

Infotainment System Project Review



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Challenge:

How can we help drivers navigate through their busy lives and the road?

Timeline:

March 7 2022 - May 20 2022

Skills:

Interaction Design, Sketching, Research, Interviewing, Usability Testing, and Prototyping

Team:

Sarah Cianciola, Joseph Sacco, and Katie Venzera

Project Overview:

Drivers will be able to use touch and physical controls to navigate through this infotainment system to be able to accept/reject phone calls, listen to a text message, change the source of the audio, turn on the A/C, and start a navigation route. (Although this was mainly a group project, these parts were completed individually: Key Level Modeling, heuristic evaluation, sketches, and product launch site).

Process:

Formative Research

Desk Research using Key Level Modeling and Heuristic Evaluation

By testing the PCM infotainment system on its ability to complete the tasks of: accept/reject phone calls, listen to a text message, change the source of the audio, turn on the A/C, and start a navigation route,

Heuristic Evaluation I learned:

- The tasks lack error prevention
- There are little to no shortcuts in the system and there is only one golden path
- Changing the source on the audio is extremely challenging especially because of the lack of visibility, real-world language, and recognition over recall

Key Level Modeling I learned:

- Listening to a text message was very complex, taking 6.4 seconds and 4 total “clicks”
- Reject phone calls took 1.6 seconds and 1 total “click”

- Start navigation took 1.6 seconds and 1 total “clicks”
- Change the source of the audio took 4.8 seconds and 3 total clicks

User Interviews

We conducted 5 interviews with current infotainment system users and 5 interviews with potential infotainment system users (users who can drive but do not drive a car with an infotainment system). We then synthesized the data and discovered that our current user population was mainly non-tech-savvy middle-aged adults which posed an interesting challenge for us, which left our potential user population to be young, tech-savvy adults that mainly could not afford cars with infotainment systems.

Personas

Primary Current User – Older Adult (First Persona)

Secondary Current User – Young Adult (Second Persona)

Potential User – Younger Adult (Third Persona)

Potential User – Younger Adult (Fourth Persona)



"I want this system to work for me, not for me to work for the system."

Karen Smith

-  Female, 55
 -  Milwaukee Suburbs
 -  Master's Degree
 -  Business Manager

Bio & Motivations

Suburban working mom and wife, who drives an SUV to carry her 3 children and dogs in her back seats. She lives and drives in the Milwaukee suburbs. She drives her children to school and then drives to work every day. Her SUV often is the car used primarily to drive as a family. She often has difficulties getting her children out of bed and ready to start their day. Her husband is also very busy with work and normally leaves before the rest awake, leaving her to do it herself.

Behaviors

- Scrambling to put on the right radio station to please her children
 - Gets frustrated with the system, she often settles on leaving it where it is or not using it at all
 - Feel like the system is too complex and a waste of her time

Tech Proficiency



Needs



Goals



Challenges

- Setting the clock
 - Having to press many buttons to complete tasks like finding car information
 - Complexity of the infotainment system, not very tech-savvy



"I seek technology that can keep up with my pace and needs."

Tom Benz

- 👤 Male, 19
- 📍 Sturgeon Bay, WI
- 📖 Undergrad
- 💼 Full-time student

Bio & Motivations

Born and raised in Sturgeon Bay and currently based in MKE. His family consist of a mother, father, 2 older sisters and a dog. During summer, Tom often takes speedy-fast long solo drives throughout his city to destress from work. He's currently on-track for a C.S. Major as a Sophomore at MSOE. To get energy for his 8 AM classes, he start his day with 2 cups of his self-made French Press coffee. Tom is always busy aside from academics, with his involvement with Triangle, a Fraternity, where he drives to twice a week.

Behaviors

- Uses phone to play music via Bluetooth
- Never uses the car's built-in phone, gets frustrated with the system's complexity
- Does not use car's navigation system, instead uses his phone

Tech Proficiency



Needs



Goals

- Putting the car in curse control
- Pressing several buttons to view car's information
- System keeps the last window on display- never goes back to the home screen
- Bluetooth connectivity takes too long

Challenges



"I am content with what I have ..."

