Prototype 2
 Prototype 3

Explain your preference

Type answer here...

What features would you add or remove to your preferred interface?

Type answer here...

Select the interface you prefer, considering aspects such as ease of use, visual clarity, functionality, and safety while driving. *

Current
 Prototype 1
 Prototype 2
 Prototype 3

Explain your preference

Type answer here...

What features would you add or remove to your preferred interface?

Type answer here...

Figure 7.1—Prototypes Survey

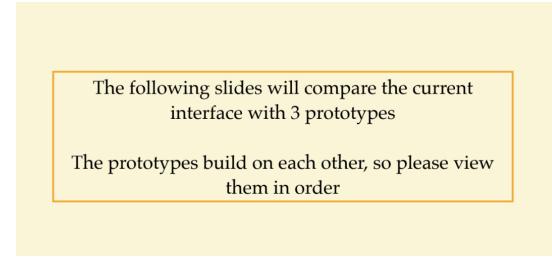


Figure 7.2—Prototypes Slides

https://drive.google.com/file/d/1osD9m3VbIVVFv9SZSWx_rBvkRh_z38XNG/view?usp=sharing

Please confirm that you have reviewed the provided slides and understand the features and flow of interaction for both the current car mode and the proposed prototypes!

1. I confirm
2. I confirm
3. I confirm
4. I confirm
5. I confirm
6. I confirm
7. I confirm
8. I confirm
9. I confirm
10. I confirm
11. I confirm
12. I confirm
13. I confirm
14. I confirm
15. I confirm
16. I confirm
17. I confirm
18. I confirm
19. I confirm

In Prototype 1, what features did you find appealing? (Select all that apply)

1. Voice assistant|Visibility of background screen removed|Circular buttons with haptic feedback|A bright border to indicate activation|Less intrusive playback slider
2. Circular buttons with haptic feedback|A bright border to indicate activation|Less intrusive playback slider
3. Circular buttons with haptic feedback
4. Voice assistant
5. Album cover enlarged and opacity reduced to blend in|Circular buttons with haptic feedback|A bright border to indicate activation|Less intrusive playback slider
6. Visibility of background screen removed|Album cover enlarged and opacity reduced to blend in|Circular buttons with haptic feedback|A bright border to indicate activation|Less intrusive playback slider
7. Voice assistant|Circular buttons with haptic feedback|Less intrusive playback slider
8. Less intrusive playback slider
9. Visibility of background screen removed|Circular buttons with haptic feedback|Less intrusive playback slider
10. Circular buttons with haptic feedback|A bright border to indicate activation|Less intrusive playback slider
11. Visibility of background screen removed
12. Voice assistant|Album cover enlarged and opacity reduced to blend in
13. Voice assistant|A bright border to indicate activation|Less intrusive playback slider
14. Circular buttons with haptic feedback|A bright border to indicate activation|Less intrusive playback slider
15. Circular buttons with haptic feedback|Less intrusive playback slider
16. Voice assistant|Album cover enlarged and opacity reduced to blend in|Circular buttons with haptic feedback|A bright border to indicate activation|Less intrusive playback slider
17. Visibility of background screen removed|Circular buttons with haptic feedback|A bright border to indicate activation
18. Circular buttons with haptic feedback|A bright border to indicate activation
19. Album cover enlarged and opacity reduced to blend in|A bright border to indicate activation|Less intrusive playback slider

Please specify if you chose 'Other'

1
2
3
4
5
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12
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14
15
16
17
18
19

How would you rate the effectiveness of Prototype 1 compared to the current Car Mode interface? Please consider aspects such as visual clarity, ease of access to controls, and overall usability.

1. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access
2. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access
3. 5. Much better - Prototype 1 substantially improves the overall experience with clearer visuals and more intuitive controls
4. 3. Equivariant - Prototype 1 offers no discernible improvement or detriment in comparison to the current Car Mode
5. 3. Equivariant - Prototype 1 offers no discernible improvement or detriment in comparison to the current Car Mode
6. 9. Much better - Prototype 1 substantially improves the overall experience with clearer visuals and more intuitive controls
7. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access
8. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access
9. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access
10. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access
11. 3. Equivariant - Prototype 1 offers no discernible improvement or detriment in comparison to the current Car Mode
12. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access
13. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access
14. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access
15. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access
16. 4. Slightly better - Prototype 1 offers no discernible improvement or detriment in comparison to the current Car Mode
17. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access
18. 5. Much better - Prototype 1 substantially improves the overall experience with clearer visuals and more intuitive controls
19. 4. Slightly better - Prototype 1 introduces subtle improvements in clarity and control access

Prototypes 2 and 3 feature a 'hidden tray' with added functionalities.
Users can reveal and hide this tray anytime using swipe gestures. When the tray is hidden, the default interface is prototype 1. How intuitive is this interaction between simplicity and functionality?

