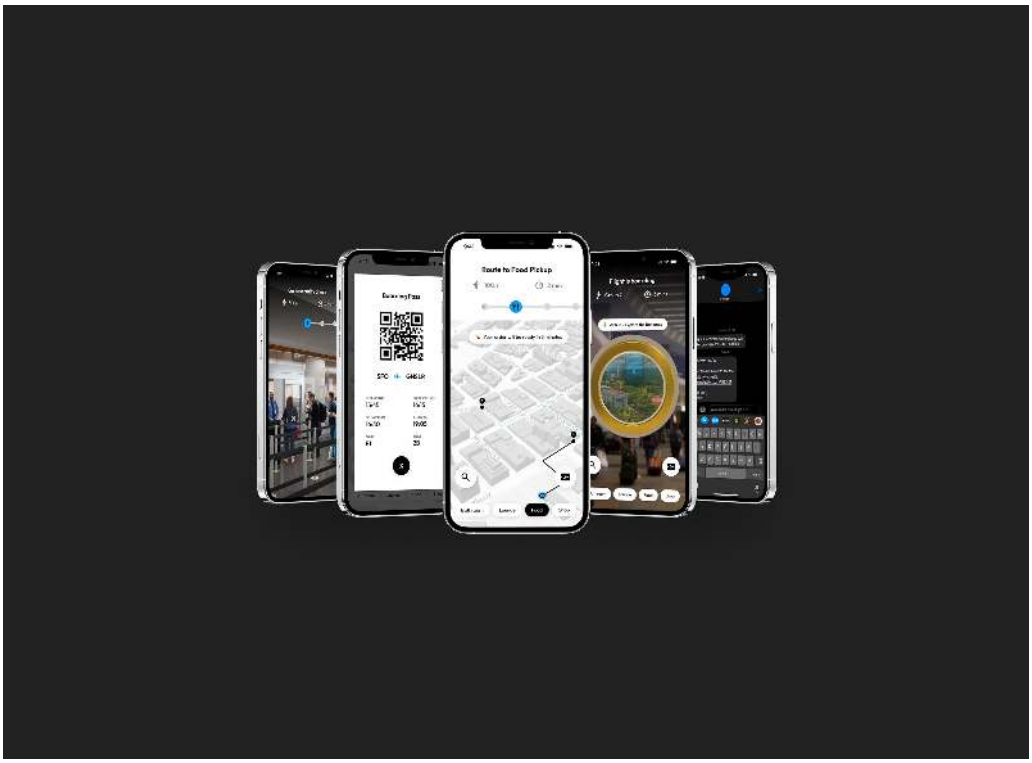
Airport Wayfinding App—A Design Case Study

Personalizing Airport Navigation with Gensler for (potentially) San Francisco Airport



Return to Portfolio / Next Case Study

Imagine arriving at San Francisco Airport as a first-time traveler or a layover passenger, feeling anxious about finding your way around. As you enter the airport, unclear signage and directions leave you frantically searching for your gate, hoping not to miss your flight. The stress builds up, and your travel experience quickly turns into a nightmare. Unfortunately, this is a common experience for many passengers at the airport. But what if there was a solution to guide you every step of the way?

Our team, consisting of six individuals from various international backgrounds, was tasked with the challenge question of enhancing the experience for airport passengers using the Metaverse platform. Through our partnership with Gensler, a prestigious architecture, design, planning, and consulting firm with a global network of over 6,800 professionals spanning 52 offices worldwide, we gained valuable insight into the importance of developing multiple prototypes to cater to various target groups and thoroughly evaluate necessary features for the final deliverable.

After reviewing the challenge in the fall semester and receiving feedback from Gensler and our faculty grader, Professor Powers, the team refined the focus to “How might we use a mixed reality wayfinding tool to reduce stress in the passenger’s journey in SFO airport?” Our proposed spring deliverable will aim to provide passengers with a stress-free travel experience by using mixed reality technology to guide them through the airport.

Featured in the Local News

Discipline
Product Design, Consulting, and Storytelling.

Timeline
80 hours during the semester

My Role
Lead Student Design Consultant for Gensler as part of Minerva University’s academic requirement.

Intended Users
First-time Travellers to the large SFO Airport

Tools
Figma, Notion, and Loom.

Our Web App Solution—Prototype

The main flow prototype.

The actual final pitch—we really didn't prepare for it because we were too focused on the product. Haha!

In response to the challenge of reducing stress levels for passengers traveling through San Francisco Airport, Team Qubic has designed a wayfinding web app. Our app aims to guide passengers to their gates and provide them with a more comfortable and stress-free experience. Our team was aware of the challenge that unclear signage posed, causing stress for 28% of the passengers at the airport (SFO, 2019). As a result, our web app is targeted at first-time travelers and layover passengers who are not familiar with the spatial layout of the airport.

Our hypothesis is that if passengers are guided to their gate with the help of an indoor map wayfinding app, they will feel more confident and secure in navigating. Our design principles were based on reducing friction and cognitive load for the users (Krug, 2014). To make the app

accessible, we integrated various features such as augmented reality, voice guides, and tactile feedback through vibration (Harding Jr., et al., 2017). We also incorporated San Francisco Airport's color theme to strengthen its brand recognition and to make waiting for the flight more enjoyable by integrating destination sneak peeks with augmented reality entertainment (San Francisco International Airport, 2022; Khan et al., 2019).

Our team has designed a prototype of the web app that will be tested and refined before its final version. The app will provide step-by-step guidance and visual feedback to passengers as they navigate through the airport. By using our web app, we hope to provide passengers with a comfortable and stress-free travel experience, making their journey through San Francisco Airport a pleasant one.

How it works

We plan our solution to be accessible through a web application that can be accessed through a personalized link provided to the passenger after ticket purchase. The app provides step-by-step guidance and visual feedback to passengers as they navigate through the airport. Augmented reality was also used to help passengers navigate the airport and make waiting for their flight more enjoyable.

The Deliverable—A Guided-Tour Figma Prototype

You may explore our prototype through this Figma link.

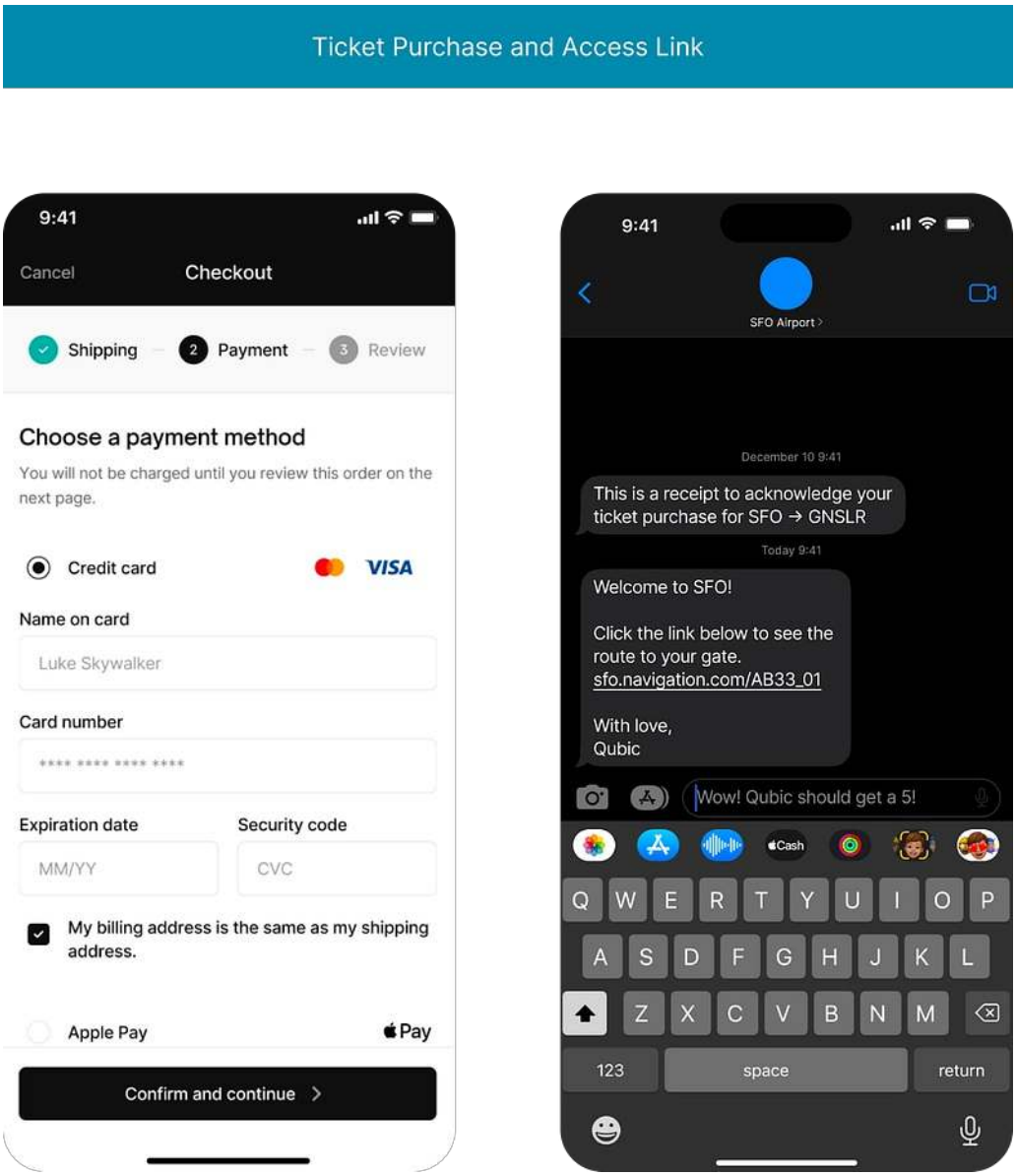
Features

Ticket Purchase

The system uses information from the purchase to produce a personalized wayfinding link. Once passengers arrive to SFO, they can simply tap the link. This link directs passengers to their boarding gate, providing real-time location feedback and up-to-date information about their flight.

Figure 2

Screenshot—Ticket Purchase and Access Link



Personalized Route

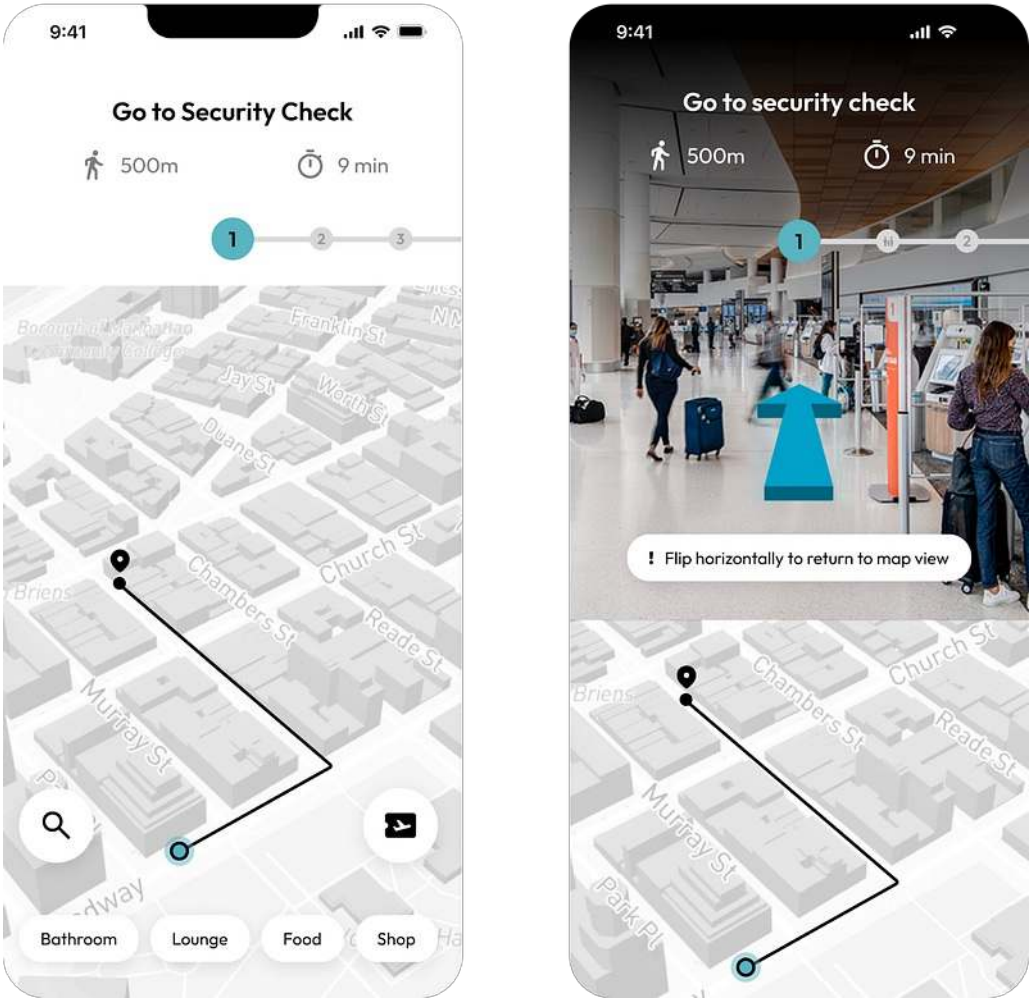
Our map user interface provides passengers with step-by-step feedback to guide them to their gates. The interface uses direct and actionable instructions with visual cues, reducing cognitive load for the user.

We designed the app with accessibility in mind, integrating visual (AR), voice, and tactile (vibration) feedback through vibration to help guide users. These options are turned on by default.