Katie Jones

- █ Female, 20
- █ Milwaukee, WI
- █ Undergrad
- █ Full-time Student

Bio & Motivations

Kaite is a student and does not have extra money to spend on many features. She is used to only playing music with her Aux cord and radio. Katie is unaware of a lot of the new features that infotainment systems have to offer, and she is very content with minimal features.

Behaviors

- Uses an Aux cord to play her music
- Very tech-savvy and would be motivated to learn a new system because she is unaware of a lot of the new features infotainment systems have
- Looking for a budget-friendly car

Tech Proficiency



Needs



Goals



Challenges

- Affordability, many infotainment systems are out of her budget
- Only familiar with using Aux and radio features



"I enjoy the extra functionalities, without having to rely on them..."

Taylor Harris

- 👤 Female, 20
- 📍 Milwaukee, WI
- 📖 Undergrad
- 💼 Full-time student

Bio & Motivations

Taylor is a full-time student at Marquette University in Milwaukee Wisconsin, and she is currently majoring in childhood education. She normally walks around due to living on campus, but she does share a car with her long-time boyfriend. She often rides with him to go get food, study off-campus and go out. Although she does not own her own car with an infotainment system she is tech-savvy and could use one fairly effortlessly.

Behaviors

- Flipping through hip-hop & pop radio stations
- Gets frustrated with her boyfriend who changes the volume of her song
- Her tech-savviness helps her use the system with few issues

Tech Proficiency



Needs



Goals



Challenges

- Wants to play her own music playlists, but there is no auxiliary port
- Does not have her own car, always using different cars
- Has to resort to using the navigation on her phone because the system is not capable of supporting navigation

Use Scenarios

	Primary Persona Use Scenarios	Primary Persona Requirements
Switching Modalities; Switch audio to nav and end nav	<p>Karen is trying to drop her kids off on their first day of school and wants to know what the traffic is like for this drive, so they are not late. So, she turns off the music that her kids enjoy listening to and instead switches to navigation. Then once she drops the kids off at school, she stops the navigation and starts listening to her favorite radio station.</p>	<p>This system shall be able to be changed between FM and AM radio using FM and AM toggle on the infotainment system screen UI in under 3 taps.</p>
Using radio/media; Switching from AM to FM radio	<p>On her way to her weekly Sunday morning Peloton class, Karen wants to switch off her morning news and get some energy with the pop music station before she goes into her class, so she switches from the AM news to an FM radio station.</p>	<p>Go to Audio to Navigation-Voice The user shall be able to hit the voice command button on the steering wheel to activate the natural language commands that will switch between listening to audio and start using the navigation, all through natural voice commands in approximately 5-15 seconds depending on the length of the verbal command with 1 initial button tap to activate the voice system.</p> <p>Go to Audio to Navigation-touch The user shall be able to use tabs on the top of the infotainment system UI to switch between audio and navigation under 3 taps.</p> <p>End Navigational Route-touch The user shall be able to hit a red button on the infotainment system's screen UI to end a navigational route in 1 tap.</p>