1. **Very useful** - I find the interaction smooth and well integrated allowing for easy access to added functionalities without impacting my driving experience.
 2. **Very useful** - I find the interaction smooth and well integrated allowing for easy access to added functionalities without impacting my driving experience.
 3. **Moderately useful** - The feature makes it very straightforward and I can caught up with a reasonable ease.
 4. **Very useful** - I find the interaction smooth and well integrated allowing for easy access to added functionalities without impacting my driving experience.
 5. **Very useful** - I find the interaction smooth and well integrated allowing for easy access to added functionalities without impacting my driving experience.
 6. **Slightly useful** - I find the interaction between the hidden tray and the main interface is understandable, but it might be a bit slower than I would like.
 7. **Slightly useful** - I find the interaction between the hidden tray and the main interface is understandable, but it might be a bit slower than I would like.
 8. **Moderately useful** - The feature makes it fairly straightforward and I can caught up with a reasonable ease.
 9. **Very useful** - I find the interaction between the hidden tray and the main interface is understandable, but it might be a bit slower than I would like.
 10. **Very useful** - The interaction between the hidden tray and the main interface is confusing and hinders my usage.
 11. **Not useful** - The interaction between the hidden tray and the main interface is confusing and hinders my usage.
 12. **Very useful** - I find the interaction smooth and well integrated allowing for easy access to added functionalities without impacting my driving experience.
 13. **Very useful** - I find the interaction smooth and well integrated allowing for easy access to added functionalities without impacting my driving experience.
 14. **Very useful** - I find the interaction smooth and well integrated allowing for easy access to added functionalities without impacting my driving experience.
 15. **Very useful** - I find the interaction smooth and well integrated allowing for easy access to added functionalities without impacting my driving experience.
 16. **Very useful** - I find the interaction smooth and well integrated allowing for easy access to added functionalities without impacting my driving experience.
 17. **Very useful** - I find the interaction smooth and well integrated allowing for easy access to added functionalities without impacting my driving experience.
 18. **Very useful** - I find the interaction smooth and well integrated, allowing for easy access to added functionalities without impacting my driving experience.
 19. **Very useful** - I find the interaction smooth and well integrated, allowing for easy access to added functionalities without impacting my driving experience.
 20. **Very useful** - I find the interaction smooth and well integrated, allowing for easy access to added functionalities without impacting my driving experience.

In Prototype 2, how useful do you find the addition of recently listened to artists?

1. **Very useful** - I significantly enhances the music selection experience.
 2. **Very useful** - I significantly enhances the music selection experience.
 3. **Moderately useful** - A decent feature adds some value, but it isn't essential.
 4. **Very useful** - I significantly enhances the music selection experience.
 5. **Moderately useful** - A decent feature adds some value, but it isn't essential.
 6. **Very useful** - I significantly enhances the music selection experience.
 7. **Very useful** - I significantly enhances the music selection experience.
 8. **Moderately useful** - A decent feature adds some value, but it isn't essential.
 9. **Very useful** - I significantly enhances the music selection experience.
 10. **Very useful** - I significantly enhances the music selection experience.
 11. **Very useful** - I significantly enhances the music selection experience.
 12. **Very useful** - I significantly enhances the music selection experience.
 13. **Very useful** - I significantly enhances the music selection experience.
 14. **Very useful** - I significantly enhances the music selection experience.
 15. **Very useful** - I significantly enhances the music selection experience.
 16. **Very useful** - I significantly enhances the music selection experience.
 17. **Very useful** - I significantly enhances the music selection experience.
 18. **Very useful** - I significantly enhances the music selection experience.
 19. **Very useful** - I significantly enhances the music selection experience.
 20. **Very useful** - I significantly enhances the music selection experience.

In Prototype 3, how useful do you find the addition of recently listened to playlists and albums?