Figure 3

Screenshot—Wayfinding Map UI and AR UI

Wayfinding UI

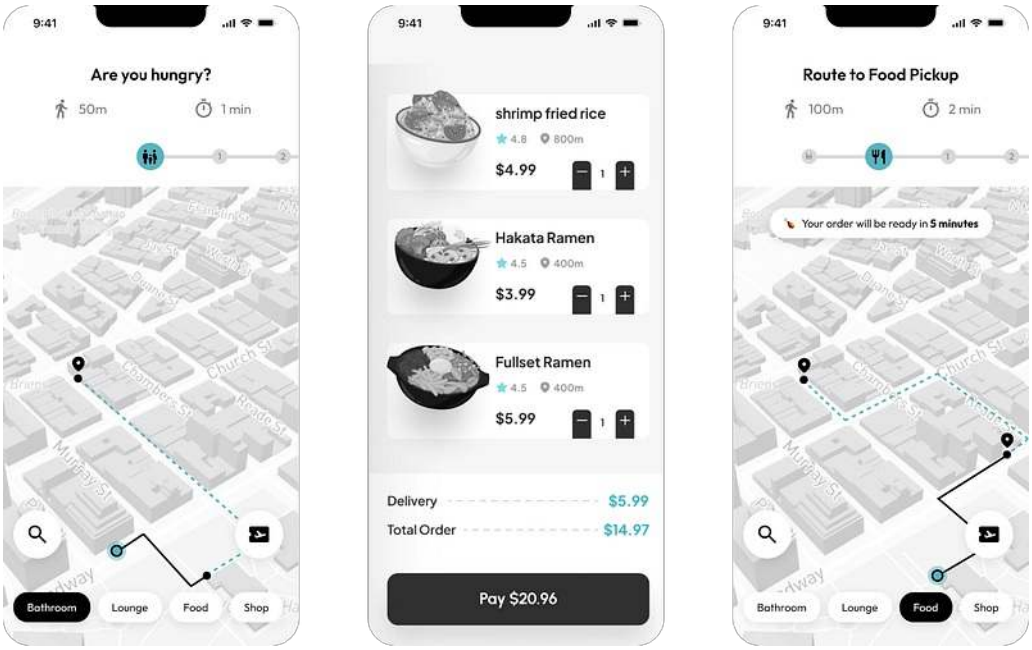


Quick Links

Our wayfinding web app solution includes quick links to essential airport facilities, such as bathrooms, lounges, food, and shops. If the passenger provides their preferences during the purchase of the ticket, tapping on the button automatically adds a stop in the passenger's existing route. Otherwise, the web app will prompt the users to input it via a set of buttons.

Figure 4

Screenshot—Quick Action Buttons (bottom)

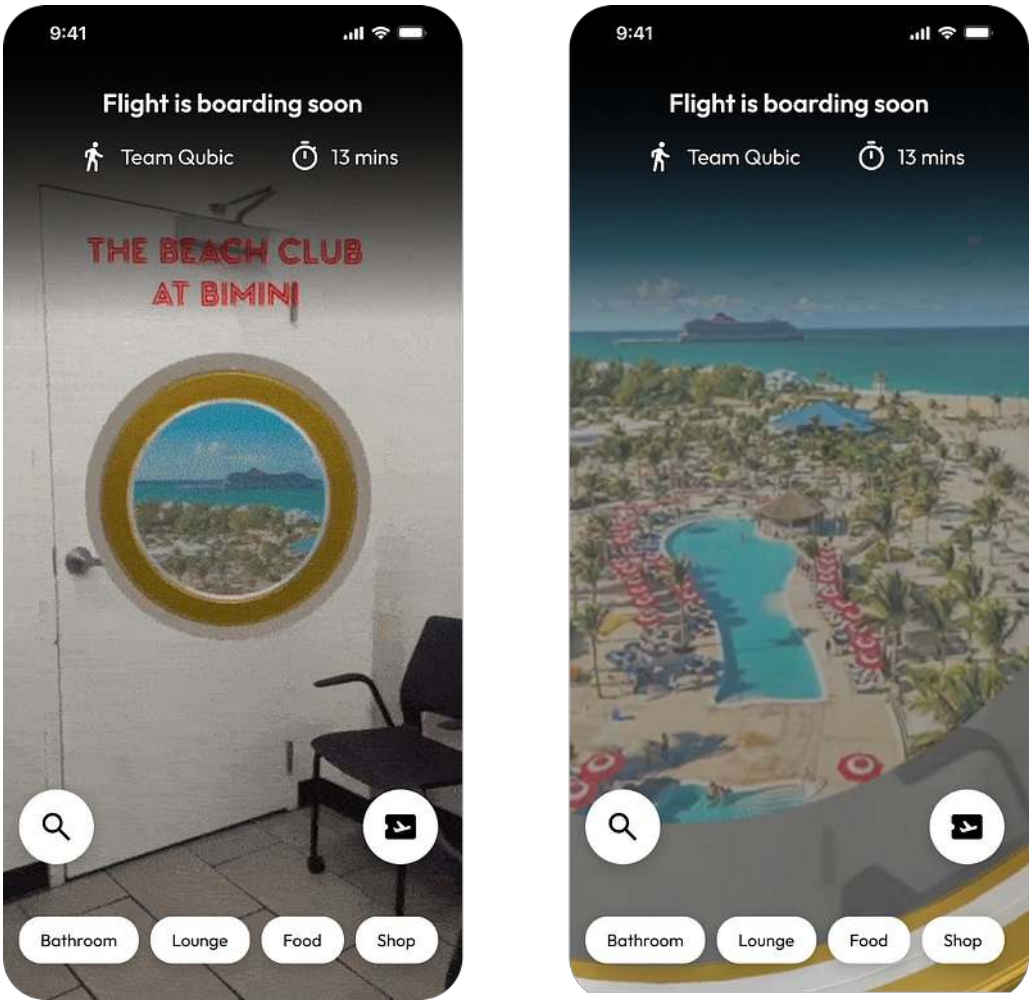


AR Entertainment

To make waiting for flights more enjoyable, we incorporated augmented reality (AR) entertainment. This feature allows passengers to explore different destinations virtually, making their airport experience more engaging. The AR entertainment feature is designed to help passengers relax and enjoy their wait time before boarding their flights.

Figure 5

Screenshot—Destination Sneak Peek with AR



Our Problem-Solving Approach / Group Process Description

We used #rightproblem to holistically view the different faces of this challenge. Detailed below is the documentation of how we solved it along with the evolution of our solution exhibiting our design thinking process.

Qubic went through eight iterations of the design with the Design Sprint Methodology of Google (n.d.) to create the prototype we have for our assigned civic partner, Gensler.

Figure 3

The Design Sprint Methodology adapted by Qubic (Google, n.d.)

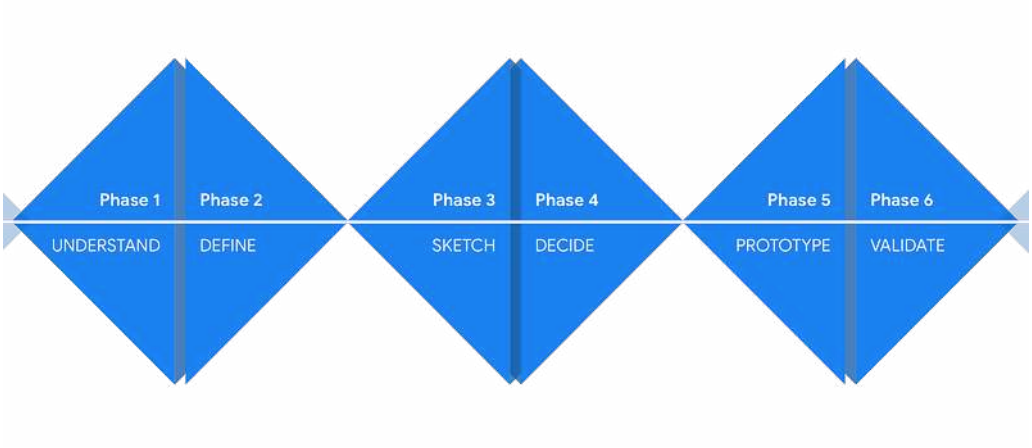
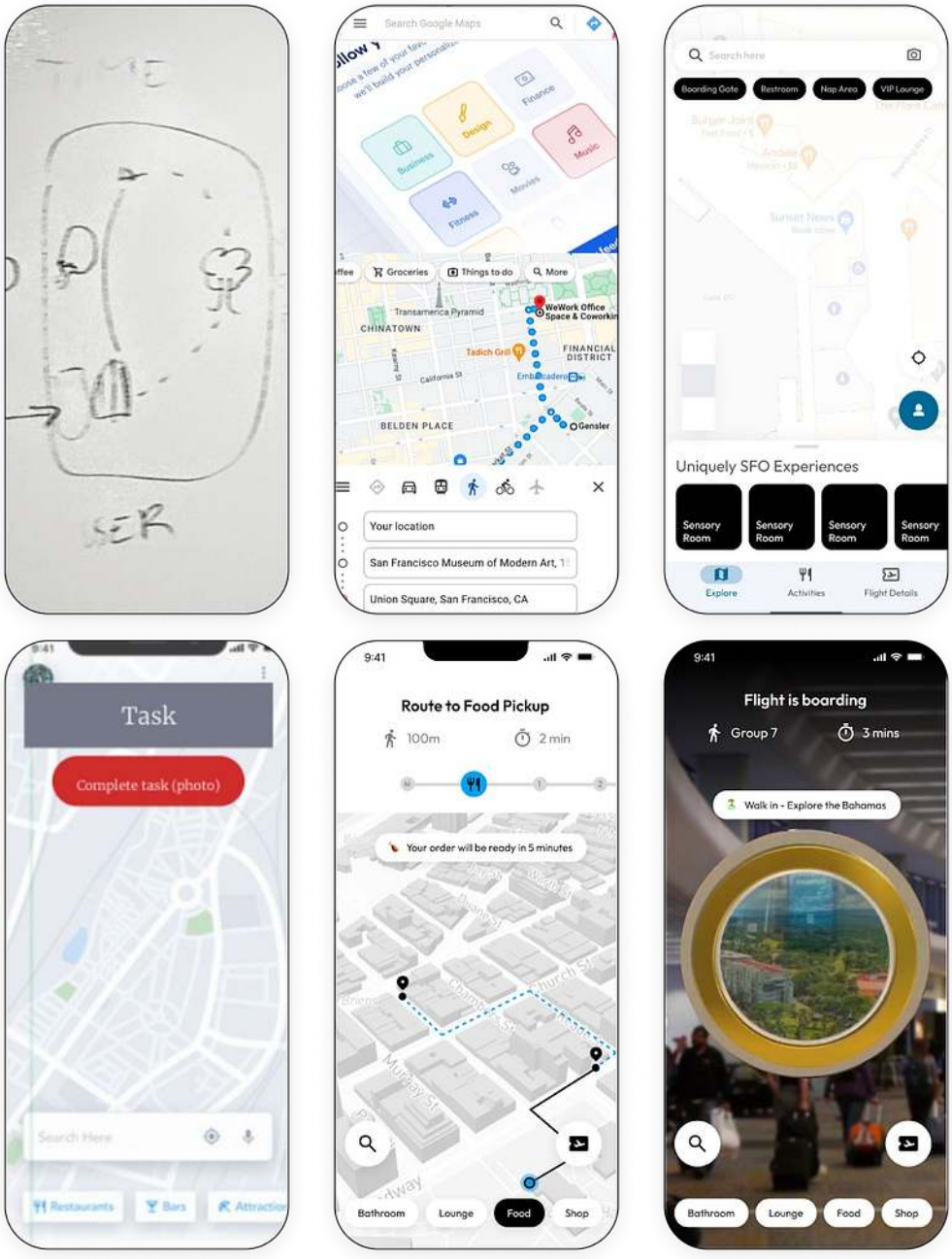


Figure 4

The Design Evolution of our Solution.



Note. Each iteration has a name. From left to right: (1) Sketch, (2)

Frankenstein, (3) Maps-heavy UI, (4) Simplification, (5), High-Fidelity, and (6) AR Integration.

Initial state

The current wayfinding systems at SFO are inadequate, as evidenced by 28% of passengers expressing dissatisfaction with the clarity of the signage (SFO, 2018). This has resulted in confusion and frustration for travelers navigating the airport, negatively impacting SFO's business performance. Studies show that passenger satisfaction with wayfinding is directly correlated with their overall satisfaction with the airport, which can significantly impact repeat business and word-of-mouth (Harding et al., 2011). Further research has also discovered that the ease of finding one's way inside the airport is the top customer satisfaction factor for international passengers (ACRP, 2019).

Figure 2

Top 8 US Gateway Customer Satisfaction Factors (Tezcan & Mastrigt, 2019)

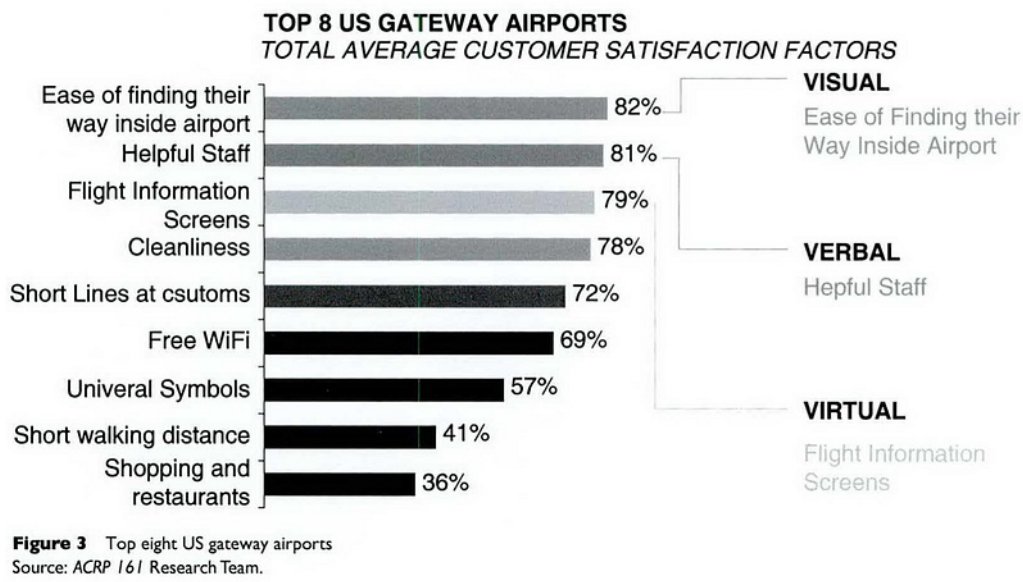


Figure 3 Top eight US gateway airports
Source: *ACRP 161* Research Team.

