

## **UX Product Management**

Week 4: Research Plan

Carlos Zuniga

February 6th, 2024

### **SCHEDULE**

Here's a breakdown of scheduling three to five participants to meet at an EVGO location or an auto manufacturer charging station over the next three weeks:

#### **Week 1:**

##### **Participant 1:**

**Date:** Tuesday, [Date]

**Time:** 10:00 AM

**Location:** EVGO Station (Specify Address) or Auto Manufacturer Charging Station

**Purpose:** Gather feedback on user experiences and pain points with current charging infrastructure.

#### **Week 2:**

##### **Participant 2:**

**Date:** Thursday, [Date]

**Time:** 2:00 PM

**Location:** EVGO Station (Specify Address) or Auto Manufacturer Charging Station

**Purpose:** Discuss user preferences and needs for interface design and functionality.

##### **Participant 3:**

**Date:** Saturday, [Date]

**Time:** 11:00 AM

**Location:** EVGO Station (Specify Address) or Auto Manufacturer Charging Station

**Purpose:** Explore charging habits, usage patterns, and expectations for future charging infrastructure.

### **Week 3:**

#### **Participant 4:**

**Date:** Monday, [Date]

**Time:** 3:00 PM

**Location:** EVGO Station (Specify Address) or Auto Manufacturer Charging Station

**Purpose:** Collect feedback on proposed interface design concepts and gather suggestions for improvement.

#### **Participant 5:**

**Date:** Wednesday, [Date]

**Time:** 9:00 AM

**Location:** EVGO Station (Specify Address) or Auto Manufacturer Charging Station

**Purpose:** Conduct a follow-up discussion to address any remaining questions, gather additional insights, and finalize requirements.

Ensure to confirm the specific EVGO station or auto manufacturer charging station location with each participant and provide any necessary details or instructions for the meeting. Additionally, I'll adjust the dates and times as needed to accommodate participants' availability.

### **DATA INTERPRETING**

Interpreting and consolidating the data gathered from my user research is a critical step in the design process. Here are several approaches I'll consider to interpret and consolidate the data effectively:

#### **Thematic Analysis:**

Thematic analysis involves identifying recurring themes, patterns, and trends within the data. It entails systematically coding the data to categorize information into themes or topics.

#### **Steps:**

- Review all data collected, including interview transcripts, survey responses, and observational notes.
- Code the data by identifying key concepts, ideas, or sentiments.
- Group related codes into overarching themes or categories.

- Analyze and interpret the themes to identify insights and implications for the design.

### **Affinity Diagramming:**

Affinity diagramming is a visual method for organizing and synthesizing qualitative data into related groups or categories. It helps uncover relationships and connections between different pieces of information.

#### **Steps:**

- Write each data point (e.g., quotes, observations) on sticky notes or index cards.
- Group related data points together based on common themes or relationships.
- Arrange the grouped data points into clusters to identify patterns and connections.
- Analyze the clusters to draw conclusions and insights.

### **Persona Development:**

Persona development involves creating fictional representations of typical users based on the data collected. Personas help humanize the user data and provide a clear understanding of users' needs, goals, and behaviors.

#### **Steps:**

- Identify common characteristics, behaviors, and attitudes among users.
- Create distinct personas that represent different user segments or archetypes.
- Populate each persona with details such as demographics, goals, motivations, pain points, and preferred interactions.
- Use personas to guide design decisions and ensure solutions are tailored to specific user needs.

### **Journey Mapping:**

Journey mapping visualizes the user experience over time, from initial engagement to completion of a task or goal. It helps identify touchpoints, pain points, and opportunities for improvement throughout the user journey.

#### **Steps:**

- Outline the key stages or steps of the user journey (e.g., awareness, consideration, usage).
- Plot user interactions, emotions, and pain points at each stage of the journey.
- Identify moments of delight and frustration to inform design enhancements.
- Use the journey map to prioritize design improvements and optimize the overall user experience.

### **Quantitative Analysis (Optional):**

If applicable, complement qualitative data analysis with quantitative analysis to quantify user behaviors, preferences, or satisfaction levels. This could involve analyzing survey responses, usage metrics, or other quantitative data sources.

#### **Steps:**

- Aggregate and analyze quantitative data to identify trends, correlations, or statistical significance.
- Compare quantitative findings with qualitative insights to validate findings and gain a comprehensive understanding of user behavior.
- Use quantitative data to prioritize design decisions and measure the impact of design changes over time.

#### **Iterative Refinement:**

Iteratively refine your interpretations and conclusions based on ongoing analysis and feedback. Continuously validate your findings through additional user research and testing to ensure the accuracy and relevance of your insights.

I'll approach or combine a few approaches that best align with your research objectives, data types, and project constraints. Each method offers unique benefits for uncovering insights and informing design decisions, ultimately leading to more effective and user-centered solutions.

## **DATA REPRESENTATIONS**

These data representations provide visual and narrative insights into user behaviors, needs, pain points, and interactions within the charging ecosystem. They serve as valuable tools for informing design decisions, prioritizing features, and aligning stakeholders around user-centric solutions.

#### **Personas:**

##### **Persona 1: Cost-Conscious Commuter**

**Description:** A 35-year-old professional who commutes daily to work in their electric vehicle. They are price-sensitive and prioritize affordable charging options.