1. **Very useful** - Greatly improves ease of access to preferred content.
 2. **Very useful** - Greatly improves ease of access to preferred content.
 3. **Moderately useful** - A decent feature adds some value, but it isn't essential.
 4. **Very useful** - Greatly improves ease of access to preferred content.
 5. **Moderately useful** - A decent feature adds some value, but it isn't essential.
 6. **Very useful** - Greatly improves ease of access to preferred content.
 7. **Moderately useful** - A decent feature adds some value, but it isn't essential.
 8. **Very useful** - Greatly improves ease of access to preferred content.
 9. **Moderately useful** - A decent feature adds some value, but it isn't essential.
 10. **Very useful** - Greatly improves ease of access to preferred content.
 11. **Very useful** - Greatly improves ease of access to preferred content.
 12. **Very useful** - Greatly improves ease of access to preferred content.
 13. **Very useful** - Greatly improves ease of access to preferred content.
 14. **Very useful** - Greatly improves ease of access to preferred content.
 15. **Very useful** - Greatly improves ease of access to preferred content.
 16. **Very useful** - Greatly improves ease of access to preferred content.
 17. **Very useful** - Greatly improves ease of access to preferred content.
 18. **Very useful** - Greatly improves ease of access to preferred content.
 19. **Very useful** - Greatly improves ease of access to preferred content.
 20. **Very useful** - Greatly improves ease of access to preferred content.

For Prototype 3, how do you rate the enhanced artist interaction in the hidden tray regarding its contribution to your overall user experience?

1. **Significant Contribution** - The interaction often significantly enhances the user experience, making it more engaging and enjoyable.
 2. **Minor Contribution** - The interaction often slight improvement that are barely noticeable.
 3. **Moderate Contribution** - The interaction makes a moderate difference, contributing to the overall user experience.
 4. **Minor Contribution** - The interaction makes a slight difference, contributing to the overall user experience.
 5. **Moderate Contribution** - The interaction makes a moderate difference, contributing to the overall user experience.
 6. **Minor Contribution** - The interaction makes a slight difference, contributing to the overall user experience.
 7. **Moderate Contribution** - The interaction moderately enhances the user experience, making it more engaging and enjoyable.
 8. **Minor Contribution** - The interaction slightly enhances the user experience, making it more engaging and enjoyable.
 9. **Moderate Contribution** - The interaction moderately enhances the user experience, making it more engaging and enjoyable.
 10. **Minor Contribution** - The interaction slightly enhances the user experience, making it more engaging and enjoyable.
 11. **Moderate Contribution** - The interaction moderately enhances the user experience, making it more engaging and enjoyable.
 12. **Minor Contribution** - The interaction slightly enhances the user experience, making it more engaging and enjoyable.
 13. **Moderate Contribution** - The interaction moderately enhances the user experience, making it more engaging and enjoyable.
 14. **Minor Contribution** - The interaction slightly enhances the user experience, making it more engaging and enjoyable.
 15. **Moderate Contribution** - The interaction moderately enhances the user experience, making it more engaging and enjoyable.
 16. **Minor Contribution** - The interaction slightly enhances the user experience, making it more engaging and enjoyable.
 17. **Moderate Contribution** - The interaction moderately enhances the user experience, making it more engaging and enjoyable.
 18. **Minor Contribution** - The interaction slightly enhances the user experience, making it more engaging and enjoyable.
 19. **Moderate Contribution** - The interaction moderately enhances the user experience, making it more engaging and enjoyable.
 20. **Minor Contribution** - The interaction slightly enhances the user experience, making it more engaging and enjoyable.

Select the interface you prefer, considering aspects such as ease of use, visual clarity, functionality, and safety while driving.

1. Prototype 1
 2. Prototype 1
 3. Prototype 1
 4. Prototype 3
 5. Prototype 2
 6. Prototype 3
 7. Prototype 1
 8. Prototype 1
 9. Prototype 1
 10. Prototype 2
 11. Prototype 2
 12. Prototype 2
 13. Prototype 2
 14. Prototype 3
 15. Prototype 2
 16. Prototype 2
 17. Prototype 2
 18. Prototype 3
 19. Prototype 1

Explain your preference

1. **1** Prototype 1 is far back in terms of balancing function and safety, so the hidden tray requires too many actions to use, and the icons are on the small side, making it difficult to manipulate while driving.
 2. **4** It allows you to choose music from the recommended songs.
 3. **5** I like the minimalist design with added functionality for advanced users.
 4. **8** Prototype 1 seems straight to the point and gets the job done with the minor adjustments, the features offered in P2 & P3 doesn't seem to add much value.
 5. **9** I like the layout, it's clean, clutter-free and safe while driving.
 6. **10** In the addition of the artist and recently played albums/playlists, I also like that you can return to the simplified view.
 7. **11** The artist interaction isn't as used in the car.
 8. **12** Having my recent artists albums to select in a big plus.
 9. **13** I like the shuffle mode, it's great for those days like the last one like the last few times.
 10. **15** The ability to choose by artist or album quickly is very useful because often times, the shuffle mode might not play the songs I enjoy.
 11. **17**
 12. **18** It can be simple and functional.
 13. **19** Prototype 1 is simple and better than current.