Note. Result from a survey of 1,000 international passengers in the US' top eight airports

Moreover, poor wayfinding can lead to missed flights, incurring rebooking fees and additional accommodation expenses, causing significant stress and anxiety for passengers (Tezcan & Mastrigt, 2019). These issues also create logistical and financial challenges for both the passengers and the airport.

Goal state

The goal state is to improve the wayfinding system at SFO to ensure that at least 90% of passengers are satisfied with the clarity of the wayfinding. The ease of finding should also improve the passenger experience at SFO by reducing stress and anxiety associated with navigation through the airport. Success will be quantified by an increase in customer satisfaction ratings related to wayfinding, a reduction in the number of passengers who miss their flights due to poor navigation, and cost savings for both passengers and the airport.

Key obstacles

One of the key obstacles is ensuring that the app is accessible to all passengers, including those with disabilities or even passengers whose hands are carrying bags. To address this, the solution utilizes multiple types of feedback: visual, voice guidance, and tactile (vibration).

Another key obstacle is ensuring that the app is intuitive and easy to use, as passengers may already be feeling overwhelmed and stressed. To address this, the design philosophy of "don't make me think" has been used, which means reducing cognitive load by making the app as simple and user-friendly as possible.

Scale

The scale of the problem is the three terminals in San Francisco Airport (SFO). We intentionally chose to focus our solution here due to the information from expert authorities, Gensler, and the fact that everyone in the group has already experienced the problem.

Iteration 1—Refining the Challenge Question

The metaverse, at the time, was in its infancy. Because of that, both the team and Gensler worked together to refine the challenge question in four aspects: (1) the desired technology to be used, (2) the purpose of the solution, (3) when in an airport passenger's journey will the solution be utilized, and (4) where the solution will be deployed. By doing this, the team had a clearer picture of the problem at hand, which informed our future decisions.

Before the end of the first meeting, Carl also started playing with the

idea of bringing airport kiosks, which usually have dynamic maps, to passengers' smartphones to test the waters.

Figure 3

Before and After—Team Qubic's Refined Research Question

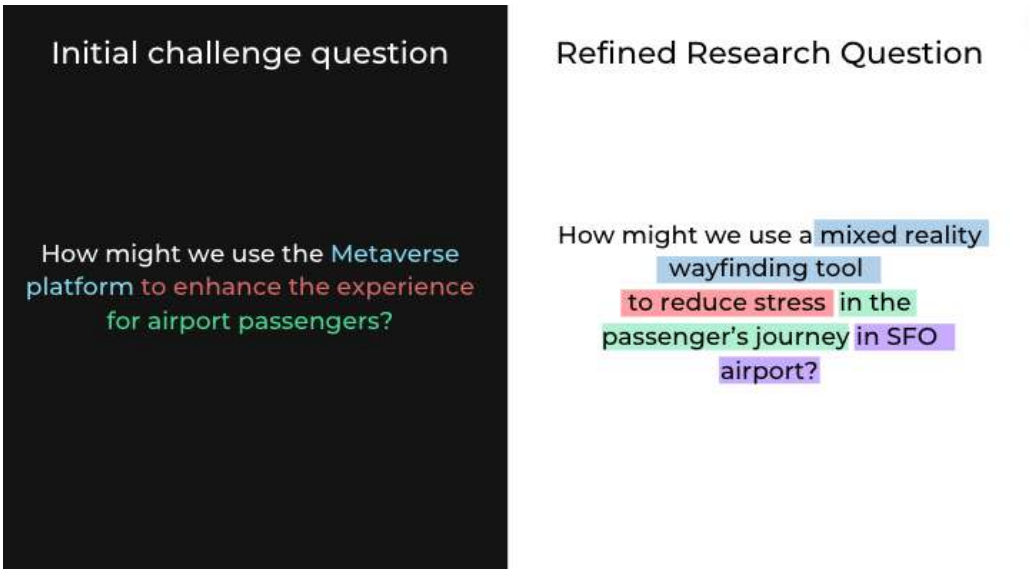
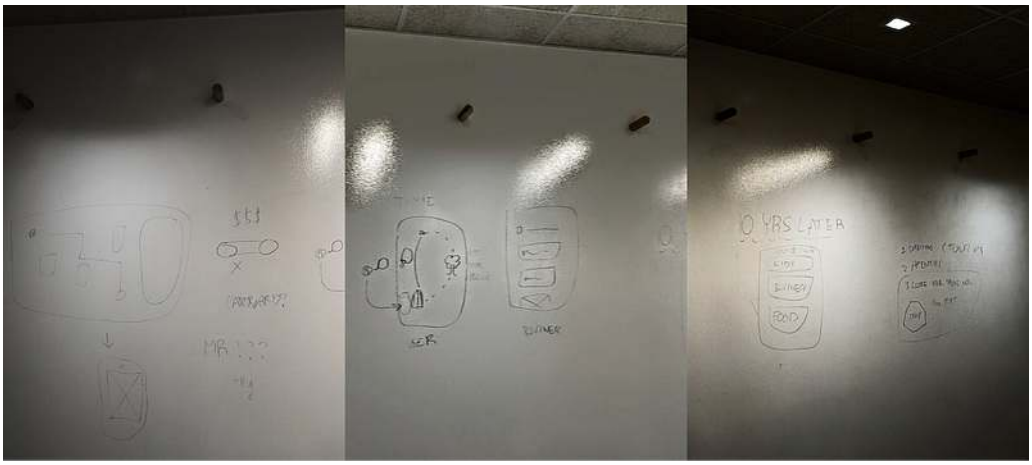


Figure 4.

Carl's on-the-spot low-fidelity sketch presented to Gensler



Iteration 2—Initial Research and Feedback

Figuring out where to start is a hard process. Fortunately, Gensler provided us with their existing research paper which talked about the types of airport passengers and their individual journey moments, along with SFO and underlying values. This gave Qubic a headstart and an opportunity to put together a proof of concept, which they will later use to gather feedback from professionals in technology. The team then communicated their ideas to Gensler asynchronously.

Figure 5

SFO's Principles of REACH document from Gensler (2015)—publicly available

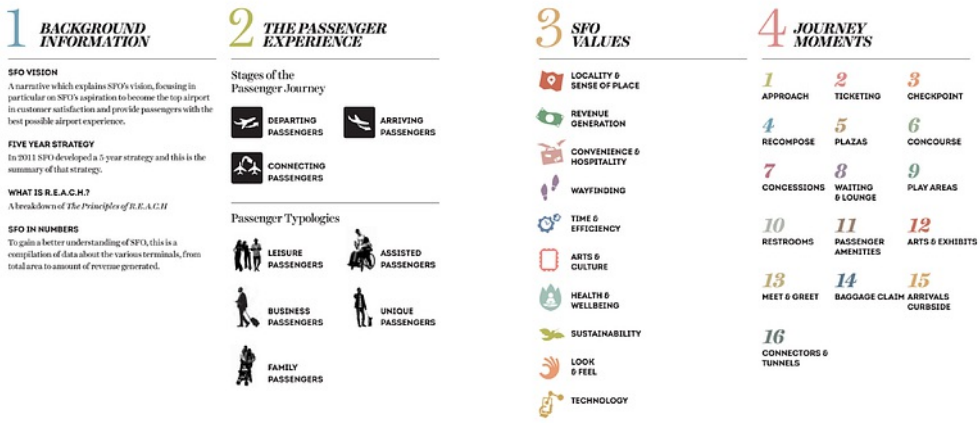


Figure 6.

Design Iteration 2—The team "Frankensteined" features from Google Maps'

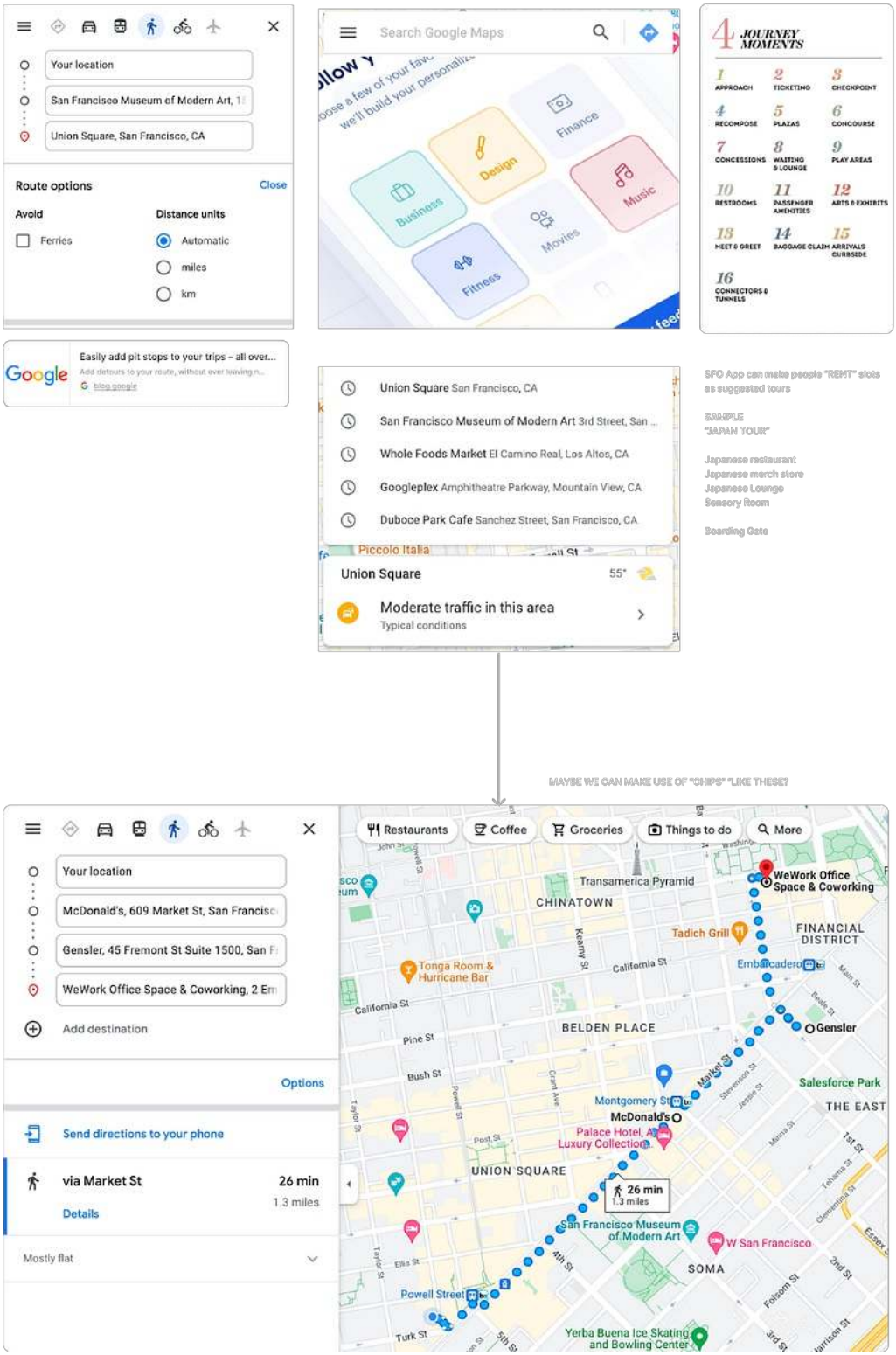


Figure 7

Feedback from the Professionals to "personalize" the journey in flowchart

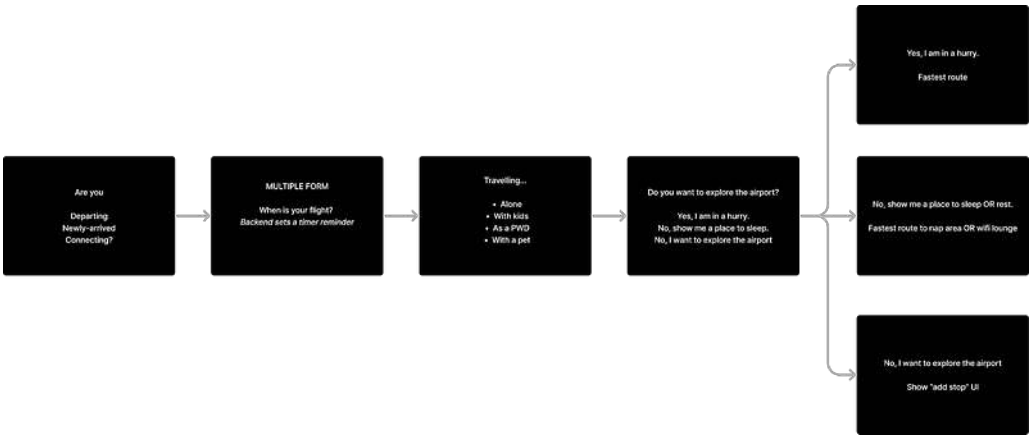
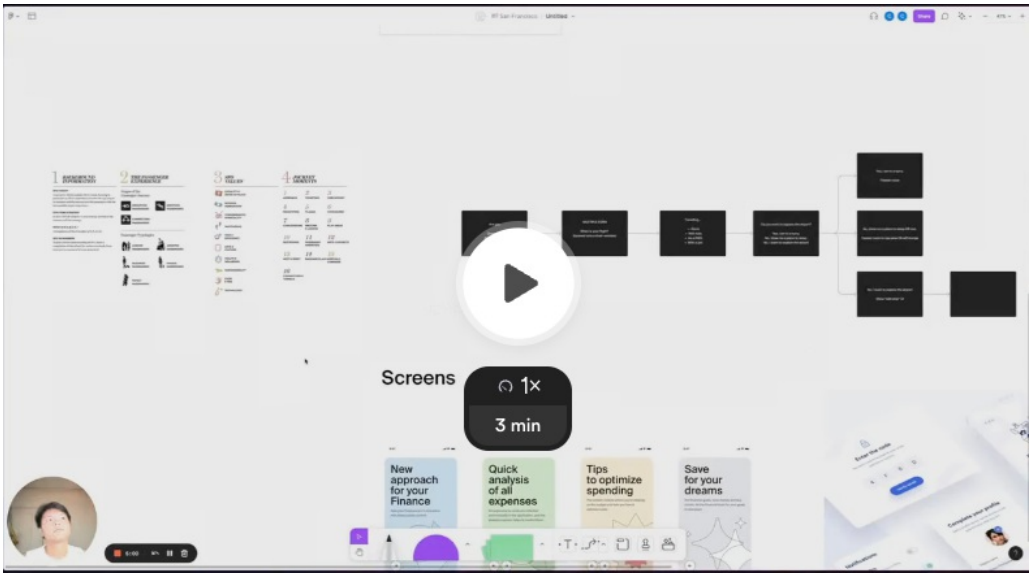


Figure 8.