		<p><i>End Navigational Route-voice</i></p> <p><i>The user shall be able to hit the voice command button on the steering wheel to activate the natural language commands to end the navigation route all through natural voice commands in approximately 5-15 seconds depending on the length of the verbal command with 1 initial button tap to activate the voice system.</i></p>
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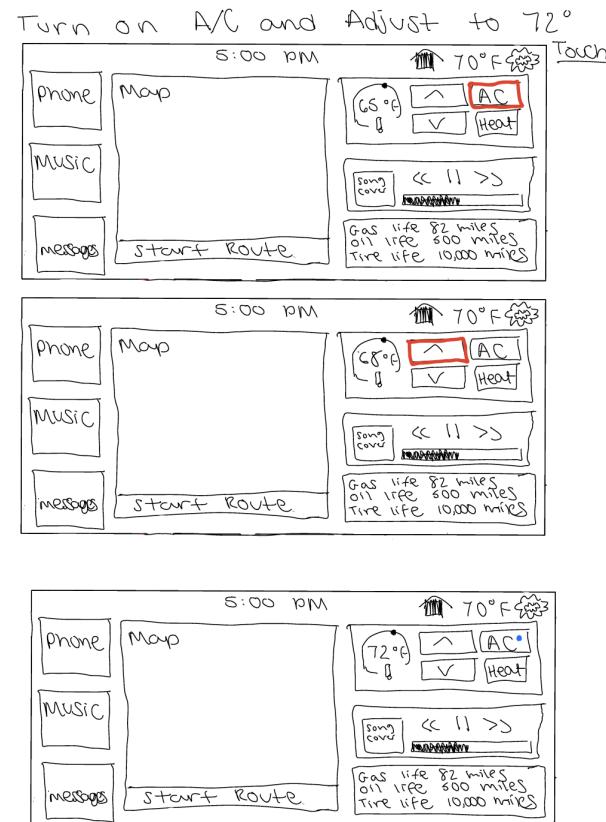
<p>Using the phone; reject and incoming call; listen to the text message</p>	<p>We find Karen in a rush to get from work to her doctor's appointment on time, and back to work before her break is over. However, on her way to the appointment, she is on the phone with her husband, but then her boss calls to check the status of her team's progress report for their next deal. She rejects the call from her boss but then uses voice commands to hear the message back from her boss.</p>	<p>Reject Incoming Call-touch For all phone calls the infotainment system screen shall simultaneously display the calling name (if inputted in the user's contacts) and number on the screen as well as read out the name and number of the caller, immediately when the phone rings. There shall be a hang up button and an accept button with iconography on the infotainment system's screen UI and the user shall be able to complete this task in one tap.</p> <p>Reject Incoming Call-voice For all phone calls the infotainment system screen shall simultaneously display the calling name (if inputted in the user's contacts) and number on the screen as well as read out the name and number of the caller, immediately when the phone rings. The user shall be able to hit the voice command button on the steering wheel to be able to use natural language commands that will allow them to say accept/reject phone calls through natural voice commands in approximately 5-15 seconds depending on the length of the verbal command with 1 initial button tap to activate the voice system.</p> <p>Listen to a Text Message- Immediately after a text is received the system will read aloud the text message to the user, this will be done automatically, within 1-3 seconds.</p> <p>For past text messages the user shall be able to hit the voice command button on the steering wheel to be able to use natural language commands that will allow them to listen to a past message through</p>
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		<i>natural voice commands the user chooses in approximately 5-15 seconds depending on the length of the verbal command with 1 initial button tap to activate the voice system.</i>
Adjust Climate Control; Turn on AC and adjust to 72 degrees	<p>After Karen's Peloton class she likes to turn on the climate control and set the air conditioning to 72 degrees to keep her cool on the drive home.</p>	<p>Using Controls- <i>The user shall be able to reach and touch the A/C button under the infotainment system's screen and an LED light will appear when the A/C is activated within 1 tap. (This will simply turn on the A/C to the temperature that was last used)</i></p> <p><i>The user shall be able to reach for the up and down arrows under the infotainment system's screen next to the A/C button to be able to adjust the temperature to 72 degrees and will receive immediate feedback with a small display with the temperature degree on it and the LED light on the A/C button will lite if it not already, the number taps required are variable depending on the current temperature. (The user shall not have to press the A/C button if they touch the arrows first)</i></p> <p>Using Voice- <i>The user shall be able to hit the voice command button on the steering wheel to be able to use natural language commands that will allow them to turn on the A/C via voice and the same LED light will appear under the infotainment system's screen after activation is complete in approximately 5-15 seconds depending on the user's speech speed with 1 initial button tap to activate the voice system.</i></p>

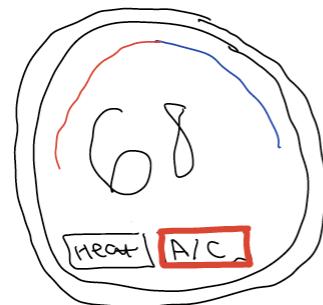
		<p><i>The user shall be able to hit the voice command button on the steering wheel to be able to use natural language commands that will allow them to verbally adjust the temperature to 72 degrees through natural voice commands in approximately 5-15 seconds depending on the user's speech speed with 1 initial button tap to activate the voice system.</i></p>
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Sketches