**Goals:** Minimize charging costs, and find convenient charging locations.

**Pain Points:** High pricing, and limited availability of charging stations.

**Persona 2:** Tech-Savvy Enthusiast

**Description:** A 45-year-old technology enthusiast who is passionate about electric vehicles. They value advanced charging technology and seamless user experiences.

**Goals:** Access fast-charging capabilities, and integrate with smart devices.

**Pain Points:** Unreliable charging infrastructure, and slow charging speeds.

**Journey Map:**

**Stage:** Planning for Charging

**Touchpoints:** Searching for charging stations online, reviewing pricing and availability.

**Pain Points:** Limited station locations, and unclear pricing information.

**Stage:** Charging at the Station

**Touchpoints:** Arriving at the station, initiating charging session.

**Pain Points:** Long wait times, and difficulties with payment or authentication.

**Stage:** Post-Charging Experience

**Touchpoints:** Reviewing charging session details, and providing feedback.

**Pain Points:** Billing discrepancies, lack of post-session support.

**System Map:**

**Elements:** User (EV owner), Charging Station, Charging Network Provider, Mobile App.

**Relationships:** The user interacts with the mobile app to find and access charging stations. Charging stations are managed by the provider and connected to the network for billing and monitoring.

**Ecosystem Map:**

**Components:** EV Owners, Charging Infrastructure Providers, Electric Vehicle Manufacturers, Government Agencies.

**Interactions:** EV owners rely on charging infrastructure provided by providers, who collaborate with manufacturers to support EV adoption. Government agencies may provide incentives or regulations to promote charging infrastructure development.

### **Scenarios:**

#### **Scenario 1:** Cost-Conscious Commuter

**User Story:** As a cost-conscious commuter, I want to find the most affordable charging station near my workplace, so I can minimize my charging costs.

#### **Scenario 2:** Tech-Savvy Enthusiast

**User Story:** As a tech-savvy enthusiast, I want to access fast-charging capabilities using my smartphone, so I can charge my EV quickly during road trips.

## **CUSTOMER SEGMENTS**

Based on the personas and user characteristics identified in my research, my customer segments will be categorized into distinct groups based on shared traits, behaviors, and needs. Here are the customer segments identified from the personas and user research:

### **Cost-Conscious Commuters:**

**Description:** EV owners who prioritize affordability and cost-effectiveness when it comes to charging their vehicles.

#### **Characteristics:**

- Price-sensitive
- Regular commuters with predictable charging needs
- Seek out charging options with lower costs

#### **Needs:**

- Affordable charging options
- Convenient access to charging stations along commuting routes
- Clear pricing information and transparency

### **Tech-Savvy Enthusiasts:**

**Description:** EV owners who are enthusiastic about technology and value advanced features and capabilities in charging infrastructure.

**Characteristics:**

- Technology enthusiasts
- Interested in innovative charging solutions
- Willing to invest in high-tech charging options

**Needs:**

- Fast-charging capabilities
- Integration with smart devices and platforms
- Seamless user experience with advanced features

**Environmental Advocates:**

**Description:** EV owners who prioritize sustainability and environmental responsibility in their lifestyle choices.

**Characteristics:**

- Environmentally conscious
- Supportive of renewable energy and green initiatives
- Seek out eco-friendly charging options

**Needs:**

- Access to charging stations powered by renewable energy sources
- Participation in carbon offset programs
- Information on the environmental impact of charging choices

**Convenience-Seeking Professionals:**

**Description:** EV owners with busy lifestyles who prioritize convenience and efficiency in their charging experience.

**Characteristics:**

- Busy professionals with demanding schedules
- Value time-saving features and services

- Willing to pay for convenience

**Needs:**

- Access to fast-charging options
- Seamless user experience with minimal wait times
- Integration with navigation systems for easy route planning

**Fleet Operators:**

**Description:** Businesses or organizations that manage fleets of electric vehicles for commercial purposes.

**Characteristics:**

- Manage multiple EVs for business use
- Require efficient and cost-effective charging solutions
- Seek out solutions that can scale to accommodate fleet charging needs

**Needs:**

- Fleet management tools for monitoring charging activities
- Bulk charging options for multiple vehicles
- Integration with business operations and accounting systems

These customer segments represent distinct groups of EV owners with unique characteristics, preferences, and needs. By understanding and targeting these segments effectively, I can tailor the charging infrastructure and services to better meet the diverse needs of the customer base.

## **VALUE PROPOSITIONS**

To effectively address the needs and preferences of each customer segment, it's essential to develop tailored value propositions that resonate with their unique characteristics and priorities. Here are value propositions for each identified customer segment based on their needs:

**Cost-Conscious Commuters:**

- Value Proposition: Affordable and Convenient Charging Solutions
- Offer competitive pricing for charging sessions.
- Provide discounts or loyalty rewards for frequent users.
- Ensure convenient access to charging stations along commuting routes.



- Tech-Savvy Enthusiasts:
- Value Proposition: Advanced and Innovative Charging Technology
- Offer fast-charging capabilities to minimize wait times.
- Provide integration with smart devices and platforms for seamless user experience.
- Implement cutting-edge features such as bi-directional charging or vehicle-to-grid integration.

**Environmental Advocates:**

- Value Proposition: Sustainable and Eco-Friendly Charging Options
- Power charging stations with renewable energy sources whenever possible.
- Offer carbon offset programs to mitigate environmental impact.
- Provide information on the environmental benefits of using electric vehicles and charging with renewable energy.