A Loom video—accessible through a [link]—of the idea sent to Gensler for feedback



Iteration 3—Research and Inspiration from Google Maps

To actualize the solution, Qubic used #gapanalysis to learn more about the current solutions and research in the field of wayfinding, as well as the available technical resources we are working with and #analogies to inspire features. It proved useful, given the #constraints (40 hours/semester) we had to work with.

Figure 9.

A flowchart organizing the research findings from the Airport Cooperative Research Program (ACRP)

Figure 10.

Additional Research Exploring the Technical Feasibility of our Solution

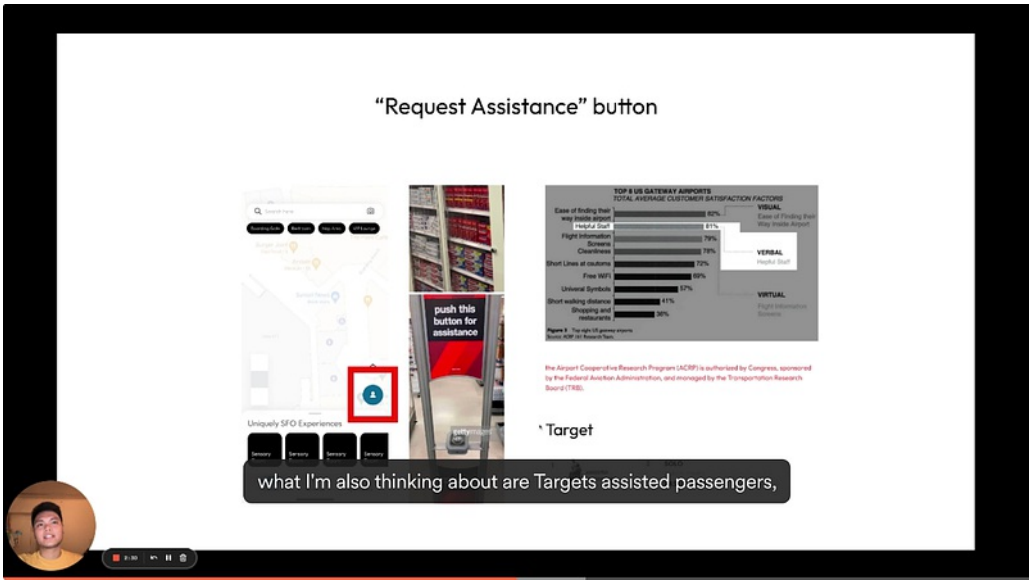
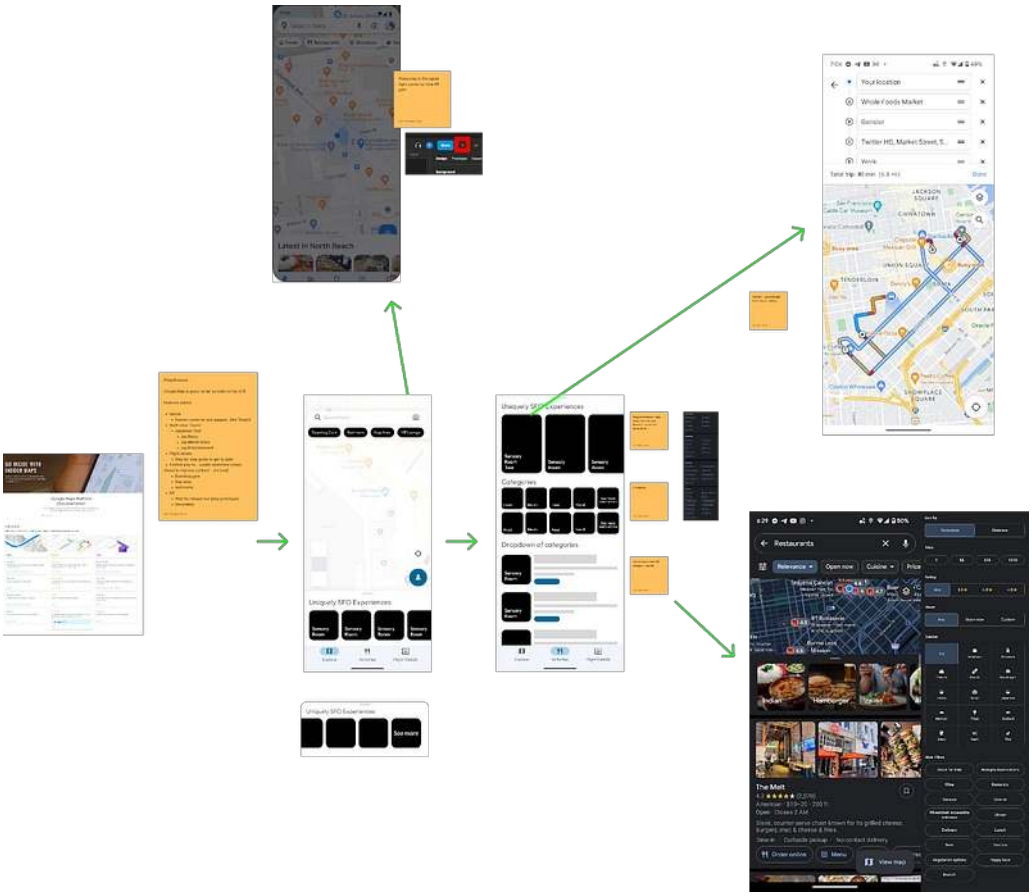


Figure 11. *A Loom video requesting feedback from Gensler for iteration 3*

Figure 12.

Design Iteration 3—A Google-Maps-Inspired Solution custom-designed for testing



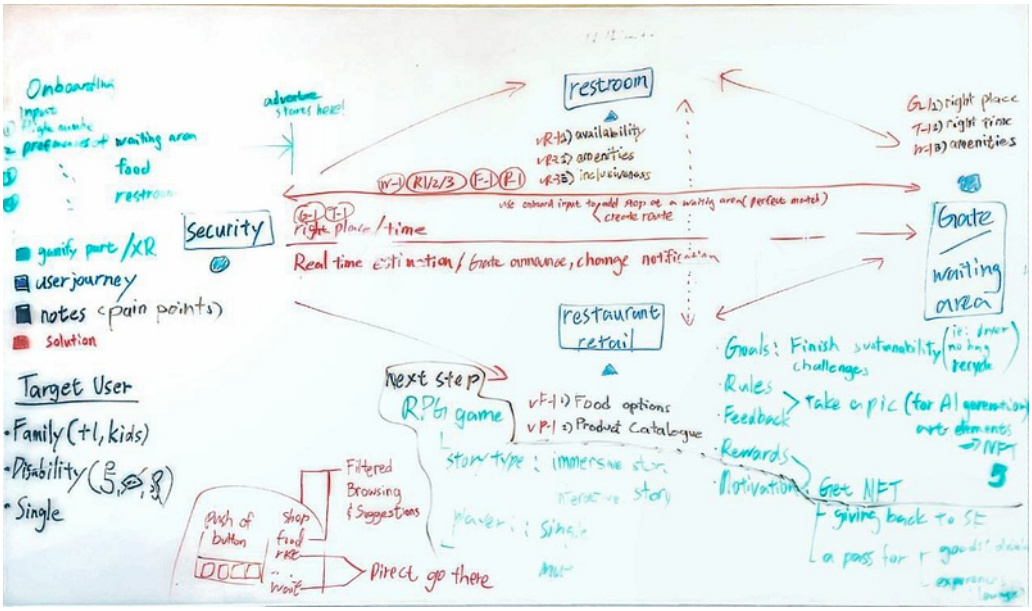
Iteration 4—Internal Pitch with Gensler

Despite the efforts, an internal conflict caused by undesired team

dynamics divided the team on what our “actual solution” might be. Gensler noticed that. To help us, Gensler grouped the team in pairs and hosted an internal pitch session. Carl and Greg worked together to clearly define the user journey and work on opportunities. With a #confidence principle, the “illusion of explanatory depth”, we discovered holes in our solution by going through the journey step-by-step. Unfortunately, there is no recording of the internal pitch presentation, but Carl and Greg’s pitch was chosen to serve as the foundation for the final prototype.

Figure 13.

Produced User Journey and ideas for the Fall presentation’s solution.



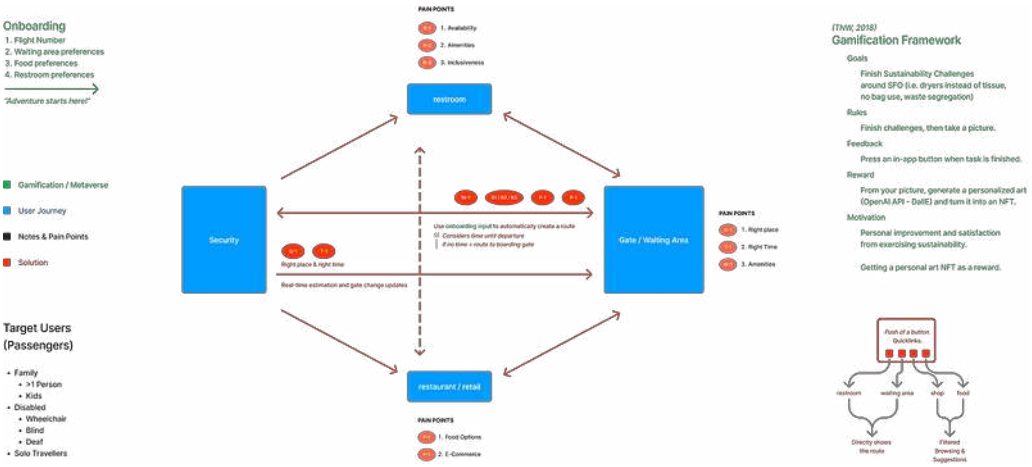


Figure 14.

A Slide from the Internal Pitch

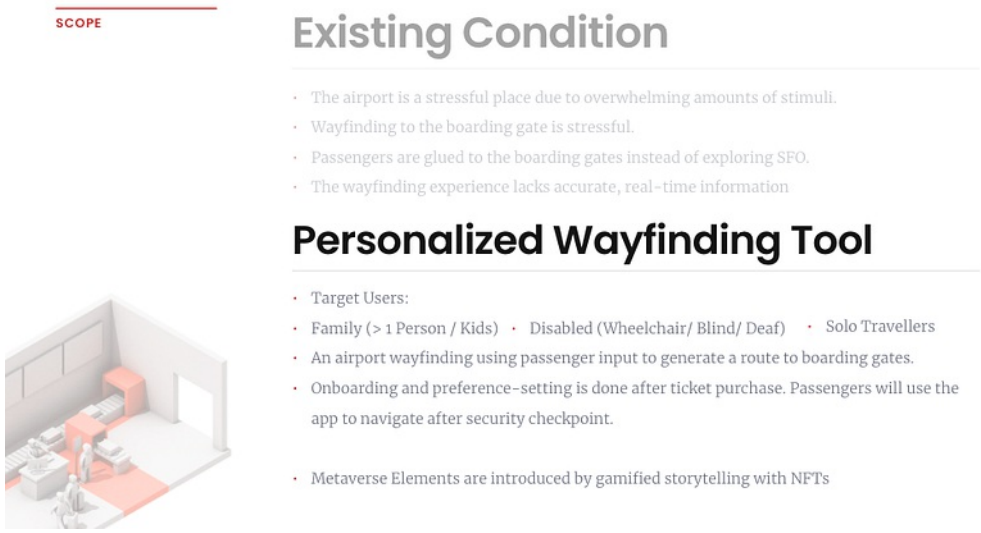
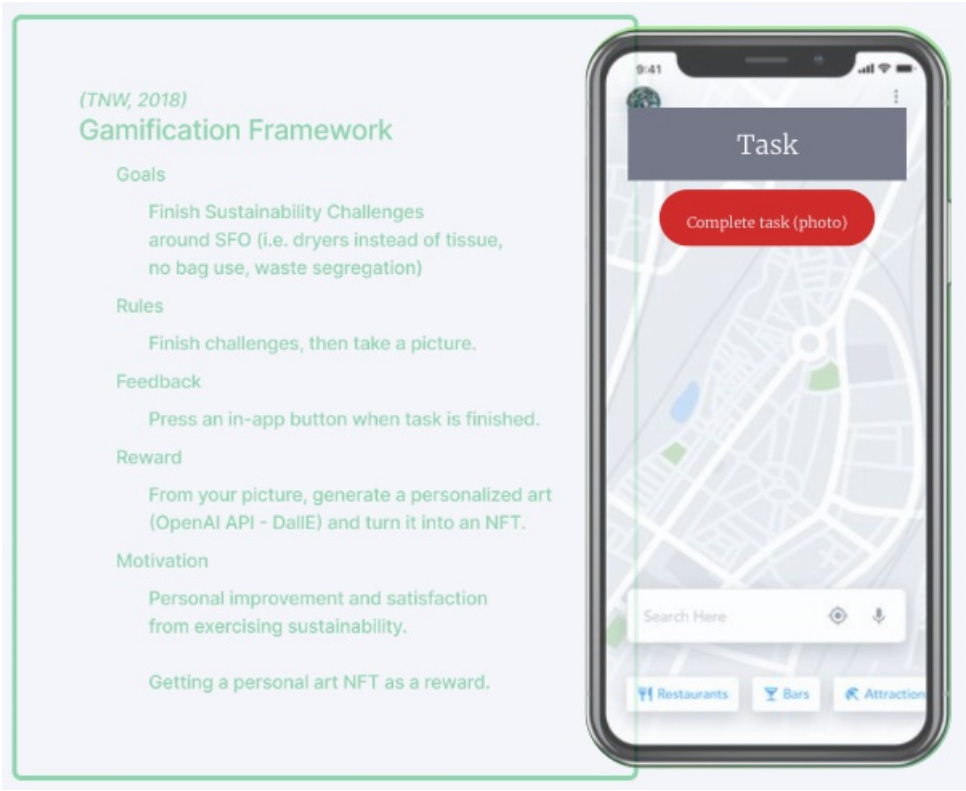


Figure 15

Design Iteration 4—Simplifying the Interface



Iteration 5—Final Fall Proposal

We finalized our journey and developed a high-fidelity Figma prototype for the Fall proposal.