What features would you add or remove to your preferred interface?

1. **1**
 2.
 3.
 4. A feature to play all the songs at once.
 5. The song names are good.
 6. I like prototype 1 as you designed it.
 7.
 8.
 9. It's less clutter.
 10. It's fast.
 11.
 12.
 13. None.
 14. I don't think add or remove anything from prototype 3. A settings menu to customize the bottom tray however would be nice so I could customize whether I wanted it to look prototype 2 or if I only wanted recently listened to albums.
 15.
 16.
 17.
 18. Not sure how voice works.
 19. More ways to safely use such as voice.

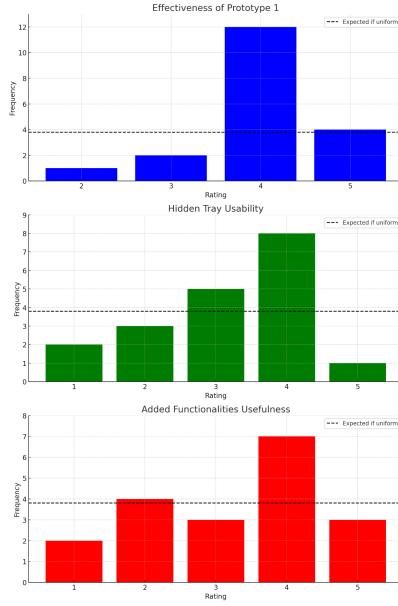


Figure 8.1—Prototypes Survey Responses

Spotify Car Mode (Final Prototype)

Hey Y'all! Seeking input from any Spotify users. My study aims to understand how drivers interact with Spotify while driving, focusing on the usability aspects of the current 'Car Mode' interface. This survey requires a video walkthrough and an interactive Figma demo of my final prototype.

CSV

```
[{"1": "I confirm I have watched the walkthrough video for the prototype"}, {"2": "I confirm I have interacted with the prototype on Figma!"}]
```

JSON

```
[{"1": "I confirm I have watched the walkthrough video for the prototype"}, {"2": "I confirm I have interacted with the prototype on Figma!"}]
```

Please confirm that you have watched the walkthrough video for the prototype!

1: I confirm
2: I confirm
3: I confirm
4: I confirm
5: I confirm
6: I confirm
7: I confirm
8: I confirm
9: I confirm
10: I confirm
11: I confirm
12: I confirm
13: I confirm
14: I confirm
15: I confirm
16: I confirm
17: I confirm
18: I confirm
19: I confirm
20: I confirm

Please confirm that you have interacted with the prototype on Figma!

2: I confirm
3: I confirm
4: I confirm
5: I confirm
6: I confirm
7: I confirm
8: I confirm
9: I confirm
10: I confirm
11: I confirm
12: I confirm
13: I confirm
14: I confirm
15: I confirm
16: I confirm
17: I confirm
18: I confirm
19: I confirm
20: I confirm

In the prototype, what features did you find appealing? (Select all that apply)

1. Dedicated Car Mode button
2. Album cover enlarged and opacity reduced to blend in/Circular buttons with haptic feedback/Voice assistant/Dedicated Car Mode button
3. Circular buttons with haptic feedback/Voice assistant/Dedicated Car Mode button/Background screen adaptation
4. Circular buttons with haptic feedback/Voice assistant
5. Reduced animativeness/visibility of background screen removed/A bright border to indicate activation/Dedicated Car Mode button/Background screen adaptation
6. Reduced animations/Voice assistant/Dedicated Car Mode button
7. Visibility of background screen removed/A bright border to indicate activation/Dedicated Car Mode button/Hidden tray functionality
8. Voice assistant/Dedicated Car Mode button/Hidden tray functionality/Enhanced artist selection/Albums + Singles/EPs switcher
9. Voice assistant/Dedicated Car Mode button/Background screen adaptation/Hidden tray functionality
10. Dedicated Car Mode button/Hidden tray functionality/Enhanced artist selection
11. Dedicated Car Mode button/Hidden tray functionality
12. Visibility of background screen removed/Album cover enlarged and opacity reduced to blend in/Circular buttons with haptic feedback/A bright border to indicate activation/Voice assistant/Dedicated Car Mode button/Background screen adaptation
13. Album cover enlarged and opacity reduced to blend in
14. Dedicated Car Mode button/Hidden tray functionality
15. Album cover enlarged and opacity reduced to blend in/Circular buttons with haptic feedback/Voice assistant/Background screen adaptation/Hidden tray functionality
16. Reduced animations/Dedicated Car Mode button/Hidden tray functionality/Albums + Singles/EPs switcher
17. Dedicated Car Mode button/Hidden tray functionality/Enhanced artist selection/Albums + Singles/EPs switcher
18. Album cover enlarged and opacity reduced to blend in/Circular buttons with haptic feedback/Dedicated Car Mode button/Background screen adaptation
19. Voice assistant/Hidden tray functionality/Enhanced artist selection
20. Visibility of background screen removed/Circular buttons with haptic feedback/A bright border to indicate activation/Enhanced artist selection