**Convenience-Seeking Professionals:**

**Value Proposition:**

- Seamless and Time-Saving Charging Experience
- Ensure fast charging options with minimal wait times.
- Integrate with navigation systems to facilitate route planning and charging station discovery.
- Offer premium amenities such as reserved parking or concierge services for added convenience.

**Fleet Operators:**

**Value Proposition:**

- Scalable and Efficient Fleet Charging Solutions
- Provide bulk charging options for multiple vehicles to optimize efficiency.
- Offer fleet management tools for monitoring charging activities and optimizing operations.
- Implement billing and reporting features tailored to business needs for cost management and accountability.

These value propositions highlight the key benefits and advantages that each customer segment can expect from using your charging infrastructure and services. By aligning the offerings with the specific needs and priorities of each segment, I can effectively attract and retain customers while maximizing the value delivered to your target audience.

## **CUSTOMER PROBLEMS**

Here are the integration fields placed into the value proposition statements for each user participant segment:

### **Cost-Conscious Commuters:**

**Customer:** Test Hypothesis: Budget-Conscious Commuters

**Problem:** High charging costs and limited affordable options for daily commuting.

**Customer:** Test Hypothesis: Budget-Conscious Commuters

**User:** Electric vehicle owners who commute daily and prioritize cost-effective charging solutions.

**Payer:** Individuals or organizations paying for charging sessions.

**Value prop:** Test Hypothesis: Affordable and Convenient Charging Solutions

**Product:** Charging infrastructure with competitive pricing and convenient locations.

**Market Type:** Mass Market

### **Tech-Savvy Enthusiasts:**

**Customer:** Test Hypothesis: Tech-Savvy Enthusiasts

**Problem:** Limited access to advanced charging technology and seamless user experiences.

**Customer:** Test Hypothesis: Tech-Savvy Enthusiasts

**User:** Electric vehicle owners who are technology enthusiasts and seek innovative charging solutions.

**Payer:** Individuals or organizations investing in advanced charging capabilities.

**Value prop:** Test Hypothesis: Advanced and Innovative Charging Technology

**Product:** Charging infrastructure with fast-charging capabilities and smart device integration.

**Market Type:** Niche Market

### **Environmental Advocates:**

**Customer:** Test Hypothesis: Environmental Advocates

**Problem:** Lack of sustainable and eco-friendly charging options.

**Customer:** Test Hypothesis: Environmental Advocates

**User:** Electric vehicle owners who prioritize environmental sustainability in their charging choices.

**Payer:** Individuals or organizations willing to pay for environmentally friendly charging solutions.

**Value prop:** Test Hypothesis: Sustainable and Eco-Friendly Charging Options

**Product:** Charging infrastructure powered by renewable energy sources and carbon offset programs.

**Market Type:** Niche Market

**Convenience-Seeking Professionals:**

**Customer:** Test Hypothesis: Convenience-Seeking Professionals

**Problem:** Inconvenient charging experiences with long wait times and limited amenities.

**Customer:** Test Hypothesis: Convenience-Seeking Professionals

**User:** Electric vehicle owners with busy lifestyles who value convenience and efficiency.

**Payer:** Individuals or organizations seeking time-saving charging solutions.

**Value prop:** Test Hypothesis: Seamless and Time-Saving Charging Experience

**Product:** Charging infrastructure with fast charging options and premium amenities.

**Market Type:** Mass Market

**Fleet Operators:**

**Customer:** Test Hypothesis: Fleet Operators

**Problem:** Inefficient fleet charging solutions and lack of scalability.

**Customer:** Test Hypothesis: Fleet Operators

**User:** Businesses or organizations managing fleets of electric vehicles for commercial purposes.

**Payer:** Fleet managers or businesses investing in efficient fleet charging solutions.

**Value prop:** Test Hypothesis: Scalable and Efficient Fleet Charging Solutions

**Product:** Charging infrastructure with bulk charging options and fleet management tools.

**Market Type:** Business-to-Business (B2B) Market

These additions provide further context by specifying the customer segment, problem, user, payer, and market type for each value proposition, ensuring that they are aligned with the target user population and market needs.

Dear Participants,

Thank you for your participation in our user testing session aimed at refining the usability of electric vehicle (EV) charging vehicle interfaces for non-Tesla vehicles. Your insights are invaluable to our research, and we deeply appreciate your time and candid feedback.

**Study Objectives:**

The primary objective of this user testing was to evaluate and enhance the usability of non-Tesla EV charging vehicle interfaces. Specifically, we aimed to:

1. The primary objective of this user testing was to evaluate and enhance the usability of non-Tesla EV charging vehicle interfaces. Specifically, we aimed to:
2. Assess participants' overall experience when using EV charging interfaces to locate and access charging stations.
3. Evaluate the navigation and search functionality of EV charging interfaces in the context of finding available charging stations.
4. Understand participants' ability to identify functioning charging stations and the importance of real-time information in their charging decisions.
5. Identify any technical issues or interface errors that impacted participants' ability to locate and access charging stations.

**Data Usage and Confidentiality::**

We want to assure you that all data collected during the testing sessions will be treated with the utmost confidentiality. Your participation and responses will be anonymized, and no personally identifiable information will be shared or published.

The data obtained will be used solely for research purposes to improve the usability and user experience of non-Tesla EV charging interfaces. It will be securely stored and only accessible to the research team.