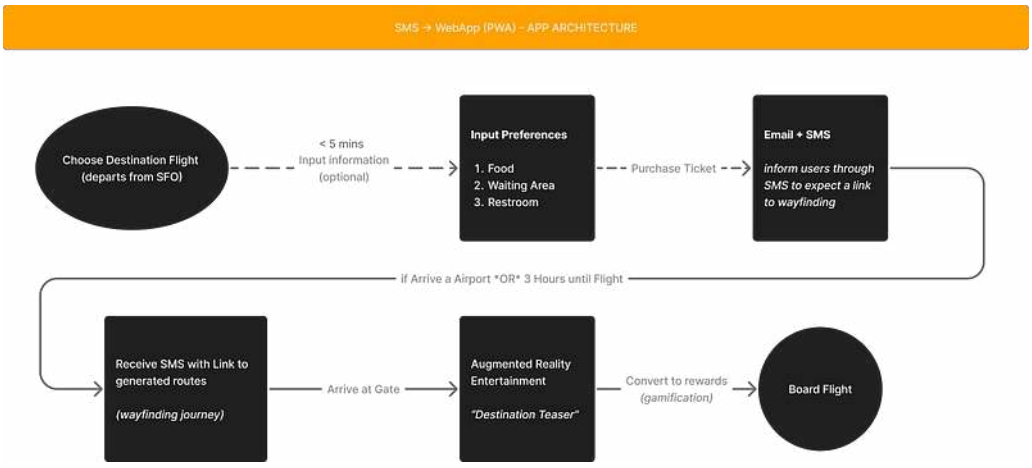


Figure 16. *Final User Journey Flow*

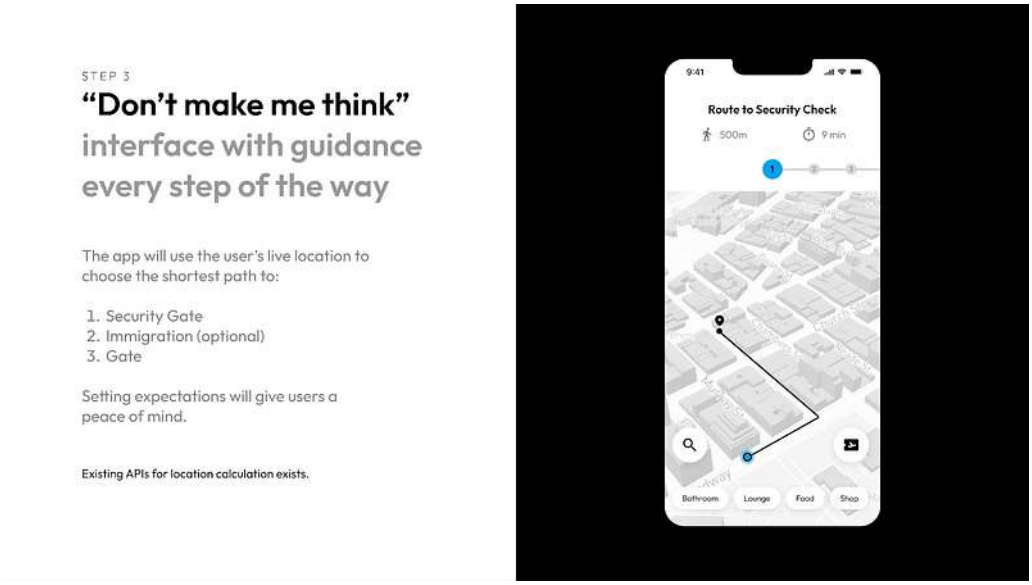


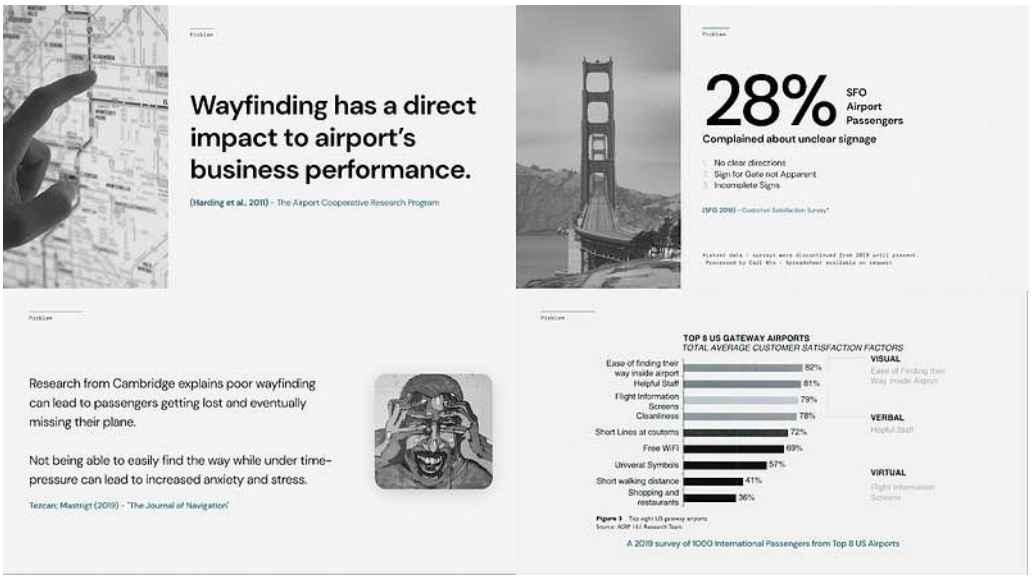
Figure 17. *A Slide from the Final Fall Proposal*

Iteration 6—Presenting to Gensler's Aviation Department

One of the biggest feedback we received was the lack of a clear thought process on the design decisions we made. We appreciated it and constructed a logical argument emphasizing the need for our solution just in time for the next big presentation.

Figure 18

"Why wayfinding? Why stress?"—The argument that satisfied Gensler



Team Qubic got the privilege of getting one hour to present and receive feedback from Gensler's entire aviation team. Before that, Carl hosted a design sprint for Team Qubic in an attempt to get a feature that adds to the "wow" factor. However, designers from Gensler pushed back because the features will either overwhelm the users or be hidden behind buttons. They were already satisfied with the destination sneak peek through Augmented Reality (AR). What came out of this meeting was our current mission statement of "Helping passengers get to their gates —every step of the way".

Figure 19.

Design Sprint for Features on FigJam using #analogies

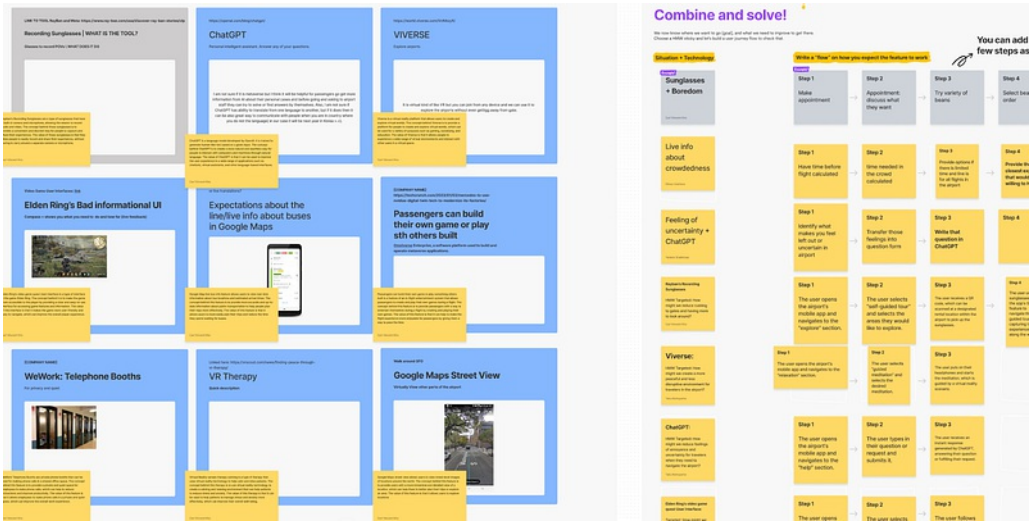


Figure 20

[Recording of the Studio Meeting] (with consent) to help faculty grader with scoring

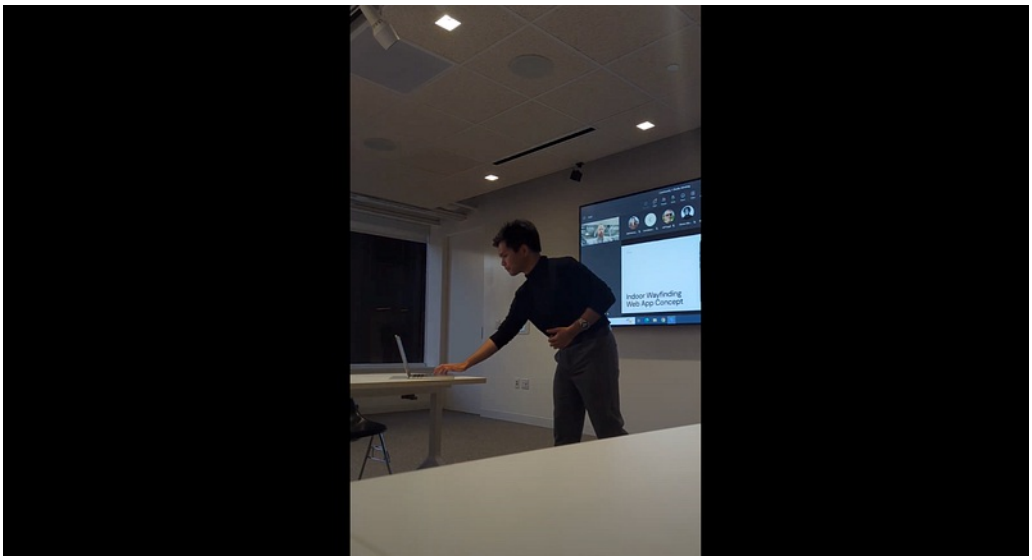
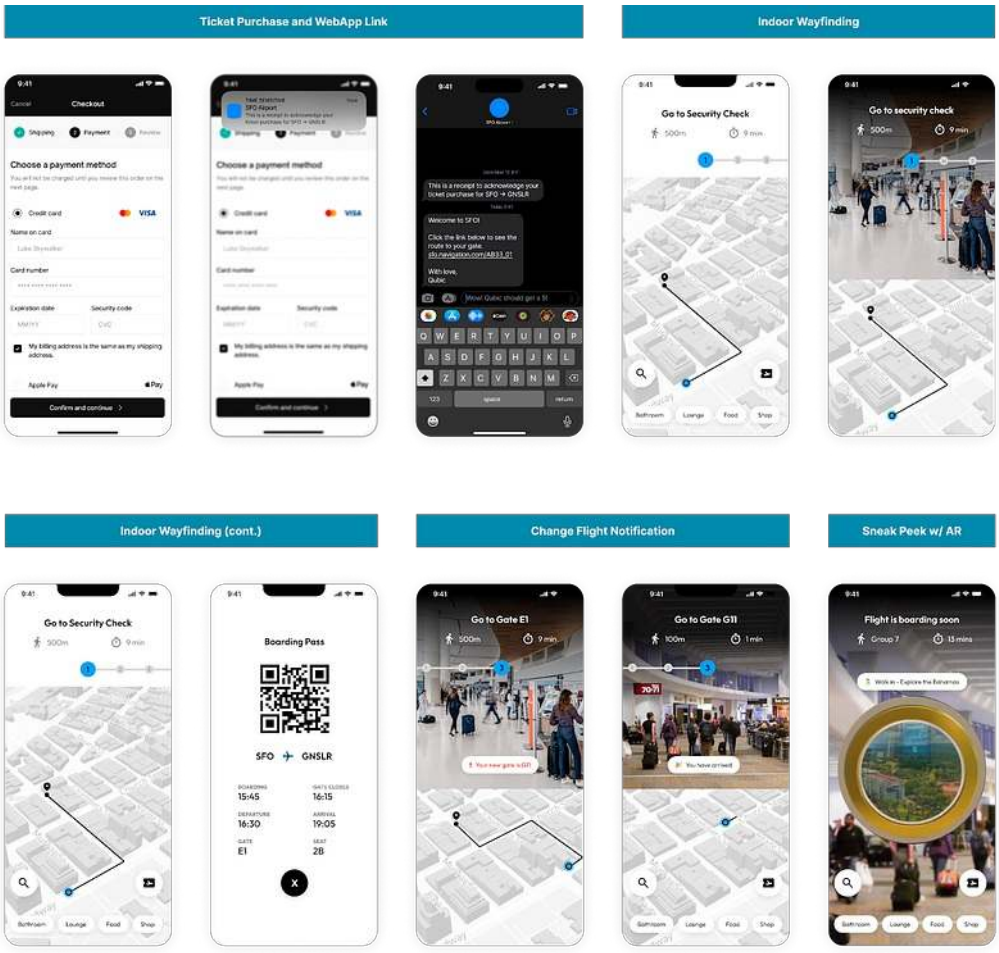


Figure 21.