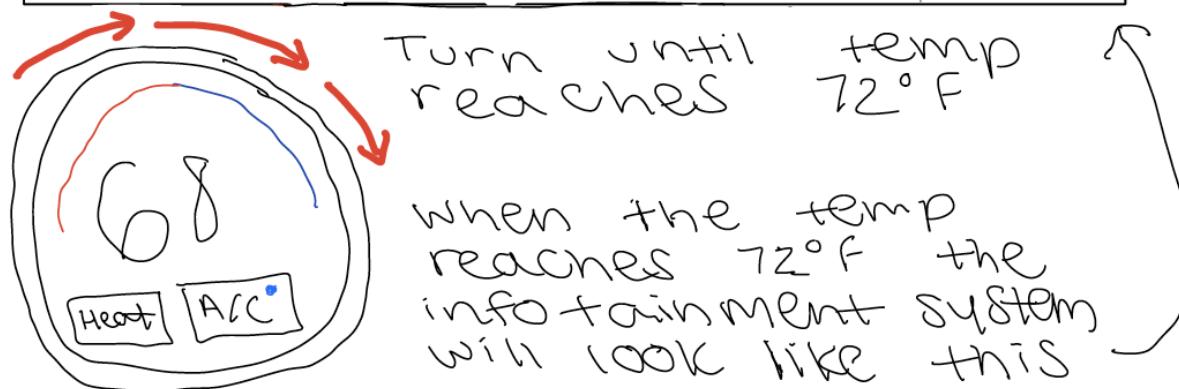
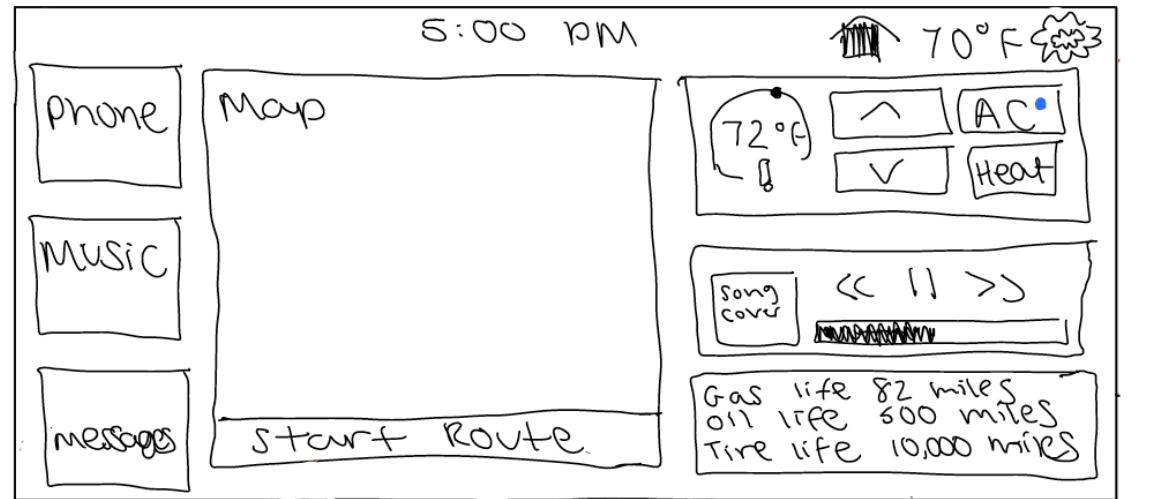
Next I sketched out some ideas based on our personas' needs to understand some of the possible touch interactions. Below is a sample of the sketches for the turning on the A/C feature.