**Study Outcomes:**

Through your valuable feedback, we have gained insights into your experiences using EV charging interfaces. Your thoughts and opinions on navigation, search functionality, station availability, and technical issues were instrumental in achieving our study objectives.

**Improving Website Usability:**

The outcomes of this study will be carefully analyzed to identify pain points and areas for improvement in non-Tesla EV charging interfaces. By addressing the issues highlighted during testing, we aim to create a more intuitive and user-friendly experience for all EV owners.

**Appreciation:**

We genuinely appreciate your honest feedback and commitment to helping us enhance the usability of non-Tesla EV charging interfaces. Your input will guide our design decisions and drive improvements that benefit all users.

**Next Steps:**

Moving forward, our research team will analyze the data and develop actionable recommendations based on your feedback. We will prioritize your preferences and needs to ensure that our improvements align with your expectations.

**Contact Information:**

If you have any additional comments, suggestions, or questions, please feel free to reach out to our research team at [[czuniga@mica.ed](mailto:czuniga@mica.ed) | 424-218-9203].

Once again, we extend our gratitude for your participation and valuable insights. Your contribution will significantly enhance the usability of non-Tesla EV charging interfaces for all users.

Best regards,

Carlos Zuniga  
MICA - Human-Centered Design

Dear Participants,

We are thrilled to invite you to participate in our user testing session aimed at enhancing the usability of electric vehicle (EV) charging vehicle interfaces. Before you proceed with the testing, we kindly request you to read and agree to the following terms and conditions:

**1. Purpose of the Study:**

The primary objective of this user testing is to evaluate and improve the usability of EV charging vehicle interfaces for non-Tesla vehicles. Your feedback will be instrumental in identifying areas for enhancement and creating a more intuitive and user-friendly experience.

**2. Voluntary Participation:**

Your participation in this study is entirely voluntary, and you have the right to withdraw at any time without providing any reasons. Your decision to participate or withdraw will not affect your relationship with any affiliated entities.

**3. Data Confidentiality:**

All data collected during the user testing will be treated with strict confidentiality. Your participation will be anonymous, and no personally identifiable information will be associated with your responses.

**4. Data Usage:**

The data obtained from the user testing will be used solely for research purposes to improve the usability of EV charging vehicle interfaces. It will be analyzed and reported in aggregate form, without identifying individual participants.

**5. Recording Consent:**

The user testing sessions may be audio and/or video recorded for research purposes only. By agreeing to participate, you grant us permission to record and use these recordings during the analysis process.

**6. Non-Disclosure Agreement:**

As a participant, you agree not to disclose or share any confidential information you may learn during the user testing. This includes any proprietary information about the EV charging interfaces or affiliated entities.

**7. Use of Findings:**

The outcomes of the study will be used to identify areas for improvement in EV charging vehicle interfaces. Your feedback will be essential in shaping future design decisions and interface enhancements.

**8. Communication and Feedback:**

During the user testing, you are encouraged to provide honest feedback and opinions about your experience. We welcome any suggestions or comments that will help us better understand your needs as a user.

**9. Right to Privacy:**

Your privacy rights will be respected throughout the user testing process. We will not collect any personal information beyond what is necessary for research purposes.

**10. Agreement Confirmation:**

By participating in the user testing, you confirm that you have read and understood the terms and conditions outlined in this participant agreement. Your voluntary participation signifies your consent to take part in the study.