How effective do you find the green border around buttons for indicating activation?

1. 2. Barely noticeable - I can see it, but it barely aids in recognizing activation.
2. 4. Clearly effective - The border is distinct and clearly indicates when a button is activated.
3. 6. Clearly effective - The border is distinct and clearly indicates when a button is activated.
4. 8. Clearly effective - The border is distinct and clearly indicates when a button is activated.
5. 9. Highly effective - The border is immediately noticeable and consistently indicates activation.
6. 11. Clearly effective - The border is distinct and clearly indicates when a button is activated.
7. 12. Barely noticeable - I can see it, but it barely aids in recognizing activation.
8. 13. Clearly effective - The border is distinct and clearly indicates when a button is activated.
9. 13. Moderately effective - The green border is visible and somewhat aids in indicating activation.
10. 14. Clearly effective - The border is distinct and clearly indicates when a button is activated.
11. 15. Barely noticeable - I can see it, but it barely aids in recognizing activation.
12. 16. Clearly effective - The border is distinct and clearly indicates when a button is activated.
13. 17. Moderately effective - The green border is visible and somewhat aids in indicating activation.
14. 18. Clearly effective - The border is distinct and clearly indicates when a button is activated.
15. 19. Highly effective - The border is immediately noticeable and consistently indicates activation.
16. 20. Moderately effective - The green border is visible and somewhat aids in indicating activation.
17. 21. Barely noticeable - I can see it, but it barely aids in recognizing activation.
18. 22. Clearly effective - The border is distinct and clearly indicates when a button is activated.
19. 23. Clearly effective - The border is distinct and clearly indicates when a button is activated.
20. 24. Clearly effective - The border is distinct and clearly indicates when a button is activated.

How well integrated do you find the voice interaction within the interface?

1. 3. Moderately integrated - The feature works within the interface but isn't seamless.
2. 5. Seemlessly integrated - Voice interaction feels like a natural and essential part of the interface.
3. 4. Well integrated - Voice interaction is a coherent part of the experience.
4. 6. Moderately integrated - The feature works within the interface but isn't seamless.
5. 7. Seemlessly integrated - The feature works within the interface but isn't seamless.
6. 8. Well integrated - Voice interaction is a coherent part of the interface.
7. 9. Moderately integrated - There's some integration, but it's not intuitive or fluid.
8. 10. Seemlessly integrated - Voice interaction is a coherent part of the interface.
10. 11. Seemlessly integrated - Voice interaction feels like a natural and essential part of the interface.
11. 12. Moderately integrated - The feature works within the interface but isn't seamless.
12. 13. Seemlessly integrated - Voice interaction feels like a natural and essential part of the interface.
13. 14. Well integrated - Voice interaction is a coherent part of the experience.
14. 15. Well integrated - Voice interaction is a coherent part of the experience.
15. 16. Well integrated - Voice interaction is a coherent part of the experience.
16. 17. Well integrated - Voice interaction is a coherent part of the experience.
17. 18. Well integrated - Voice interaction is a coherent part of the experience.
18. 19. Well integrated - Voice interaction is a coherent part of the experience.
19. 20. Well integrated - Voice interaction is a coherent part of the experience.
20. 21. Well integrated - Voice interaction is a coherent part of the experience.

How would you rate the smoothness of transitioning in and out of Car Mode using the dedicated button?