Design Iteration 6—A User Experience focused on getting Passengers to their Gates



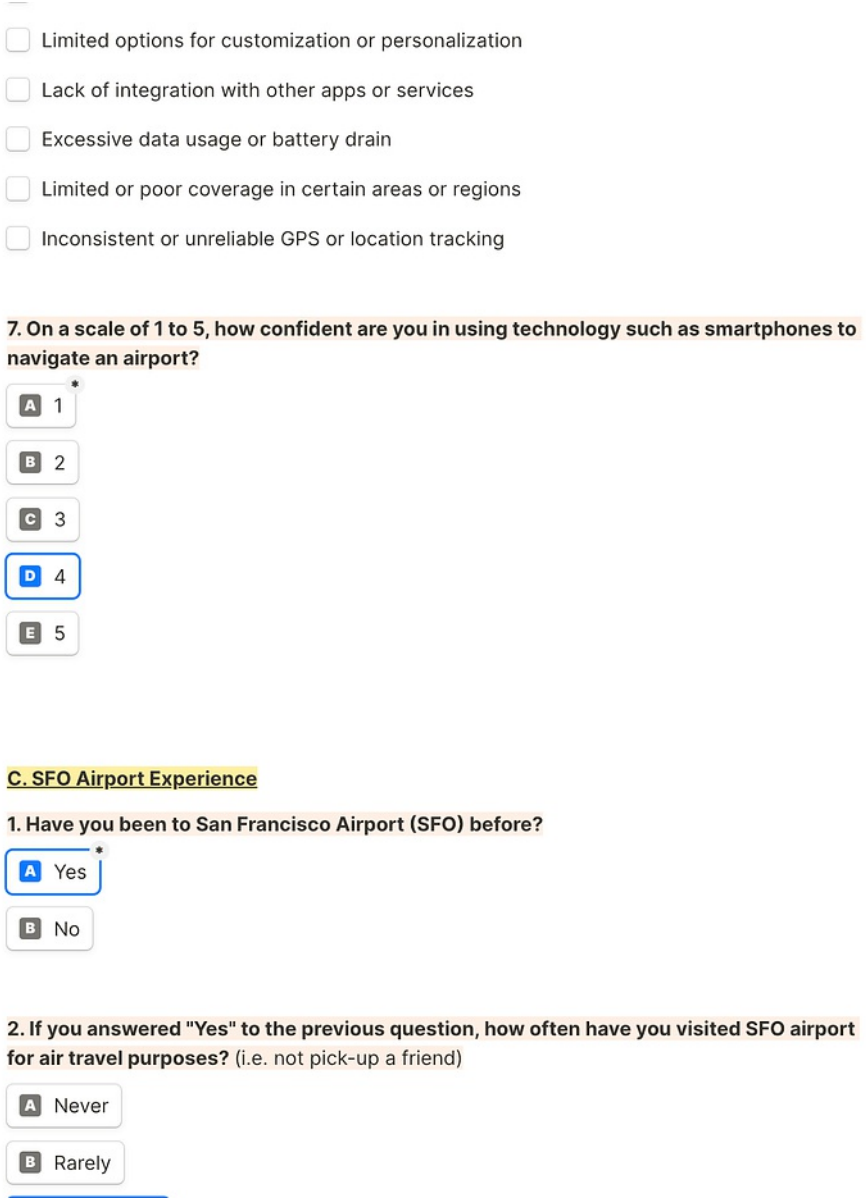
Iteration # 7—Survey Responses (N = 34)

Given the datedness of our data sources (Gensler, 2013; SFO, 2018), we sought out for a more contextual user data and conducted a survey amongst Minervans. We deemed Minervans to be a good choice given

the in-person population has been to SFO at least once. We acknowledge that the population are composed of young adults and are tech-literate, which will affect generalizability of the diverse airport passengers in SFO.

Figure 22

A screenshot of the survey in Tally.so



Note. The survey employs a mix of qualitative and quantitative questions. You may view the survey using this link.

Qualitative Findings

Thematic Analysis of the Responses from the Airport Survey of Minervans cross-class. N = 602.

How do you currently navigate an airport when you are not familiar with it?

Insight 1 (Q1)

> Signage is the primary method of navigation for most travelers.

The majority of respondents mention looking at or following signs to navigate the airport.

"Look for signs; Ask airport staff" or "Following signs"

Insight 2 (Q1)

> Maps and digital resources are also useful for some travelers.

Several respondents mention using maps, either from the airport or online, to navigate. Some also mention using mobile apps or digital resources.

"Look for signs/maps in the airport or google" or "I use maps like Google and Apple Maps"

Insight 3 (Q1)

> Asking airport staff for help is a secondary method of navigation.

Some respondents mention asking airport staff for directions or assistance.

"Ask staff" or, "I ask staff sometimes"

Insight 4 (Q1)

> Clear and visible signage is important for all travelers, especially those who are not familiar with the airport.

Several respondents mention the importance of clear signage for navigating the airport.

"Using signs / asking staff" or "Follow the signs, airports are very similar"

Insight 5 (Q1)

> Boarding passes and flight information displays are also helpful for navigation.

Some respondents mention using information from their boarding pass or flight displays to navigate the airport.

"I use information on my boarding pass to tell me where I need to go" or

“check the boards with the information about flights and which gate to go to”

Insight 6 (Q1)

> Overall, a combination of methods is used for airport navigation.

Respondents mention using a combination of signage, maps, digital resources, and asking staff for assistance.

“Look for signs and maps in the airport or google” or “follow the signs and ask someone in a yellow vest if I get lost”

Have you ever experienced any challenges or difficulties when navigating an airport, such as finding your gate, security, or immigration?

Insight 1 (Q2)

> Some travelers have experienced challenges with airport navigation due to unclear signage or directions.

Several respondents mention that they have experienced difficulties finding their gate or immigration due to unclear signage or directions.

“SFO T1 did not have clear gate signs” or “when the directions on the signs are not very clear”

Insight 2 (Q2)

> Airport transportation can also be a challenge for some travelers.

Some respondents mention difficulties with using public transportation or airport shuttles to navigate the airport.

“SF Airport is very misleading if you want to use bus” or “Sometimes it’s confusing when the airport has its own ‘subway’ and you need to use it to reach your gate (transfer flights)”

Insight 3 (Q2)

> Gate changes and announcements can cause confusion for some travelers.

Some respondents mention that gate changes or missed announcements can cause confusion during airport navigation.

“Sometimes it’s frustrating when the gate changes and I had my earphones in so I didn’t hear the announcement” or “finding my gate

can be hard”

Insight 4 (Q2)

> Airport connections can also be confusing for some travelers.

Some respondents mention difficulties with connecting flights or making connections in the airport.

“Connections can be really confusing” or “I have multiple times ended up where I was not supposed to”

Insight 5 (Q2)

> Overall, airport navigation can be stressful and confusing for some travelers.

Several respondents mention that they have experienced challenges or difficulties during airport navigation.

“often times I don’t know how far the gate or immigration is which makes things stressful when they don’t need to be” or “Yes, connections can be really confusing”

Insight 6 (Q2)

> Clear and visible signage and directions are crucial for airport navigation.

Several respondents mention the importance of clear signage and directions for navigating the airport.

“Not really, but a sometimes it’s frustrating when the gate changes and I had my earphones in so I didn’t hear the announcement” or “when the directions on the signs are not very clear”

What value do you see in this web app?

Insight 1 (Q3)

> The web app would be valuable for reducing airport-related stress and anxiety.

Many respondents mention that the web app would help reduce anxiety and stress related to navigating the airport and finding gates.

“Reduces airport-related anxiety” or “Relax”

Insight 2 (Q3)

> The web app would be useful for providing clear and specific directions.

Several respondents mention that the app would be useful for providing

clear directions and reducing confusion around where to go in the airport.

“Directions, I like directions” or “It removes potential for confusion and uncertainty around where to go”

Insight 3 (Q3)

> The web app would be valuable for travelers with specific needs, such as language barriers or disabilities.

Some respondents mention that the app would be useful for travelers with language barriers, disabilities, or those who don’t travel frequently.

“For older people or language issues” or “for people with disabilities, people who don’t travel a lot, mitigate language barriers”

Insight 4 (Q3)

> The web app would be valuable for saving time and avoiding missed flights.

Several respondents mention that the app would be useful for saving time and avoiding missed flights due to confusion or uncertainty around gate locations.

“would be time efficient, will spend less time walking around looking for directions” or “preventing late arrivals to gate”

Insight 5 (Q3)

> The web app should be easy to use and focused on providing clear directions.

Many respondents mention that the app should be easy to use and focused on providing clear directions, rather than incorporating too many features.

“As long as the app is easy to use and doesn’t try to incorporate too many features, it would reduce my stress” or “Easy to use; No thinking needed; No stress; Personalized route”

Insight 6 (Q3)

> The web app should provide personalized and specific information.

Some respondents mention that the app should be customizable and provide specific information, such as boarding pass reminders or security line waiting times.

“personalized route” or “Security line waiting time info”

Do you see yourself using it in the near future? Why?

Insight 1 (Q4)

> Some travelers are open to using the web app in the near future, particularly if it covers airports they frequently use.

Several respondents mentioned that they would consider using the app if it covers airports they frequently use or if they were in a rush.

“Yes, because I travel a lot” or “Maybe in a really big and complicated airport like JFK”

Insight 2 (Q4)

> Some travelers are hesitant to use the web app due to concerns about phone storage or critical thinking skills.

Some respondents mention concerns about the app taking up phone storage or taking away from their critical thinking practice.

“Takes up phone storage” or “takes away some critical thinking practice”

Insight 3 (Q4)

> The web app would be useful for reducing stress and increasing confidence during airport navigation.

Many respondents mention that the app would be useful for reducing stress and increasing confidence during airport navigation.

“I would feel more secure and comfortable that I can make it to my gate and not miss my flight” or “To be more confident in the directions, I would use this app”

Insight 4 (Q4)

> The web app should be easy to use and require minimal effort to access information.

Several respondents mention that the app should be easy to use and require minimal effort to access information, such as not requiring sign-ups or mandatory information.

“You’d have to make it really easy to get directions (just click a link, no sign up or anything mandatory)” or “No thinking needed; No stress; Personalized route”

Insight 5 (Q4)

Some travelers are open to using the web app to try out new experiences.

Some respondents mention that they would consider using the app to try out new experiences or to improve their overall airport experience.

“I think it would be interesting to use at SFO because it will give me a new experience of navigating an airport” or “as it would improve my overall experience and time at the airport and I will avoid unnecessary stress”

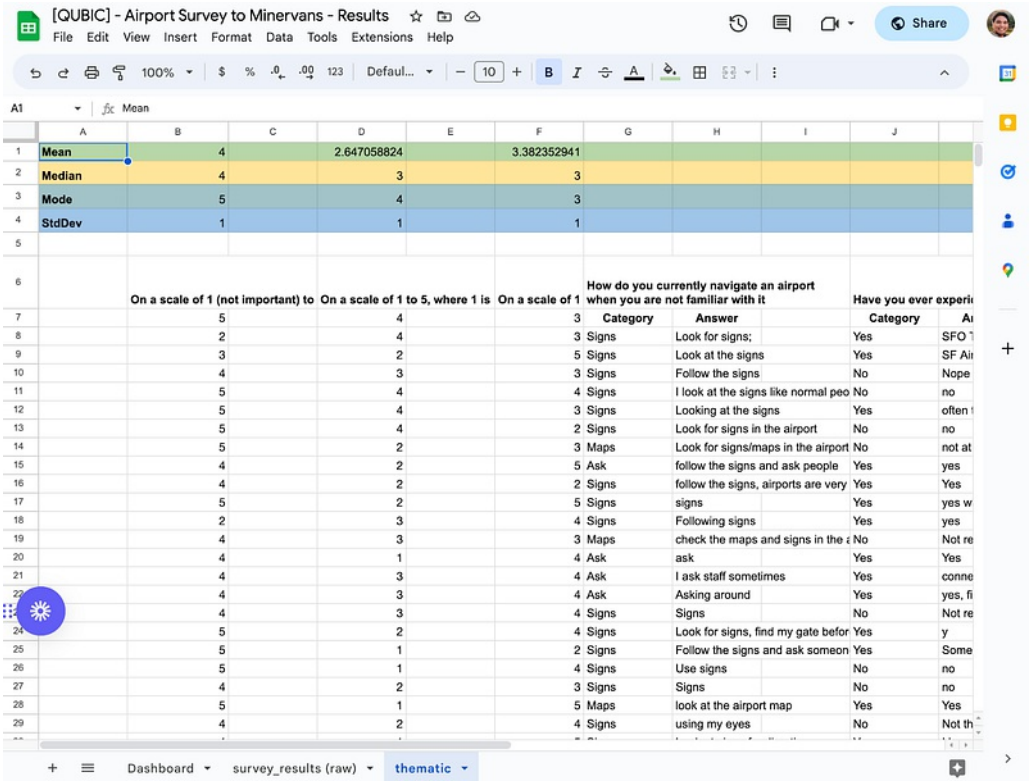
The key findings from the table indicate that travelers primarily rely on signage for airport navigation, with maps and digital resources, and asking airport staff as secondary methods. Challenges faced during airport navigation include unclear signage, transportation, gate changes, and airport connections. The proposed web app could be valuable for reducing stress, providing clear directions, catering to travelers with specific needs, saving time, and offering personalized information. Travelers are open to using the web app if it covers their frequently used airports and if it is easy to use without requiring sign-ups or mandatory information.

Quantitative Findings

Qubic also utilized Likert scale questions to quantitatively analyze the data. We will use it to formally make inferences using the tools for different measures of location: the mean, median, mode, and standard deviation.