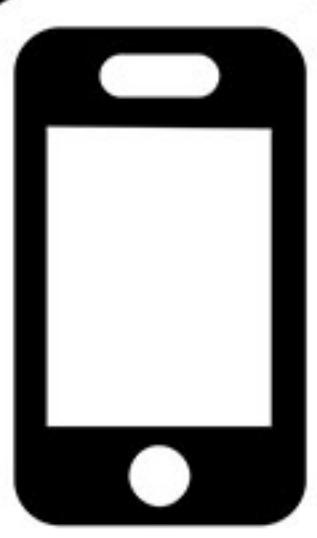
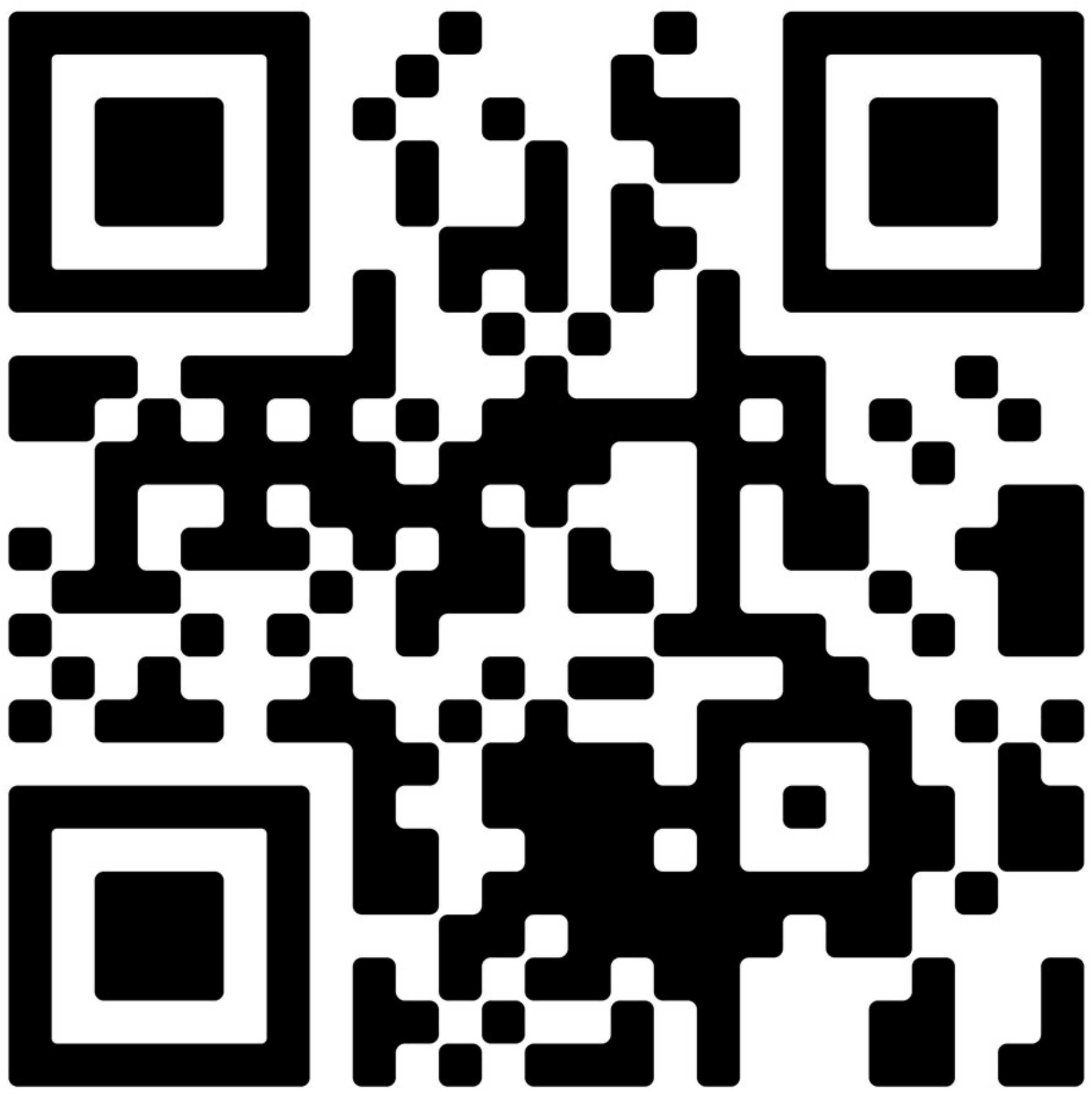
If you agree to these terms and wish to participate, please sign below:

Participant's Name: \_\_\_\_\_

Participant's Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Thank you for your cooperation and valuable contribution to our research. Your participation will play a significant role in improving the usability of EV charging vehicle interfaces for all users. If you have any questions or concerns, please contact our research team at [[czuniga@mica.ed](mailto:czuniga@mica.ed) | 424-218-9203].



SCAN ME



5

KEY CONCEPTS

IDEAS

SENTIMENTS

PAIN POINTS

**How to Search:** By accessing the built-in interface  
*Carlos Zuniga*

**How to Search:** Using Voice Commands  
*Carlos Zuniga*

**How to Search:** My Vehicle doesn't have a vehicle interface  
*Carlos Zuniga*

**Search Feature** Very Dissatisfied  
*Carlos Zuniga*

**Search Feature** Dissatisfied  
*Carlos Zuniga*

**Search Feature** Somewhat Dissatisfied  
*Carlos Zuniga*

**Search Feature** Neutral  
*Carlos Zuniga*

**Importance:** Very Important  
*Carlos Zuniga*

**Preferences & Amenities:** Theres amenities? What? Where?  
*Carlos Zuniga*

**Preferences & Amenities:** Now, I have a few favorite locations I go to, but again, it seem like everyone else has the same favorites. #FML  
*Carlos Zuniga*

**Preferences & Amenities:** I prefer locations with multiple charging stations. Most places only have 2-3 stations and 1-2 are not working. Leaving only station to use.  
*Carlos Zuniga*

**improvements:** For the BMW i4 interface, is kind low res, it lags, so speed up the interface. Simi-Complex, maybe simplify the interface.  
*Carlos Zuniga*

**improvements:** Being able to access Level 3 Superchargers.  
*Carlos Zuniga*

**improvements:** Yes, I would appreciated if these location can offer private bathrooms and/or Free WIFI.  
*Carlos Zuniga*

**improvements:** Adding a charging Station locator  
*Carlos Zuniga*

**improvements:** I would like to see if any charging stations are not working  
*Carlos Zuniga*

**improvements:** A Porsche charging infrastructure or a partnership with Tesla  
*Carlos Zuniga*

**improvements:** Add Netflix, Hulu, into the interface.  
*Carlos Zuniga*

**improvements:** Incorporate images, real-time information, add MORE station and locations  
*Carlos Zuniga*

**Useful or Valuable:** What I find most useful is that you have the option to use Waze navigation instead of Google Maps, but regardless in which platform you decide to utilize, you will only receive "Non-Real Time" information. It gives a basic break down of what the location should have available, if we were living in perfect world.  
*Carlos Zuniga*

**Useful or Valuable:** What I find most useful is that vehicle interface automatically pin-points the exact station that I need use to continue my trip.  
*Carlos Zuniga*

**Useful or Valuable:** Absolutely Nothing  
*Carlos Zuniga*

**Useful or Valuable:** I find it super inconvenient that I have a 30 min free session to use from my BMW i4 2 year free membership.  
*Carlos Zuniga*