Turn on A/C and Adjust to 72°
controls



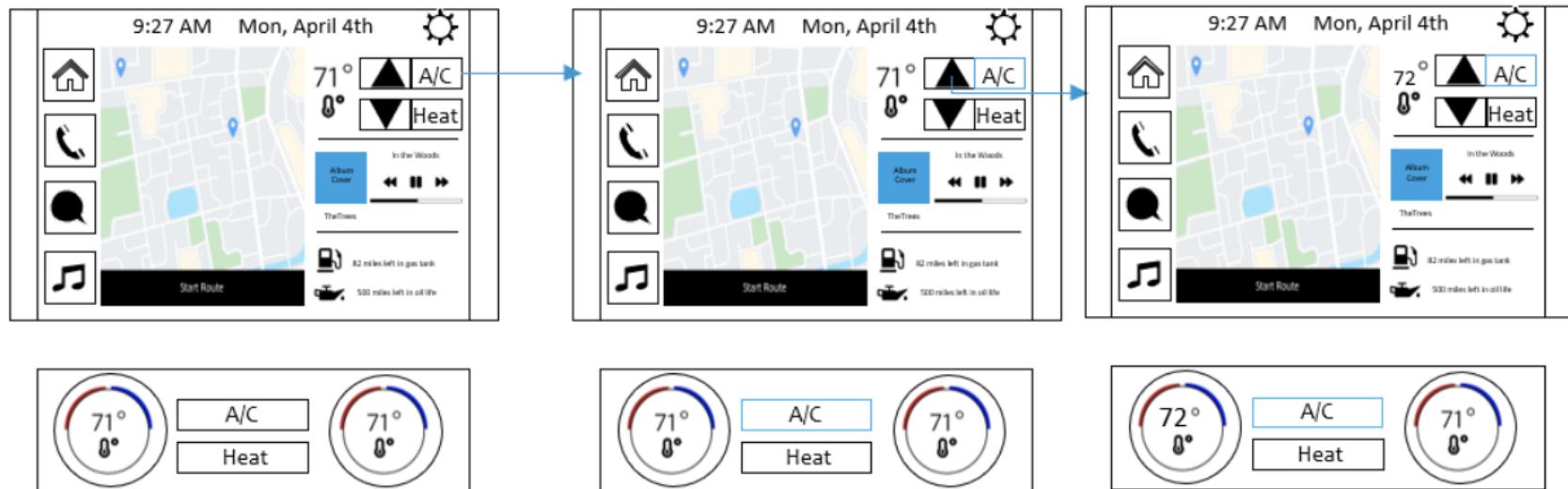
Knob - below infotainment
System screen



Interaction Map

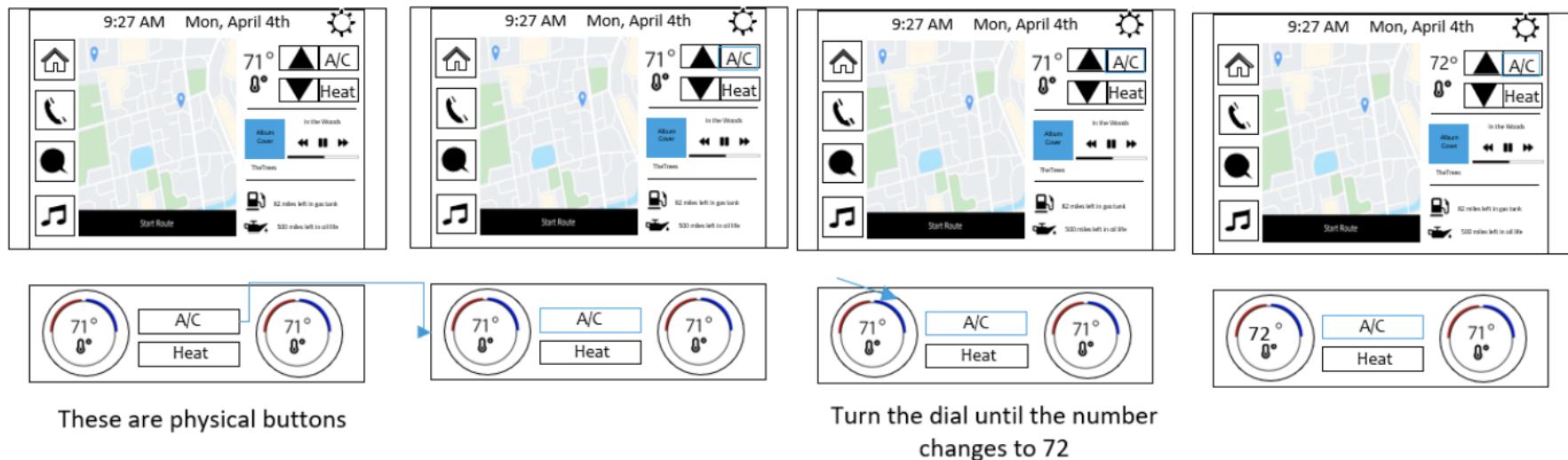
Then we collaborated and created a medium fidelity interaction map based on our individual sketches, in which we drew elements from everyone's sketches for this medium fidelity version. Below is a sample of the sketches for the turning on the A/C feature.

