WanderIn Report

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Design Team

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Executive Summary

Job-to-be-done:

We want to nurture the spirit of exploration in people by giving organizations the tools they need to make their destinations alive-no matter what destination that may be.

Approach:

By including a wristband into our product, it will be able to navigate users to new posts that are close to their location. We also have a smartphone app that will provide geolocation data, sending it to the wristband. The app will allow users to be able to add pins and trips to be able to navigate to them as they are wandering around. Users will be able to share these locations to their friends.

Findings:

Users want an affordable tour experience at their own pace, that is personal and not shared. Having some of the trips and posts be stored locally were important to customers in case their phones died or there was poor internet connection. Other key features that were important was an accurate component that helped with location, as well as setting trips.

1. Company Synopsis

1.1 Vision

The need for exploration has become more and more relevant as people have become more attached to screens. For many 7+ hour screen time users, social media is what they do when they have no other choice than boredom. These users stay glued to their couches, feeling disconnected from the people and places around them. They have no reason to visit that old park they grew up in, that

museum that caught their eye on their last walk downtown, or that arts district across town. If these places were known to have WanderIn, the individual would be assured that they could contribute and view a unique set of content, and be incentivized to go. The individual could expect to feel less out of place because they are able to learn about it through the lens of the people who have been in their shoes exploring it before. If the place contains shopping areas, the individual would also be incentivized by the possibility of proximity based deals they could unlock. We are giving our users a better choice to the couch: going outside and exploring somewhere new. Instead of encouraging the loneliness and exhaustion that come with constant consumption in one place, WanderIn encourages people to interact with their surroundings.

The other aspect of our vision is to give organizations the ability to turn stale spaces into attractions with new life and direction. Content creators for these organizations would be able to improve and change with time in order to keep audiences attracted, and keep exploration alive. For example, the museum could leave posts connecting pop culture moments to history in order to attract the younger audiences they need to survive. A park could advertise "easter egg" hunts with local businesses offering prizes to bring the community together on certain days. They could create seasonal content for any holiday quickly and easily, without spending a ton. The options are endless when the tools are in hand.

To put it simply, our vision is to nurture the spirit of exploration in people by giving organizations the reliable tools they need to make their destinations alive. By tagging discussion and content onto map coordinates, we are integrating what people love about social media into a healthier process for the long term.

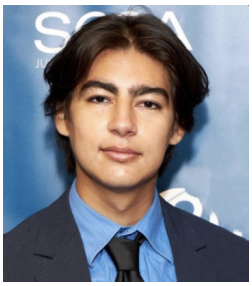
In order to nurture exploration, we prioritized reliability. We wanted to remove as many obstacles to wandering as possible. Since the IOT device includes a GPS chip, it can be used outside under different conditions. Since the connection between the IOT device and app server is done through bluetooth, no WIFI is required. Since the app backs up multiple posts and post captions from a desired trip to the wristband by pressing "GO" on the mobile app, it ensures that phone connection is not needed to access the content.

1.2 Team Bios

Our team contained a variety of skill sets that were all important to the success of the final product. We used our knowledge of each other's experience to organize ourselves into the following leadership structure. As the weeks progressed, we found ourselves supporting each other where extra work was required.

 **Miriam Hamidi** **4th year, EE Major** **CSD Depth**	**Project Lead** Miriam's design experience in the UCSD Global Ties program and systems internship experience gave her the skills to lead the overall vision of the product. Global Ties is a program that allows UCSD students to design products to support underserved communities. Because of her experience leading projects from scratch there, she was able to determine what milestones the team needed to be meeting along the way to have a completed MVP by the Maker's Fair. Understanding what materials and processes were priority every week allowed the team to stay organized. Her

	experience in C++ allowed her to support Kevin on the programming of the ESP32 as well.
 **Kevin Pham** **4th year, EE Major** **CSD Depth**	**Systems Lead** Kevin's experience in object oriented programming and circuits made him the right person to lead the IOT side programming and design. His extensive knowledge of C/C++ allowed him to design efficient classes and methods (No global variables!) that gave the wristband its extensive functionalities. He also used his skills gained in peer programming and use of libraries from ECE141 to swiftly design, test, and deploy code that comprised the UI and interfaced with the front end that Kenny was developing.
 **Kenny Chan** **4th year, CE Major**	**Software Lead** Kenny's previous experience in front end development as a Computer Engineer made him well suited to lead the app development in Flutter, an open source mobile development platform created by Google. Because of his experience, he was able to learn a brand new programming language, Dart, in four weeks in order to ensure our app would be able to be hosted on IOS and Android platforms. This platform flexibility was key because it