**Useful or Valuable:** Having to use my mobile device to locate charging stations  
*Carlos Zuniga*

**Pain Points:** My Porsche does not come with a vehicle charging station interface  
*Carlos Zuniga*

**Pain Points:** I find it super inconvenient that I have a 30 min free session to use from my BMW i4 2 year free membership.  
*Carlos Zuniga*

**Pain Points:** Anguish and Displeasure  
*Carlos Zuniga*

**Pain Points:** Yes, not being able to check if the station is not working. I hate driving all the way there only to find out only 1 of 3 machines are working, and theres a line, 5 cars long.  
*Carlos Zuniga*

**Pain Points:** I want to rip my hair out sometimes  
*Carlos Zuniga*

**Pain Points:** Annoyance and Disappointment  
*Carlos Zuniga*

**Pain Points:** I want to blowup my car sometimes. Although I save money by driving electric. I hate having to wait 2-3 hours just to charge my fucking car.  
*Carlos Zuniga*

**Pain Points:** Frustration & Irritation  
*Carlos Zuniga*

THEME 1: BMW | GMC

THEME 1: BMW | GMC

THEME 3: PORSCHE

**Search Feature** Somewhat Dissatisfied  
*Carlos Zuniga*

**How to Search:** By accessing the built-in interface  
*Carlos Zuniga*

**Search Feature** Neutral  
*Carlos Zuniga*

**Importance:** Very Important  
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*Carlos Zuniga*



## **UX Product Management**

Week 6: Customer Problem Statement

Carlos Zuniga

February 27th, 2024

### **Basic Need**

The basic need is to improve the user experience of electric vehicle (EV) owners when accessing charging infrastructure. The current problem revolves around the lack of a unified, intuitive, and user-friendly charging interface, leading to frustration, inefficiency, and suboptimal utilization of EV charging stations.

This problem encompasses various aspects, including the disjointed nature of existing solutions, the absence of real-time data availability, and the challenges in integrating charging interfaces with diverse vehicle platforms and charging networks. It is essential to address this need to enhance the overall usability, accessibility, and convenience of EV charging infrastructure, thereby facilitating the widespread adoption and utilization of electric vehicles.

### **Desired Outcome**

The desired outcome of the EV charging vehicle interface project is to revolutionize the user experience of electric vehicle owners by providing a seamless, intuitive, and efficient interface for locating and accessing charging stations.

Qualitatively, the goal is to enhance user satisfaction and convenience, leading to increased adoption and utilization of electric vehicles. Quantitatively, the project aims to achieve metrics such as improved interface usability, reduced time spent searching for charging stations, increased usage of non-Tesla charging networks, and higher overall customer satisfaction scores.

### **All stakeholders stand to benefit from this outcome:**

- Electric vehicle owners will enjoy a more streamlined and hassle-free charging experience, leading to greater convenience and satisfaction with their electric vehicles.
- Electric vehicle manufacturers will benefit from increased customer loyalty and positive brand perception resulting from a superior charging interface.
- Charging infrastructure providers will experience higher utilization rates and increased revenue opportunities as more electric vehicle owners utilize their networks.
- Government and regulatory authorities will see progress toward sustainability goals and reduced greenhouse gas emissions as electric vehicle adoption increases.
- Software developers and interface designers will gain recognition and market credibility for their innovative solutions in the electric vehicle industry.
- Environmental groups and advocacy organizations will celebrate progress toward reducing reliance on fossil fuels and mitigating climate change impacts.

By addressing the industrywide challenge of fragmented and often confusing EV charging interfaces, the project aims to fill a critical gap in the market and catalyze further innovation and advancement in electric vehicle technology and infrastructure.

## **Justifying the Need**

Satisfying the need to improve the user experience of electric vehicle (EV) charging interfaces aligns with the strategic goals of various stakeholders involved in the electric vehicle ecosystem.

### **Electric Vehicle Manufacturers:**

- **Strategic Goal:** Enhance Customer Experience and Loyalty
- **Justification:** Improving the usability of EV charging interfaces directly contributes to enhancing the overall customer experience with electric vehicles. By providing a seamless and intuitive interface, manufacturers can strengthen customer loyalty, differentiate their brand, and increase repeat purchases of their EV models.

### **Charging Infrastructure Providers (EV Charging Networks):**

- **Strategic Goal:** Increase Utilization and Revenue
- **Justification:** A user-friendly charging interface encourages more frequent and efficient utilization of EV charging networks. By simplifying the process of locating and accessing charging stations, providers can increase customer satisfaction, drive higher usage of their networks, and generate additional revenue streams through increased charging sessions.

### **Government and Regulatory Authorities:**

- **Strategic Goal:** Promote Sustainable Transportation
- **Justification:** Improving the usability of EV charging interfaces supports government initiatives to promote sustainable transportation and reduce greenhouse gas emissions. By facilitating easier access to charging infrastructure, authorities can encourage greater adoption of electric vehicles, leading to cleaner air, reduced dependence on fossil fuels, and progress toward environmental sustainability goals.

### **Software Developers and Interface Designers:**

- **Strategic Goal:** Drive Innovation and Market Leadership
- **Justification:** Developing user-friendly EV charging interfaces presents an opportunity for software developers and interface designers to showcase their innovation and expertise in the electric vehicle industry. By creating intuitive and efficient solutions, developers can establish themselves as market leaders, attract new clients, and capitalize on the growing demand for innovative EV technologies.