Figure 23

The spreadsheet containing the raw and processed quantitative data from the survey



[QUBIC] - Airport Survey to Minervans - Results

File Edit View Insert Format Data Tools Extensions Help

Share

A1 fx Mean

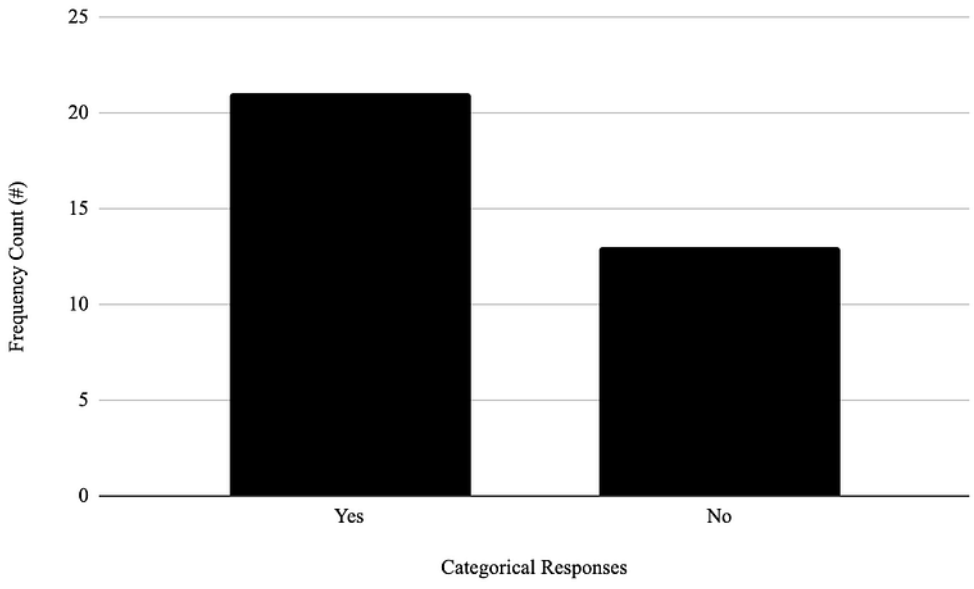
	A	B	C	D	E	F	G	H	I	J
1	Mean	4		2.647058824		3.382352941				
2	Median	4		3		3				
3	Mode	5		4		3				
4	StdDev	1		1		1				
5										
6		On a scale of 1 (not important) to		On a scale of 1 to 5, where 1 is		On a scale of 1	How do you currently navigate an airport when you are not familiar with it		Have you ever experi	
7		5		4		3	Category	Answer	Category	A
8		2		4		3	Signs	Look for signs;	Yes	SFO
9		3		2		5	Signs	Look at the signs	Yes	SF Ai
10		4		3		3	Signs	Follow the signs	No	Nope
11		5		4		4	Signs	I look at the signs like normal peo	No	no
12		5		4		3	Signs	Looking at the signs	Yes	often
13		5		4		2	Signs	Look for signs in the airport	No	no
14		5		2		3	Maps	Look for signs/maps in the airport	No	not at
15		4		2		5	Ask	follow the signs and ask people	Yes	yes
16		4		2		2	Signs	follow the signs, airports are very	Yes	Yes
17		5		2		5	Signs	signs	Yes	yes w
18		2		3		4	Signs	Following signs	Yes	yes
19		4		3		3	Maps	check the maps and signs in the a	No	Not re
20		4		1		4	Ask	ask	Yes	Yes
21		4		3		4	Ask	I ask staff sometimes	Yes	conne
22		4		3		4	Ask	Asking around	Yes	yes, fi
23		4		3		4	Signs	Signs	No	Not re
24		5		2		4	Signs	Look for signs, find my gate befor	Yes	y
25		5		1		2	Signs	Follow the signs and ask someon	Yes	Some
26		5		1		4	Signs	Use signs	No	no
27		4		2		3	Signs	Signs	No	no
28		5		1		5	Maps	look at the airport map	Yes	Yes
29		4		2		4	Signs	using my eyes	No	Not th

Dashboard survey_results (raw) thematic

Note. While we conducted the survey on Tally.so, we used Google Sheets for data analysis. You may view the spreadsheet using this link.

Figure 24

Frequency Histogram for the question "Have you ever experienced any challenges or difficulties when navigating an airport, such as finding your gate, security, or immigration?"

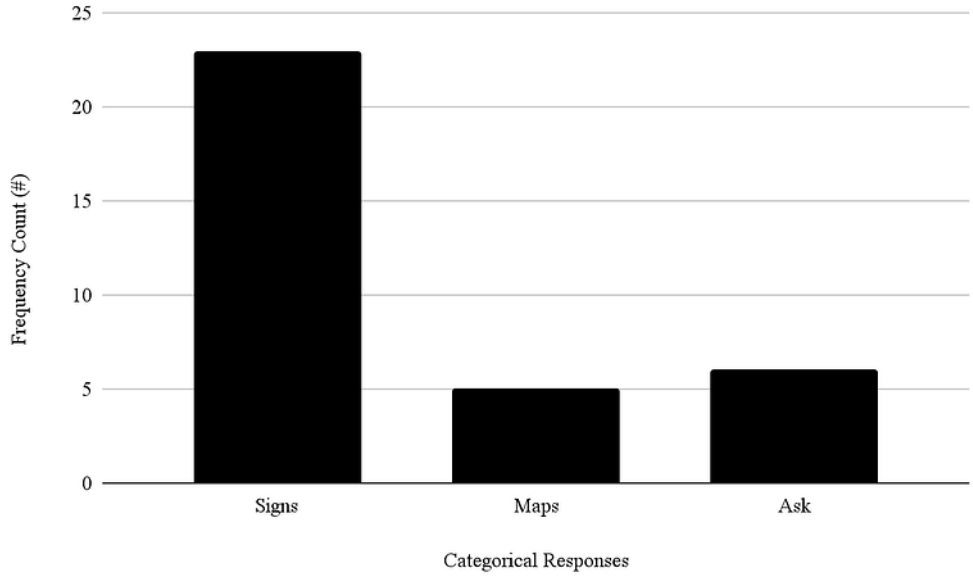


The histogram presents responses to a question about challenges or difficulties experienced when navigating an airport, specifically San Francisco Airport (SFO). The responses indicate that many passengers

share similar sentiments and have faced issues like unclear gate signs, misleading directions to public transportation, confusion regarding the distance to gates or immigration, and difficulties during connecting flights. It is important to note that because these are categorical variables, the mean and median are not important. Instead, we are focusing on the mode.

Figure 25

Frequency Histogram for the question "How do you currently navigate an unfamiliar airport?"

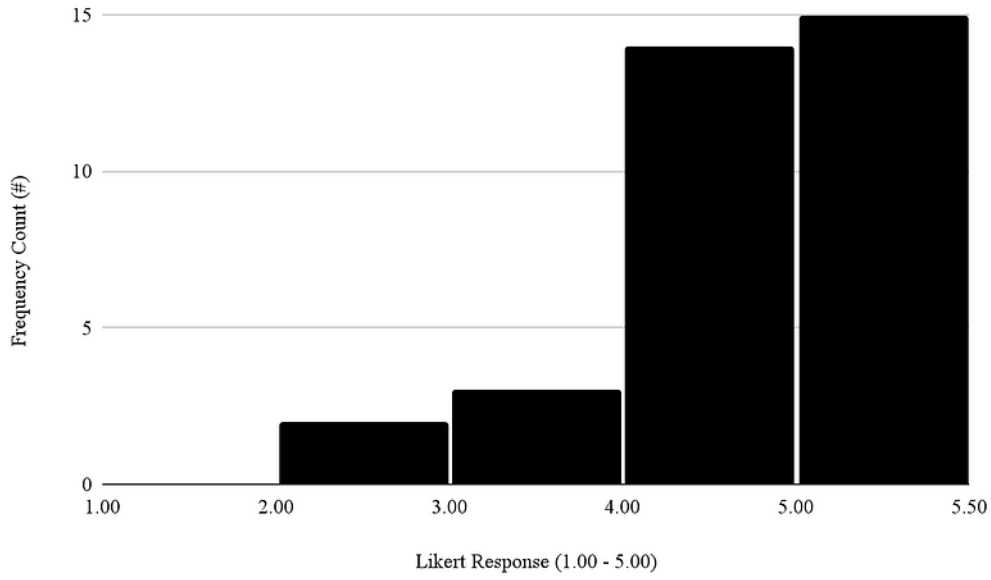


From a qualitative question whose responses were categorized manually, we have discovered that the majority of respondents rely on signs to navigate unfamiliar airports, with some also using maps, asking for help from staff or others, and checking their boarding passes.

The mode (most frequent response) is "signs," suggesting that airport signs play a crucial role in passengers' navigation. The key findings from the table highlight the importance of signage for navigating unfamiliar airports and indicate that any wayfinding solution should take this into consideration.

Figure 26

Frequency Histogram for the question "How important is it for you to have a convenient and stress-free airport experience?"



Note. Responses are based on a scale of 1 to 5, where 1 is not important and 5 is very important. Due to a technical error, 5.50 is required to display the frequency of responses for option 5.

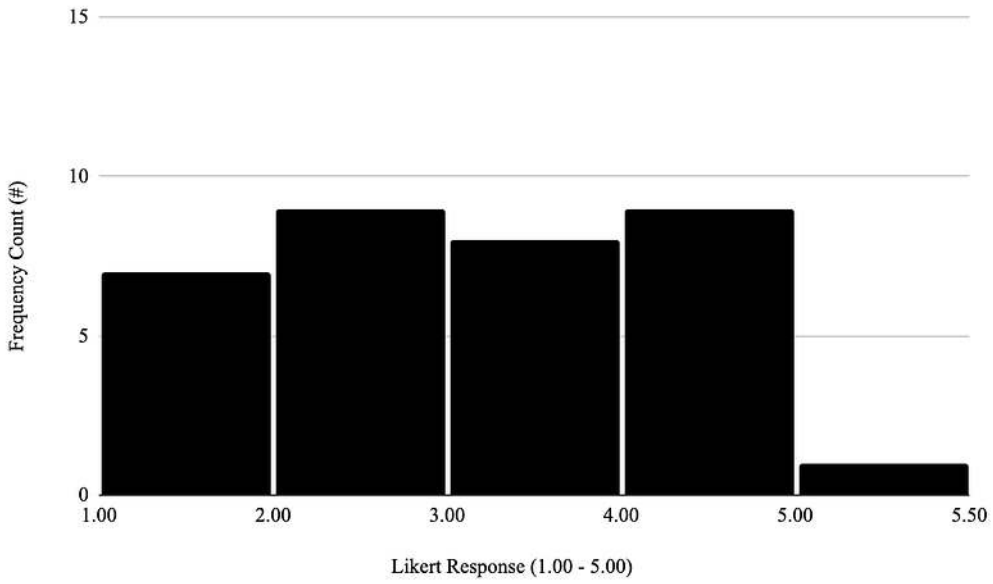
The key findings from the descriptive statistics indicate that having a convenient and stress-free airport experience is important for travelers. The mean score is 4, the median score is 4, the mode is 5, and the standard deviation is 1.

The mean and median of 4 suggest that, on average, a convenient and stress-free airport experience is important to the respondents. The mode being 5 indicates that the most common response is the highest value on the scale, emphasizing the significance of a convenient and stress-free airport experience for the majority of respondents. The relatively low standard deviation of 1 signifies that the responses are closely clustered around the mean, showing that there is a general consensus among travelers regarding the importance of a convenient and stress-free airport experience.

The data is skewed to the left, which means that the majority of responses cluster around the higher ratings (4 and 5), indicating that most respondents consider a convenient and stress-free airport experience to be important or very important.

Figure 27

Frequency Histogram for the question "How do you feel when you are at the airport?"

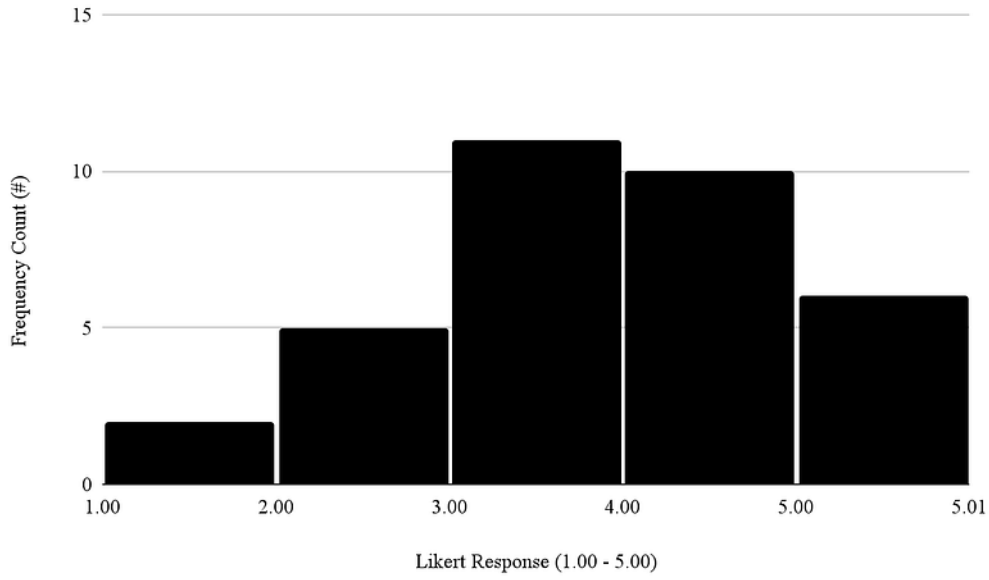


Note. Responses are based on a scale of 1 to 5, where 1 is not at all stressed and 5 is extremely stressed. Due to a technical error, 5.50 is required to display the frequency of responses for option 5.

This histogram has a mean of 2.65, a median of 3, a mode of 4, and a standard deviation of 1. The mean score of 2.65 suggests that, on average, passengers experience moderate stress levels at the airport. The median score of 3 further supports this finding, indicating that half of the passengers experience stress levels above and below this value. The mode of 4 shows that the most common response among passengers is a relatively high-stress level, suggesting that a significant portion of passengers experience considerable stress at the airport. The standard deviation of 1 indicates that the stress levels of passengers are relatively dispersed, suggesting varying levels of stress experienced by different individuals.

Figure 28

Frequency Histogram for the question "How do you find navigating to your assigned gate at SFO airport?"



Note. Responses are based on a scale of 1 to 5, where 1 is very difficult and 5 is very easy. Due to a technical error, 5.50 is required to display the frequency of responses for option 5.

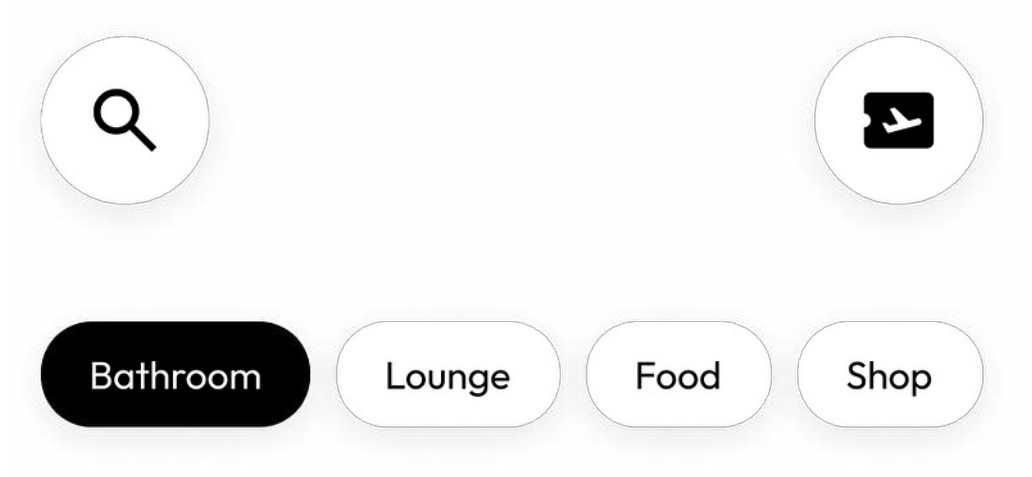
From the provided data, we can deduce that the majority of passengers have a fairly neutral experience, with a slight skew towards positive ratings.