1. 3. Adequately smooth - The transition works well enough but could be improved.
2. 5. Extremely smooth - The transition is smooth and enhances the user experience.
3. 4. Adequately smooth - The transition is consistent and enhances the user experience.
4. 3. Adequately smooth - The transition works well enough but could be improved.
5. 5. Extremely smooth - The transition is seamless and feels entirely natural.
6. 4. Smooth - The transition is consistent and enhances the user experience.
7. 3. Adequately smooth - The transition works well enough but could be improved.
8. 4. Smooth - The transition is consistent and enhances the user experience.
9. 4. Smooth - The transition is consistent and enhances the user experience.
10. 3. Adequately smooth - The transition works well enough but could be improved.
11. 4. Smooth - The transition is consistent and enhances the user experience.
12. 5. Extremely smooth - The transition is seamless and feels entirely natural.
13. 3. Adequately smooth - The transition works well enough but could be improved.
14. 3. Adequately smooth - The transition works well enough but could be improved.
15. 4. Smooth - The transition is consistent and enhances the user experience.
16. 4. Smooth - The transition is consistent and enhances the user experience.
17. 4. Smooth - The transition is consistent and enhances the user experience.
18. 4. Smooth - The transition is consistent and enhances the user experience.
19. 3. Adequately smooth - The transition works well enough but could be improved.
20. 4. Smooth - The transition is consistent and enhances the user experience.

How useful do you find the background screen adaptation to your interactions (e.g., displaying artist/album pages)?

1. 3. Moderately useful - The adaptation improves the user experience to a reasonable extent.
2. 4. Very useful - The adaptation significantly enhances the user experience, making interactions more intuitive.
3. 4. Very useful - The adaptation significantly enhances the user experience, making interactions more intuitive.
4. 3. Moderately useful - The adaptation improves the user experience to a reasonable extent.
5. 3. Moderately useful - The adaptation improves the user experience to a reasonable extent.
6. 2. Slightly useful - The adaptation has a minimal impact, offering limited benefits.
7. 5. Extremely useful - The adaptation is crucial for an optimal user experience, greatly enhancing interaction and understanding.
8. 4. Very useful - The adaptation significantly enhances the user experience, making interactions more intuitive.
9. 3. Moderately useful - The adaptation improves the user experience to a reasonable extent.
10. 4. Very useful - The adaptation significantly enhances the user experience, making interactions more intuitive.
11. 4. Very useful - The adaptation significantly enhances the user experience, making interactions more intuitive.
12. 3. Moderately useful - The adaptation improves the user experience to a reasonable extent.
13. 3. Moderately useful - The adaptation improves the user experience to a reasonable extent.
14. 4. Very useful - The adaptation significantly enhances the user experience, making interactions more intuitive.
15. 3. Moderately useful - The adaptation improves the user experience to a reasonable extent.
16. 3. Slightly useful - The adaptation has a minimal impact, offering limited benefits.
17. 4. Very useful - The adaptation significantly enhances the user experience, making interactions more intuitive.
18. 3. Moderately useful - The adaptation improves the user experience to a reasonable extent.
19. 2. Slightly useful - The adaptation has a minimal impact, offering limited benefits.
20. 4. Very useful - The adaptation significantly enhances the user experience, making interactions more intuitive.

How effectively does the prototype balance simplicity with functionality?

1. Poorly balanced - The design does not combine simplicity and functionality well.
2. 4 Well balanced - The design effectively combines simplicity with the necessary functionality.
3. Optimally balanced - The design perfectly marries simplicity with comprehensive functionality.
4. 3 Balanced - A good trade-off between simplicity and functionality, though there's room for improvement.
5. 2 Unbalanced - The design prioritizes simplicity over functionality.
6. 4 Well balanced - The design effectively combines simplicity with the necessary functionality.
7. 3 Balanced - A good trade-off between simplicity and functionality, though there's room for improvement.
8. 4 Well balanced - The design effectively combines simplicity with the necessary functionality.
9. Optimally balanced - The design perfectly marries simplicity with the necessary functionality.
10. 4 Well balanced - The design effectively combines simplicity with the necessary functionality.
11. 4 Well balanced - The design effectively combines simplicity with the necessary functionality.
12. 4 Well balanced - The design effectively combines simplicity with the necessary functionality.
13. 3 Balanced - A good trade-off between simplicity and functionality, though there's room for improvement.
14. 3 Balanced - A good trade-off between simplicity and functionality, though there's room for improvement.
15. Optimally balanced - The design perfectly marries simplicity with comprehensive functionality.
16. 4 Well balanced - The design effectively combines simplicity with the necessary functionality.
17. 4 Well balanced - The design effectively combines simplicity with the necessary functionality.
18. 3 Balanced - A good trade-off between simplicity and functionality, though there's room for improvement.
19. 3 Balanced - A good trade-off between simplicity and functionality, though there's room for improvement.
20. 4 Well balanced - The design effectively combines simplicity with the necessary functionality.