### **Environmental Groups and Advocacy Organizations:**

- **Strategic Goal:** Advocate for Sustainable Practices
- **Justification:** Supporting initiatives to improve EV charging interfaces aligns with the goals of environmental groups and advocacy organizations to promote sustainable transportation solutions. By advocating for user-friendly charging experiences, these groups can accelerate the transition to electric vehicles, mitigate climate change impacts, and foster a more sustainable future for all.

In summary, addressing the need to enhance EV charging interfaces serves the strategic goals of stakeholders by improving customer satisfaction, increasing utilization of charging infrastructure,

promoting sustainable transportation practices, driving innovation, and advancing environmental stewardship.

### **Desired Benefits and Measurement Metrics for Stakeholders:**

#### **Electric Vehicle Manufacturers:**

Desired Benefits:

- Enhance customer satisfaction and loyalty.
- Increase sales of electric vehicles.

Measurement Metrics:

- Customer satisfaction scores and feedback surveys.
- Sales data and market share growth for EV models.

#### **Charging Infrastructure Providers (EV Charging Networks):**

Desired Benefits:

- Increase utilization of charging networks.
- Generate additional revenue streams.

Measurement Metrics:

- Charging session data (frequency, duration, etc.).
- Revenue generated from charging sessions and network usage fees.

#### **Government and Regulatory Authorities:**

Desired Benefits:

- Promote sustainable transportation and reduce greenhouse gas emissions.
- Advance environmental conservation efforts.

Measurement Metrics:

- Reduction in carbon emissions from transportation sector.
- Progress toward sustainability goals (e.g., percentage of electric vehicles on the road).

#### **Software Developers and Interface Designers:**

Desired Benefits:

- Establish market leadership and reputation for innovation.
- Attract new clients and business opportunities.

Measurement Metrics:

- Market recognition and industry awards.
- Growth in client base and project opportunities related to EV technology.

#### **Environmental Groups and Advocacy Organizations:**

Desired Benefits:

- Accelerate adoption of electric vehicles and sustainable transportation practices.
- Mitigate climate change impacts and promote environmental conservation.

Measurement Metrics:

- Increase in public awareness and support for electric vehicles.
- Progress toward sustainability goals (e.g., reduction in carbon emissions).

These desired benefits can be measured using both qualitative and quantitative metrics, depending on the nature of the stakeholder and their specific goals. By aligning the project's objectives with the strategic priorities of stakeholders, the initiative can deliver tangible outcomes that contribute to their success and further their mission or business objectives.

### **Contextualize the Problem - Critical**

In contextualizing the problem of improving EV charging interfaces, it's essential to explore past approaches and successes/failures in related sectors that may offer insights. Here are some approaches that have been tried and their analysis:

#### **Mobile Apps for Charging Network Navigation:**

- **Analysis:** Many charging infrastructure providers have developed mobile apps to help users locate and navigate to charging stations. While these apps offer convenience, they often lack integration with vehicle interfaces, leading to disjointed user experiences.
- **Comparison:** These apps provide a foundation for interface design but fall short in seamless integration with vehicle systems.

#### **Third-Party Navigation Systems Integration:**

- **Analysis:** Some electric vehicle manufacturers have integrated third-party navigation systems like Google Maps or Apple Maps into their vehicles, allowing users to search for charging stations along their route. However, these integrations may not always provide real-time data on station availability or compatibility with specific charging networks.
- **Comparison:** While these integrations offer broader navigation capabilities, they may not prioritize charging-specific features or provide a tailored user experience for electric vehicle owners.

#### **In-Vehicle Charging Interfaces:**

- **Analysis:** Tesla has set the standard with its in-vehicle charging interface, offering features like real-time Supercharger availability, automatic routing to nearby stations, and remote monitoring via the Tesla mobile app. However, non-Tesla electric vehicle owners often lack similar functionality and may rely on less integrated solutions.
- **Comparison:** Tesla's approach demonstrates the potential for seamless integration between vehicle systems and charging interfaces, highlighting the gap for non-Tesla electric vehicles.

### **Successes and failures in other sectors can also inform the conceptualization of the problem:**

**Augmented Reality (AR) in Retail:** The success of AR applications in retail, such as home improvement and clothing, demonstrates the value of immersive experiences in enhancing consumer confidence and driving purchasing decisions.

**Digital Payment Solutions:** The widespread adoption of digital payment solutions in various sectors showcases the importance of seamless and intuitive interfaces in facilitating transactions and enhancing user experiences.

**Internal constraints on implementing a solution may include:**

- Limited resources (financial, technical, and human) for research, development, and implementation.
- Organizational resistance to change or lack of prioritization for user interface improvements.
- Technical challenges in integrating charging interface systems with existing vehicle platforms and charging networks.

**External constraints may include:**

- Regulatory requirements and standards for electric vehicle charging infrastructure.
- Compatibility and interoperability challenges with diverse charging networks and vehicle models.
- Market competition and the need to differentiate from existing solutions while meeting user expectations.

Addressing these constraints requires a holistic approach that considers technological feasibility, market dynamics, regulatory compliance, and user needs/preferences. By leveraging insights from past approaches and successes/failures in related sectors, stakeholders can develop innovative solutions that address the unique challenges of improving EV charging interfaces.