Iteration # 8—Economic Sustainability for SFO

When customers purchase their ticket through the airlines of their preference, they input information such as contact details. In return, the system provides passengers with their flight tickets. In our solution, we plan to insert additional input fields to gather personal preferences. When in a hurry, the The preference information can then be used to personalize the route. We now included the quick actions bar to better explain how our product can help SFO on the business side.

Figure 29

A screenshot of the Quick Actions bar in our prototype



Note. Tapping on “Bathroom” and “Lounge” prompts passengers to input their preferences, and then adds an additional *stop* to your journey. Tapping on “Food” and “Shop” opens an in-app window featuring a shop user interface.

The Data from “preferences” can be sold to companies to help them (1) Better tailor products or services to target consumers, (2) Accurate Advertising, and (3) Statistical analysis and other quasi-scientific uses (Usercentrics, 2021). We also took inspiration from Google maps, where they make money through advertising, through businesses that pay to be at the top of the search results (Rhineheart, 2022).

A Reflection on Conformity and Pushing for Agency in Future Projects

We acknowledge that Team Qubic has gone through many obstacles in the completion of this project. As a result, we have taken the time to comprehensively reflect and avoid “ending on a flat note.” This reflection was taken from SS51’s self-reflection assignment from the perspective of Carl Kho (2023). We have carefully extracted the essential takeaways to avoid self-plagiarism.

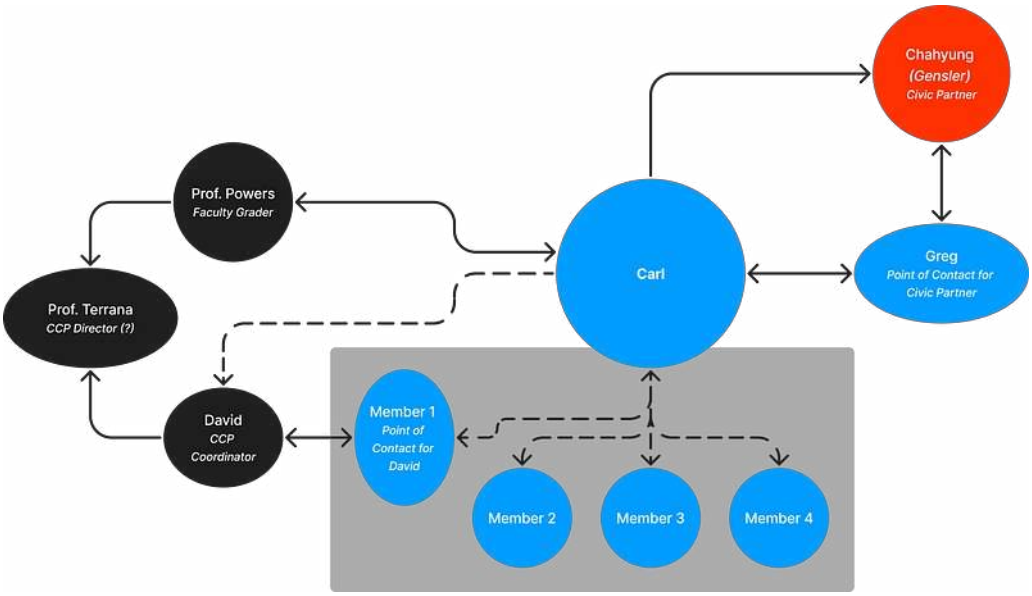
Partnering up with Gensler was a big deal for Carl because it would make a nice addition to his resume and portfolio. With that came the pressure of wanting to produce a “perfect” solution. However, as soon as he looked at my teammates, he felt unsatisfied. While it may sound harsh, he initially believed that for this project to be successful, he needed people with experience in working with product; people who could “speak the same language”. As the member with product design experience, he immediately started the design process on my own. He started dissecting research papers in aviation and ideated on a personal

inconvenience that he had in airports: wayfinding. Specifically, he wanted to take the interactive maps from airport kiosks to a phone with a Google-Maps-like user interface.

Time went by and the first assignment for CCP was due. Meeting with his members was inevitable and he can already foresee the many directions they want this project to take given the metaverse hype. Thankfully, there was one other person who had experience with product: Greg. He secretly met up with Greg before the same meeting and learned that they had the same goals: make a high-quality project worthy of a portfolio entry. Greg also saw potential issues out of working with an inexperienced team, so they started doing things on their own.

Figure 30

A Network Diagram explaining the flow of information



Note. This diagram explains the role Carl played and how it led to information conformity of his groupmates via the flow of non-conservative information in the system that is team Qubic on the individual level. The nodes represent a person. The larger the node, the more information about the project they hold. A dotted line represents weak communication while a straight line represents strong communication between the nodes. A line is bidirectional when the nodes directly interact, which is useful in this context because some nodes are specifically “points of contact” for other nodes (like Gensler and David) to certain members of Qubic. Red nodes represent the civic partner; blue represents members of Qubic; and black represents the staff from Minerva.

Carl and Greg exercised the second face of power: they kept other members off the decision-making process to reduce friction to productivity, but it started causing issues. Specifically, it burdened Carl with the threat of burnout. He was the central node of the information who had to talk about the updates to the team, faculty grader, and civic partner (technical aspects). Greg was tired of the unproductive exchanges and built-up tension, so he turned to Carl to disseminate information to the group, as exhibited by the large degree node "Carl" holds. Additionally, Carl was in charge of creating the Figma prototype, writing up the research, gathering feedback from outside experts, and preparing for presentations. In other words, he took all the responsibility for the team. And because Carl executed well, a **negative network effect** was observed in his groupmates: informational conformity to my suggestions and all future actions.

This impacted the team negatively. Enumerated is a list of how this network structure impacted specific decisions or outcomes:

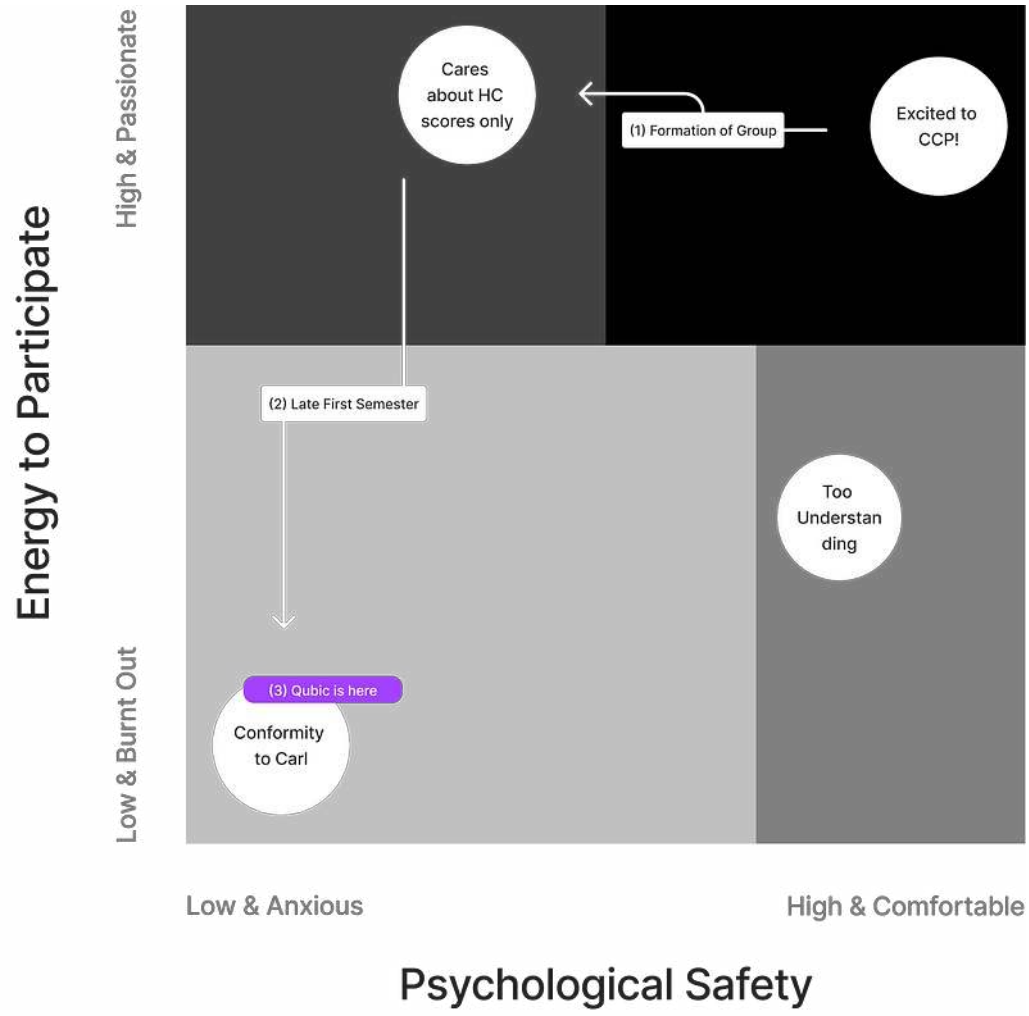
a) The initial challenge question's focus on the Metaverse platform led the team to spend a significant amount of time exploring and trying to incorporate this technology into their solution. This focus on a specific technology may have limited their ability to identify and explore alternative solutions.

b) The division of the team due to undesired team dynamics resulted in an internal conflict about the "actual solution" during the fourth iteration. This conflict required intervention from Gensler, which led to an internal pitch session to help the team find common ground and move forward.

c) The lack of a clear thought process on design decisions was evident during the sixth iteration, prompting the team to construct a logical argument to justify the need for their solution. This exercise allowed the team to reevaluate their choices and ensure that their solution aligned with their purpose statement.

Figure 2

A diagram of Qubic's Team Dynamics over time



Note. The mechanism behind energy as a dimension is measurable via academic load (assignments, lengthy pre-class works, and the number of Minerva-sponsored events); with team psychological safety measured from a survey design plus interpretation adapted from "The Fearless Organisation" by Edmondson (2018) of Harvard Business School. The numbered arrows tell a story of Qubic's movement between attractions over time.

The system dynamic diagram visualizes the movement of the system from being "Excited to CCP" to "Conforms to Carl (Group Leader)". It aims to give a more in-depth answer to the explanatory challenge "Why did my groupmates stop showing enthusiasm, leading to a lack of responsibility in the assignments?" Upon retrospection is due to two feedback loops where my members (1) feel less psychologically safe over time and (2) have lower energy to participate.

Carl's initial belief of my groupmates' lack of experience was reinforced, as he continuously shot down their ideas because it was not technically feasible or because he has witnessed the same idea to be ineffective from his experiences as a product designer. In a future conversation with one

of Carl's members, he was told that he did not give them room to expound, **decreasing their psychological safety.**

Carl also exhibited normative social conformity in the form of public compliance. When my members suggest an idea, he openly support it, but he does not act on it and push through with what he thinks is the best when working on the prototype. **This reduced his members' energy to participate** because they feel like they have no contributions to the output. Upon deeper introspection, he learned that he does this to avoid burning bridges because his mother, who is in sales, taught him the value of networks.

These feedback loops made Qubic stick to different attractors over time. Note that the low-and-low basin of attraction is large, with a critical point accessible at all basins—even when a group is high-and-high—because living under Minerva's academic circumstances makes it easy for students to abruptly burn out.

Two assignments later and the team reached low-and-low. Because Carl was worn out and focused on the prototype rather than the writeups, Qubic received low scores. This alarmed the Minerva staff. Carl reached out to my faculty grader, Professor Powers, who gave him good leadership advice with extra emphasis on giving my groupmates agency and a sense of ownership in their tasks, which Carl can later revise with them if it comes out unsatifactory.

The result is Carl's organization of an "open forum". Qubic all sought forgiveness from one another and encouraged a culture of open communication and mutual support. Carl also eliminated hard roles and gave every team member the opportunity to work on what they thought needed some work. This significantly boosted morale and helped Qubic ace the final fall proposal. They also started using Notion to plan out our specific timelines and assigned tasks. Offers of help were more frequent to sustain grit, with work-together sessions put in place for accountability and self-control. Today, we are ending the project with Gensler with a coherent solution and smiles on our faces.

Moving forward, Qubic has laid out a guide to address the issues of burnout and informational conformity, as well as to improve the overall project performance:

1. **Redistribute responsibilities**

Encourage team members to take on different roles and tasks, providing them with opportunities to develop new skills and ensuring that they are not overburdened. This can help prevent burnout and promote a more balanced workload. Implement a system to monitor the workload distribution among team members and make adjustments as needed.

2. **Improve communication channels**
   Establish regular team meetings or check-ins to facilitate open and transparent communication, allowing for better exchange of ideas, feedback, and knowledge. Utilize various communication tools, such as video conferencing, messaging apps, or project management software, to ensure all team members are kept informed and have access to the necessary resources.
3. **Encourage diverse perspectives**
   Foster a culture of open-mindedness and encourage team members to share their opinions and ideas, even if they contradict the majority view. This can help prevent informational conformity and lead to more innovative solutions.
4. **Implement a mentorship program**
   Pair experienced team members with less experienced ones to provide guidance and support. This can help build confidence, improve skills, and prevent burnout by sharing the workload and responsibilities.
5. **Enhance team building and bonding**
   Organize team-building activities or social events to promote a sense of camaraderie and trust among team members. This can lead to improved communication, collaboration, and overall team performance.

Return to Portfolio / Next Case Study

By Carl Kho on October 11, 2023.

Canonical link

Exported from Medium on October 31, 2025.