Touch



The touch controls only adjust
the drivers controls (left
control) have to use physical
controls to adjust passenger
side

Controls



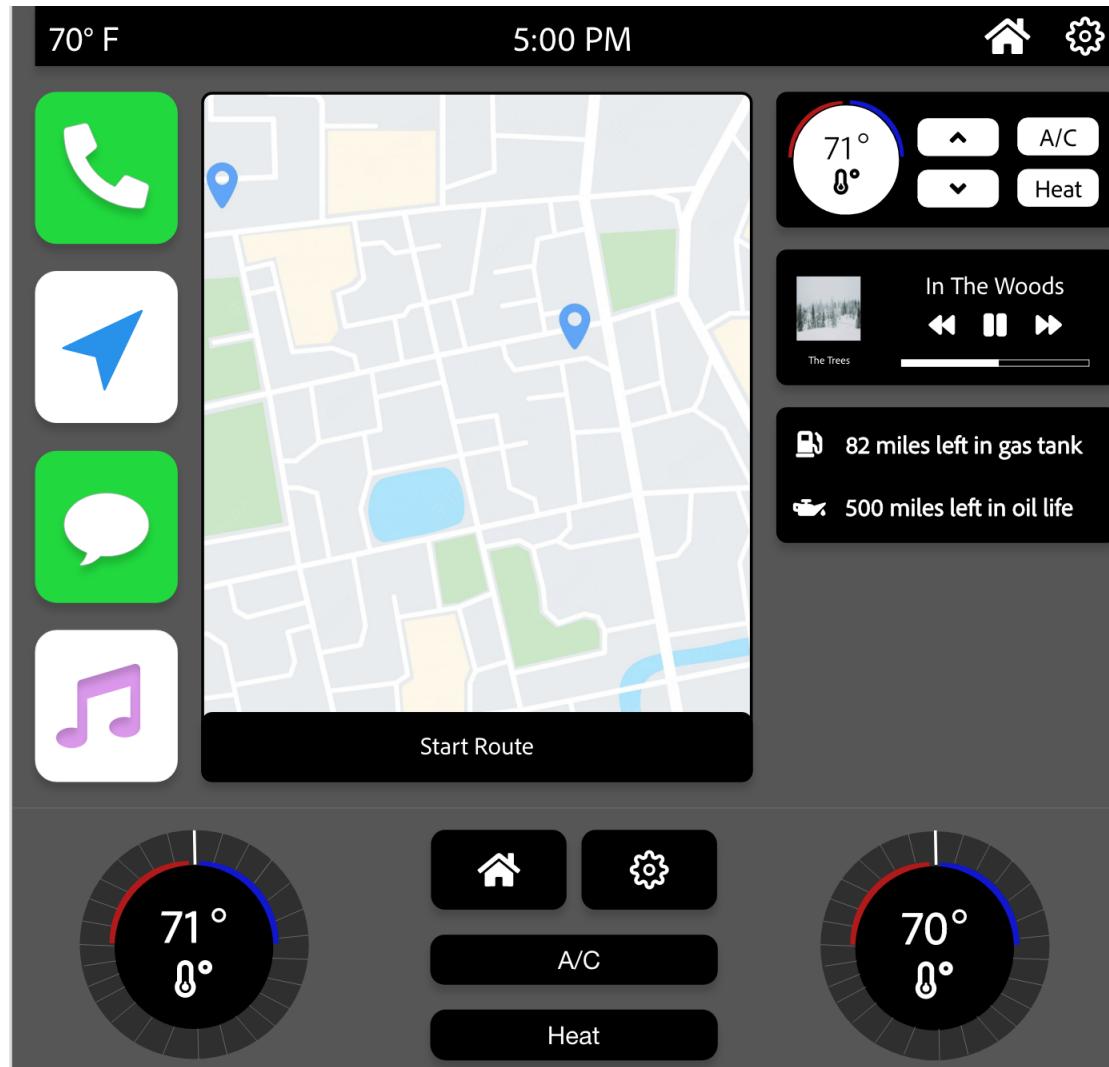
Final Prototype:

Link: <https://xd.adobe.com/view/f2e27e42-88ff-40ce-ad1b-9d3fdefbbfce-a7b1/>

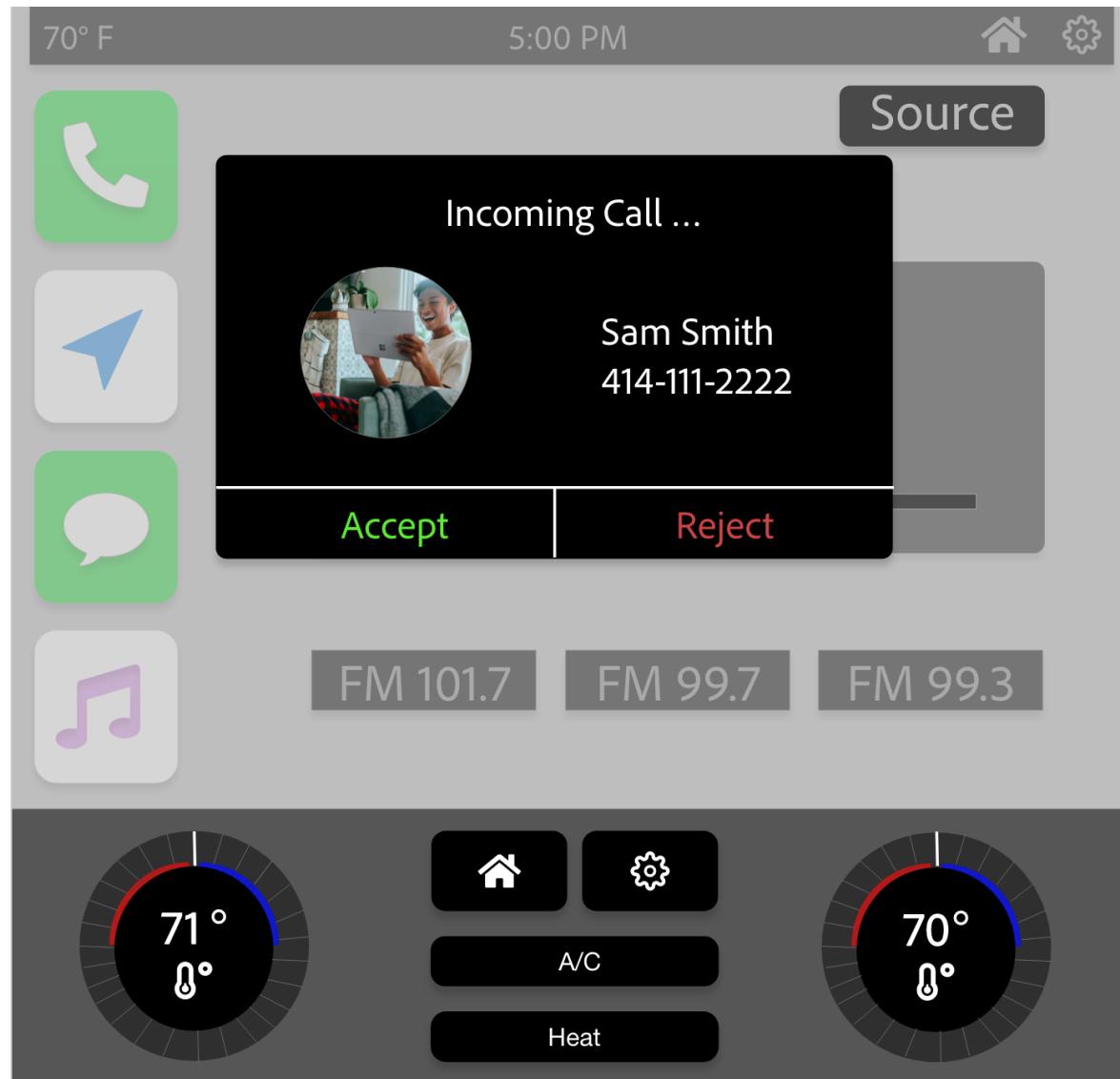
Home Screen

Audio Screen

Navigation Screen



Incoming Call Screen



Incoming Text Message Screen

Settings Screen



Usability Testing Findings and Next Steps for Improvements:

Findings

In our results, we found our user's interaction time to complete a task was longer than anticipated, based on our calculation KLM. Once we prefaced our users to use "Enter" (now renamed to Select) to initiate an interaction, their interaction time to complete a task decreased. Watching our users interact with the infotainment system, we realized how the enter key created extra button pressing.

Insights

From analyzing our results, we found our users' mental model regarding functions differed from what we prototyped. This infotainment system's function and design felt foreign for some users as it was not intuitive. However, our users expressed that once they learned the system, it was easier to understand, but the users thought there was a learning curve to the system. The "Enter" (now renamed to Select) key to make the highlight appear was not intuitive and this played a significant role in why our users' interaction time to complete a task was longer. Another factor, our users noted was their surprise regarding how it took them longer to complete a task than expected when using physical buttons. Another thing our users mentioned was their confusion about why there is a two-button method for selecting an item on the screen. In addition, users were confused regarding if the icons at the top right were touchable or not for the touch control user cases.

In the usability study, we learned that our users generally preferred to use touch controls over the physical ones because it was fewer clicks/movements. However, the temperature controls are normally used through their physical buttons in infotainment systems, especially when they do not have touch controls for that. It seems to stop being about conditioning with more experienced drivers who are not used to that much technology.