**Customer Problem Statement**

The current state of electric vehicle (EV) charging interfaces presents a significant challenge for EV owners, charging infrastructure providers, and stakeholders across the electric vehicle ecosystem. Existing solutions, including mobile apps for navigation and in-vehicle charging interfaces, often lack seamless integration, real-time data availability, and user-centric design, resulting in frustration, inefficiency, and a suboptimal user experience.

The lack of a unified, intuitive, and user-friendly charging interface hinders the widespread adoption and utilization of electric vehicles, undermines efforts to promote sustainable transportation, and limits the potential of EV charging infrastructure investments. Without a viable solution in place, electric vehicle manufacturers, charging infrastructure providers, and regulatory authorities face ongoing challenges in achieving their strategic goals and fulfilling the evolving needs of electric vehicle owners.

**A viable solution to this problem would encompass the following key elements:**

1. **Seamless Integration:** A charging interface that seamlessly integrates with electric vehicles' onboard systems, providing real-time information on charging station availability, compatibility, and navigation.
2. **User-Centric Design:** An intuitive and user-friendly interface that prioritizes the needs and preferences of electric vehicle owners, enhancing their charging experience and overall satisfaction.
3. **Comprehensive Coverage:** A solution that offers comprehensive coverage of charging infrastructure networks, ensuring accessibility and usability across diverse geographic regions and charging networks.

4. **Technological Compatibility:** Compatibility with existing electric vehicle models, charging infrastructure systems, and industry standards, facilitating widespread adoption and interoperability.
5. **Regulatory Compliance:** Compliance with regulatory requirements and standards for electric vehicle charging interfaces, addressing safety, security, and usability concerns.
6. **Continuous Improvement:** A commitment to ongoing research, development, and refinement of the charging interface based on user feedback, technological advancements, and market trends.

**Achieving this solution would require significant resources, including:**

- **Research and Development:** Investment in research and development to design, prototype, and test the charging interface solution across diverse electric vehicle models and charging networks.
- **Technological Infrastructure:** Development of backend infrastructure, data systems, and software platforms to support real-time data integration, user authentication, and remote monitoring capabilities.
- **Collaboration and Partnership:** Collaboration with electric vehicle manufacturers, charging infrastructure providers, regulatory authorities, and other stakeholders to align goals, share resources, and drive industry-wide adoption of the charging interface solution.
- **User Engagement and Education:** Outreach efforts to engage electric vehicle owners, gather feedback, and educate users on the benefits and functionalities of the new charging interface, fostering adoption and acceptance.

In summary, the problem statement encapsulates the urgent need for a viable solution to improve electric vehicle charging interfaces, outlining the essential components, resource requirements, and strategic imperatives for addressing this challenge and advancing the electric vehicle industry's goals.

**Stakeholder Analysis**

**1. Electric Vehicle Manufacturers (EV OEMs):**

- **Category:** Key Players
- **Justification:** EV OEMs wield significant power and influence in the electric vehicle ecosystem. They have a high interest in the success of the initiative as it directly impacts the user experience of their vehicles. Their attitude is likely to be supportive, as a seamless charging interface enhances the value proposition of their EVs.

**2. Charging Infrastructure Providers (EV Charging Networks):**

- **Category:** Key Players
- **Justification:** Charging infrastructure providers hold considerable power as they control access to charging stations. They have a vested interest in the initiative's success as it drives utilization of their networks. Their attitude may vary depending on the compatibility and integration of the new interface with their existing systems.

**3. Government and Regulatory Authorities:**

- **Category:** Regulators

- Justification: Government and regulatory authorities have the power to shape policies and standards for electric vehicle charging infrastructure. They possess a high interest in promoting sustainable transportation solutions and may view the initiative favorably if it aligns with their environmental and regulatory goals.

#### **4. Software Developers and Interface Designers:**

- Category: Experts
- Justification: Software developers and interface designers possess expertise in developing user interfaces and software solutions. They have an interest in the initiative's success as it presents opportunities for innovation and market differentiation. Their attitude is likely to be supportive if the project aligns with their technical capabilities and creative vision.

#### **5. Environmental Groups and Advocacy Organizations:**

- Category: Advocates
- Justification: Environmental groups and advocacy organizations advocate for sustainable transportation and clean energy initiatives. They have a high interest in the success of the initiative as it contributes to reducing greenhouse gas emissions and promoting electric vehicle adoption. Their attitude is likely to be supportive, given the environmental benefits of the project.

#### **6. Electric Vehicle Owners:**

- Category: Users
- Justification: Electric vehicle owners are end-users directly impacted by the initiative. They have a high interest in a user-friendly and reliable charging interface to enhance their overall experience with electric vehicles. Their attitude may vary based on the usability and effectiveness of the new interface in meeting their needs and preferences.

#### **7. Utility Companies:**

- Category: Influencers
- Justification: Utility companies play a crucial role in providing electricity infrastructure for charging stations. They have an interest in supporting initiatives that promote electric vehicle adoption and grid integration. Their attitude may be influenced by the impact of the initiative on electricity demand, grid stability, and revenue opportunities.

#### **8. Automotive Industry Associations:**

- Category: Influencers
- Justification: Automotive industry associations represent the collective interests of automotive manufacturers, suppliers, and stakeholders. They have the power to advocate for industry standards and best practices related to electric vehicle charging interfaces. Their attitude may be supportive if the initiative aligns with the industry's long-term goals and priorities.