How would you rate the safety of the final prototype compared to the current Car Mode while driving, particularly considering the integration of voice interaction, adaptive background screen, and the hidden tray?

Please keep in mind that although the prototype introduces these new features, its design prioritizes simplicity by concealing most functionalities behind a simplified interface.

1. 3 Equally safe - The new design maintains the same level of safety as the current mode.
2. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
3. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
4. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
5. 4 Significantly safer - The new design greatly improves safety features and reduces potential distractions.
6. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
7. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
8. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
9. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
10. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
11. 3 Equally safe - The new design maintains the same level of safety as the current mode.
12. 5 Significantly safer - The new design greatly improves safety features and reduces potential distractions.
13. 3 Equally safe - The new design maintains the same level of safety as the current mode.
14. 3 Equally safe - The new design maintains the same level of safety as the current mode.
15. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
16. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
17. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
18. 3 Equally safe - The new design maintains the same level of safety as the current mode.
19. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.
20. 4 Safer - The new design enhances safety with clearer interfaces and better interaction.

How would you rate the effectiveness of the prototype compared to the current Car Mode interface? Please consider aspects such as visual clarity, ease of access to controls, and overall usability.

1. 3 Equally - Prototype offers no discernible improvement or detriment in comparison to the current Car Mode.
2. 5 Much better - Prototype substantially improves the overall experience with clearer visuals and more intuitive controls.
3. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.
4. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.
5. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.
6. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.
7. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.
8. 5 Much better - Prototype substantially improves the overall experience with clearer visuals and more intuitive controls.
9. 5 Much better - Prototype substantially improves the overall experience with clearer visuals and more intuitive controls.
10. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.
11. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.
12. 5 Much better - Prototype substantially improves the overall experience with clearer visuals and more intuitive controls.
13. 3 Equally - Prototype offers no discernible improvement or detriment in comparison to the current Car Mode.
14. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.
15. 5 Much better - Prototype substantially improves the overall experience with clearer visuals and more intuitive controls.
16. 5 Much better - Prototype substantially improves the overall experience with clearer visuals and more intuitive controls.
17. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.
18. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.
19. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.
20. 4 Slightly better - Prototype introduces subtle improvements in clarity and control access.

What aspects of the prototype did you find most enjoyable or useful?

1. I really liked the car mode button that lets users easier navigate between different modes
2. I find it most enjoyable to enter/exit car mode.
3. I like the music integration.
4. Voice integration
5. The car mode redesign
6. I often listen to music and I can confirm that nothing is more dangerous than trying to type in and search for your music.
The voice option is a nice touch.
7.
8. Background screen adaption
9.
10.
11. Better than current car mode
12. I found that switching in and out of Car Mode was the most enjoyable.
13.
14.
15. the hidden tray was fun. also like the animations.
16.
17. I like the flexibility of the interface.
18.
19.
20.

Were there any features or elements of the final prototype that you found confusing or challenging to use?

1. everything was pretty intuitive, great job!
2. There were no features confusing to me.
3.
4. I just always turn off car mode and still think I would even with this
5. No it was pretty straightforward
6. NA
7.
8. voice
9.
10.
11. Buttons might be too big
12. Switching between an artist's albums and singles/EPs was really confusing and a driver would never have known how to switch between them.
13.
14.
15. NA
16.
17. How do audiobooks/podcasts work?
18.
19.
20.

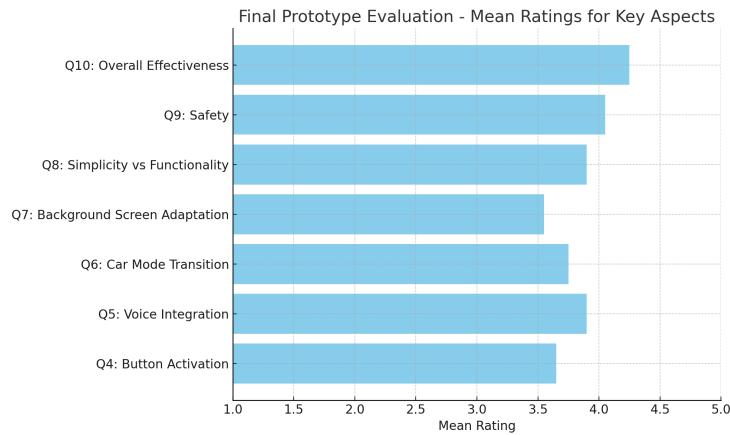


Figure 13.1—Final prototype survey



Figure 13.2—Reddit post

<https://www.reddit.com/r/truespotify/comments/1bbjtkt/comment/ku9mohm/>

FROM ChatGPT:

We can use **one-sample t-tests** to see if the mean ratings for each feature significantly differ from a neutral rating (3, which might signify an "adequate" or "expected" performance level). We hypothesize that each feature should perform better than just adequate, aiming for ratings significantly greater than 3 to indicate success.

For each feature (from Q4 to Q10), we can test the null hypothesis that its mean rating equals 3 against the alternative hypothesis that its mean rating is greater than 3. Here's how these tests would be set up and what we would be looking for:

1. Button Activation Clarity (Q4): We test if the mean rating of 3.65 significantly exceeds the neutral benchmark of 3.
2. Voice Interaction Integration (Q5): We assess whether the mean rating of 3.9 is significantly greater than 3.
3. **Car Mode Transition Smoothness (Q6): We evaluate whether the mean rating of 3.75 is significantly above 3.
4. Background Screen Adaptation Usefulness (Q7): We analyze if the mean rating of 3.55 significantly surpasses 3.
5. Simplicity vs. Functionality Balance (Q8): We verify whether the mean rating of 3.9 is significantly higher than 3.
6. Safety Assessment (Q9): We determine if the mean rating of 4.05 is significantly greater than 3.
7. Overall Effectiveness (Q10): We check if the mean rating of 4.25 is significantly above 3.

If the p-value for any of these tests is less than 0.05 (assuming a 95% confidence level), we would reject the null hypothesis for that feature, concluding that the prototype's performance in that aspect is significantly better than neutral. This

analysis would provide statistical backing to the perceived effectiveness of the prototype features and overall design.

<p>4. Background Screen Adaptation Usefulness (Q7):</p> <ul style="list-style-type: none">• T-statistic: 1.926• P-value: 0.06921• Interpretation: While the mean rating for background screen adaptation usefulness is above neutral, this result is not statistically significant at the 0.05 level, indicating a need for further evaluation or enhancement in this area.
<p>5. Simplicity vs. Functionality Balance (Q8):</p> <ul style="list-style-type: none">• T-statistic: 5.141• P-value: 0.00005802• Interpretation: The prototype's balance between simplicity and functionality is significantly appreciated by users, suggesting a successful design trade-off.
<p>6. Safety Assessment (Q9):</p> <ul style="list-style-type: none">• T-statistic: 6.474• P-value: 0.00000333• Interpretation: The safety of the final prototype, especially with its integrated features, is rated significantly higher than neutral, reinforcing the design's contribution to enhancing driver safety.
<p>7. Overall Effectiveness (Q10):</p> <ul style="list-style-type: none">• T-statistic: 8.850• P-value: 0.00000003627• Interpretation: The overall effectiveness of the prototype is perceived significantly better than the current Car Mode, demonstrating substantial improvements in visual clarity, ease of access, and usability.

The statistical analysis of the final prototype evaluation yields the following results:

<p>1. Button Activation Clarity (Q4):</p> <ul style="list-style-type: none">• T-statistic: 2.604• P-value: 0.01743• Interpretation: The mean rating for button activation clarity is significantly greater than 3 (neutral), suggesting that users found the green border effective for indicating activation.
<p>2. Voice Interaction Integration (Q5):</p> <ul style="list-style-type: none">• T-statistic: 5.107• P-value: 0.00006259• Interpretation: Voice interaction integration is significantly well-received, with a mean rating indicating strong approval and effective integration within the interface.
<p>3. Car Mode Transition Smoothness (Q6):</p> <ul style="list-style-type: none">• T-statistic: 4.659• P-value: 0.000171• Interpretation: The smoothness of transitioning in and out of Car Mode is rated significantly above neutral, affirming that users found this feature smooth and enhancing the user experience.
<p>4. Background Screen Adaptation Usefulness (Q7):</p> <ul style="list-style-type: none">• T-statistic: 1.926• P-value: 0.06921• Interpretation: While the mean rating for background screen adaptation usefulness is above neutral, this result is not statistically significant at the 0.05 level, indicating a need for further evaluation or enhancement in this area.

Figure 13.3—T-test