The prototype was usable for the interviewees, as our prototype was fully developed at the time of conducting the interviews, since we made it our goal to have it fully-functional beforehand. Our prototype provided customization, a few discoverable features, and multiple ways to complete a task. Our SUS scores were: 80, 85, 25, 30, 75, and 72.5, with an average of 61.25—this indicated our prototype is overall usable. However, there are opportunities to improve our prototype. We were able to learn from the individuals who gave the lower SUS scores since they thought there were many improvement opportunities.

Improvements

Some improvements we made to the design from the usability study were to create larger buttons/button icons so the user knows what can be pressed. We also grouped the icons that were touchable and information like the Time and Temperature to also help the user know what features are clickable.

Some improvements we made to the design were to create larger buttons/button icons so the user knows what can be pressed. We also grouped the icons that were touchable and the information like the Time and Temperature to also help the user know what

features are clickable. We decided to add icons to our Source button page after it was brought to our attention that it was only words and no visuals, which would be important to promote accessibility. Then we also added a Home icon to the steering wheel and rearranged the buttons on the steering wheel accordingly to accommodate for the Home button. Finally, the last change we made was thickening the lines on the highlight for the physical controls to make the highlight more pronounced.

We also noticed that we had an “Enter” and a “Select” button which is the same job but were in different spots and not labeled the same, making it seem to the user that they have different functionalities. We therefore decided to remove the one on the center console near our physical temperature control and make the button that said “Enter” on the steering wheel now say “Select”.

Next, we also changed the look of the Home button on the steering wheel to be larger and clearer for our users to see, as well as adding the apps to the Home screen for audio to increase the consistent use of those applications being displayed across all screens, which required the moving of other elements on these screens as well. Finally, we moved the top icons for certain groups based on if they were clickable or not, so the Time and Temperature are separate from each other as well as the Settings icon and Home buttons.