	meant our MVP met our reliability goal, as it functioned without Wifi and was available at all times on any device.
 **Raul Valadez** **4th year, EE Major**	**Customer Liaison** Raul's ability to source and communicate with others allowed him to lead the customer feedback and user testing area of the product. He was able to conduct a number of interviews and surveys along the way to help inform design decisions. He constructed the early version of what the UI/UX would look like and provided input on how the design could mitigate friction for the users. His experience in his ECE coursework allowed him also to support the hardware prototyping of the circuit. His soldering skills allowed for useful troubleshooting in the final MVP product.
William Tsui **3rd year, EE Major**	**Business Lead** William supported the business planning for the economic models needed to get WanderIn profitable. He helped define the business model for WanderIn to ensure that it is a direct competitor towards big companies, to maximize profit and ensure customer satisfaction. Also, he analyzed the product for maximum accessibility and ethical practices.

2. Market Overview

2.1 Market Potential

Our market potential can be defined by three terms: the total available market, the serviceable market, and the addressable market. In terms of the total market, we can consider tourists. In San Diego alone, the number of tourists per year reaches more than 30 million. These tourists have an impact of $11.6 billion dollars on the U.S. economy within one year as well. Clearly, it is in the best interest of cities, and all the parks/businesses/museums it is made up of, to serve this large audience. This is why the first market we are targeting is actually the agencies in charge of increasing foot traffic to travel destinations. These agencies would buy our product in bulk in order to make their destinations more interactive and informative.

We envision the process as follows: A member of the agency would create the initial tour by walking around the destination leaving the content. They leave whatever kind of content matches the unique needs and messages of the organization. For example, a museum may leave tidbits of history, a university may leave pointers to educational resources, a theme park may leave secret codes for prizes, or an arts district may leave event reminders. The organization then passes out the wristbands to visitors for use while in the destination. The visitor makes an account on the app and connects the wristband to the app via bluetooth. The visitor can use the map to plan the spots they would like to visit, and can group these spots into a trip. As the visitors wander around the destination, they can pin their own content to any coordinate within it. They can, for example, describe their initial reaction, a unique insight, or simply a fun picture of themselves at any coordinate within the destination. They can also view rather than create. In viewing mode, they are navigated to the nearest post through a compass on

the wristband. Along the way, the user would receive advertisements as posts when near a shop paying for an ad on WanderIn. At the end of the trip the user may return their device to the destination, but they will have been exposed to the benefits of location based content on a reliable secondary device. Having already made an account as well, the tourist would be more inclined to continue using the app and purchase a wristband to have for certain in their bag on their next adventure. This illustrates the transition between the two markets, destinations and social media users,that we eventually hope to undergo. See more about this in the customer acquisition section below.

There are some important considerations that narrow the total available market from the one mentioned above to the serviceable market. Firstly, WanderIn is a mobile app, so this in itself likely limits the market down to all tourists under 40 years of age. Having grown up in the age of mobile phones, this age group is more likely to be comfortable with finding and navigating new electronic interfaces. Another aspect that limits the total available market is that the use of WanderIn requires some initial investment of time to learn about since it is unlike other social media platforms available. The prerequisite would only be met by those with a level of financial and temporal freedom that many do not easily have access to. Destinations with these kinds of tourists would be the best fit market for our product.

In terms of the addressable market, the pool decreases in size again since the destinations with these kinds of tourists would have to also have a budget for marketing. For public places, this budget would come from the city. For private property, there would need to be interested agencies. In short, the addressable market becomes tourist destinations with a little money to spend on their young

audience. Therefore, our team would start with universities, as these destinations meet all the criteria we listed above.

2.2 Market Analysis

Our prospective buyer is an organization with a leg in the tourism industry. The organization itself can be big or small, but must have a budget for marketing in order to make the initial hardware purchase. The adoption cycle of our product would likely start around the winter holidays since that would be the time people are most available to travel and spend. The ambience of the season also makes it the best time to allow people to be nostalgic and open to connecting with the stories left behind by others. The wristbands would have a two year warranty and be continuously updated with better features, and this would allow the cycle of adoption to continue.

3. Competitive Analysis

3.1 Competition

When analyzing our competitors, it is important to consider the strengths, weaknesses, opportunities, and threats of Snapchat Maps and Yik Yak. Snapchat Maps has unique features that allow users to upload and view content specific to their current location. Additionally, they offer hardware equipment to enhance the social experience of their users. However, their two-component system, which requires users to purchase a physical device, may discourage some potential customers. Furthermore, the quality of user-generated content on Snapchat Maps may vary. There are opportunities for collaboration with local merchants to incorporate location-based promotions, discounts, or incentives. They can also target specific user groups such as travel bloggers and food

vloggers. In terms of threats, Snapchat Maps faces strong competition in the location-based social app market and must ensure appropriate content moderation.

Yik Yak shares similarities with Snapchat Maps in terms of content uploading and viewing, including the capability to include multiple types of content such as photos and videos. However, it also faces similar weaknesses and threats as Snapchat Maps. Yik Yak has the opportunity to improve the user environment by addressing negative behaviors like cyberbullying and focusing on content regulation. Privacy concerns also pose a threat to their platform.

In summary, by leveraging our unique features, targeting location-based communities, and carefully considering the strengths, weaknesses, opportunities, and threats presented by our competitors, we aim to establish WanderIn as a distinct and successful player in the market.

3.2 Our Unique Value Proposition

What makes our product unique is its distinct approach compared to other similar social media platforms like Snapchat Maps or Yik Yak. Our app offers a more precise tagging of content to specific locations, promoting exploration and interaction with the real world. For example, while Yik Yak allows users to access posts within a 5-mile radius, our app requires users to be within a few yards of a post for it to become available. Additionally, our app has a close distance detector that provides specific information about nearby objects or points of interest. This feature allows users to obtain detailed information about their surroundings. Our app includes a navigation feature that guides users on the path that they need to walk in order to reach a desired location or point of interest. This enhances the user experience by providing clear directions and facilitating seamless exploration.

Our map on the app ensures that users are always aware of the posts available in their surroundings. That feature integrates our app seamlessly into users' reality, making it an integral part of their daily experiences rather than an occasional escape from them.

4. Customer Personas

4.1 Interview

In order to gather more information for WanderIn we conducted interviews and questionnaires. Based on the interviews conducted with potential customers, several key insights were gathered regarding the device WanderIn. The full transcripts are in the Appendix. Yuliana Chavez, a second-year computer science major at UCSD expressed her interest in an affordable personal tour guide. Not everyone can afford the tours but many people would appreciate it. Yuliana emphasized the importance of personalized insights and recommendations when exploring new places, which is something current tours do not accomplish. She suggested including fun facts and recommendations for nearby locations to enhance the experience. She also expressed a preference for having directional guidance, especially inside buildings, to easily navigate to points of interest. This is something that really is able to set our product apart compared to other products including our competitors. Something that was discussed was dissatisfaction with boring facts and a desire for information tailored to her needs and preferences. Yuliana emphasized the value of input from actual UCSD students to gain authentic and relevant experiences during a tour.

Eugene, a psychology major and exchange student from South Korea, was also interested in an affordable personal tour guide. Eugene emphasized the importance of learning historical and fun facts

during a tour. She suggested incorporating pictures or short videos to aid in navigation and prevent getting lost as a tourist. Eugene also mentioned the potential of augmented reality (AR) to make museum exhibitions more interactive. She expressed a desire for a device, possibly worn on the wrist, that could point her to the nearest location of interest and provide information. Eugene highlighted the humor and on-the-spot comments that human-led tours offer, which she believes may be lacking in virtual tours.

In the third interview with Justin Unkefer, a Political Science major from Colton, CA, it was discovered that he is interested mostly for the sake of convenience. He valued informative reviews and contextual information about locations during virtual tour and suggested incorporating demonstrations to enhance engagement. Justin expressed a need for directional guidance, particularly inside buildings, to locate specific exhibits efficiently. This is something that no other application has been able to accomplish. There is a need for interesting information that is not just basic information that can easily be found through a simple Google search. The biggest difference that there could be when compared to a human led tour is that in real-life tours there's the ability to ask questions and establish connections, and with virtual tours that may not be replicable.

Based on the questionnaire that we distributed via Google Forms we found that there is a preference for exploring campus independently and not along with other people. One thing that was an issue that was raised was resistance to wearing a wristband, which is why we considered selling specifically to businesses at the beginning because then visitors would choose to use it or not and it would only have to be worn for a limited amount of time. There was an interest in touring arts areas on campus and San Diego in general such as Balboa Park. Someone said they had a preference for getting

lost and discovering authentic locations which made us want to have a way where you do not have to look at the map in order to be able see what posts are nearby. Another person expressed e xcitement about feeling like an adventurer in Wi-Fi-limited areas, which is why we incorporated a way to save trips locally and not need wi-fi.

These interviews provided valuable insights into the preferences and expectations of potential customers. By considering their feedback, WanderIn was able to be developed as a device that focuses a lot on directional guidance, and interactive features such as posts to enhance the overall touring and visiting experience. In the future, later renditions of our products after our MVP will be incorporating authentic experiences, recommendations from actual students, and elements of humor into the virtual tour can help bridge the gap between real-life tours and their virtual counterparts.

4.2 Acquisition Plan

WanderIn's customer acquisition plan revolves around two separate phases. The first will target businesses, and the second will focus more on individual persons ordering one for themselves. When targeting businesses it will be venues that aim to increase foot traffic, such as museums, universities, and parks. By offering these venues the opportunity to purchase WanderIn bands in bulk at a reduced price and subsequently renting them out to visitors, WanderIn can reach a wider audience. This approach allows potential users to experience the perks of WanderIn at a lower cost, generating interest and fostering engagement.

As WanderIn gradually gains more users, location-based communities will naturally form. To leverage the power of these communities, WanderIn will be able to look and identify the most active and fastest-growing groups and locations. By focusing advertisements on these communities,

particularly on other social media platforms, WanderIn can effectively target users who would want to be engaged and interested in WanderIn's location-based experiences. This targeted approach increases the likelihood of user adoption and word-of-mouth recommendations within these communities.

With a growing user base and increasing popularity, WanderIn will utilize time and location data generated by its users to improve its relevance algorithm for post recommendations. It will be able to enhance the precision of localization, making the app's recommendations even more accurate and tailored to the user's preferences. This level of precision can have commercial applications as well, allowing businesses to attach pins to specific sections of their stores and target users with relevant offers and promotions. Having precise advertisements will benefit both the user and the advertiser as well as WanderIn since we will be paid a premium for our useful advertising.

Through these strategic steps, WanderIn aims to eventually establish itself as a leader in providing the most relevant and engaging social media content. By targeting venues, forming location-based communities, and utilizing data-driven algorithms, WanderIn will be the go-to platform for users seeking location-based experiences.

4.3 Personas

Museum Tour

Raul decided to go into a museum at Balboa Park. Upon entering he was offered to rent out WanderIn for a personalized tour at his price at an affordable price. He could not help but take up the offer. This is probably the third time he has ever been in a museum so he was not really familiar with all of the art pieces. Luckily the museum had input posts so when Raul approached an art piece it would give him insights and he could read more about the pieces and about the artists. He later was

particularly interested in a specific artist, so with WanderIn it led him to all of his art pieces using the accurate directional arrow. For a margin of the price, he experienced a tour at his own pace, in his own direction.

Railroad Adventures

Kevin decided to go on a trip to the Grand Canyon in Arizona. Once he arrived there, he wanted to try out his new social AR product that he had just purchased a few days ago. He set WanderIn to its active mode and walked back to his car. Minutes later, he received a faint, pulse-like notification from his WanderIn wristband. The wristband had an arrow which pointed to a railroad station nearby. Curious, he followed the compass from the wristband. As he followed the arrow from the compass, the wristband pulsed with greater frequency. Once there, the wristband notified him that a post had been posted nearby. Kevin opened the WanderIn app to view the memory, to see that another user had shared that they had taken this train to a beautiful tourist destination nearby. Intrigued by the destination included in the post, Kevin took a trip to this location using the same train that the other user had shared via WanderIn. Kevin shared a comment on WanderIn of his trip as well, and had a fun time at this newfound location.

The Printer's Savior

Ankeen, an electrical engineering student at UCSD, wanted to print her cheat sheet right before her midterm exam on active circuit design. She had heard of printing services on campus that charge a fee to use from many of her friends. She decided to use the one at a student center on campus. As she pulled out her credit card to pay for this service, she received a notification from her WanderIn wristband. She stopped trying to pay and opened this WanderIn post on her phone. The post that

someone had left a while back said that there is free printing and other test-taking supplies at a student-run space nearby. Ankeen walked over there and is happy to see free printing and many other free supplies available to her. Without WanderIn, she would not have known about the free resources that helped her prepare for her exam.

Foodie Expedition

Walking in Downtown LA, Raven feels hungry as the sun starts to go down. She's with her friends and they can't decide where to eat because they're not from LA. She remembers that the WanderIn app has posts in random locations so she goes to the nearest memory. Raven stumbles upon an ad for a restaurant in the form of a memory and learns about multiple restaurants this way. The group starts looking at different locations and begins to decide where to go. After looking for a while, they decide to eat at an Italian restaurant that has a lot of positive memories from customers on the app. In this case, the WanderIn app has become a more immersive experience in a yelp oriented experience. Raven and her friends enjoy their meals and end the night happily after leaving a positive memory for other users to go to and find after them. WanderIn allows for users to discover new restaurants and other places that they have never seen before.

5. Product Details and Design

5.1 Overview

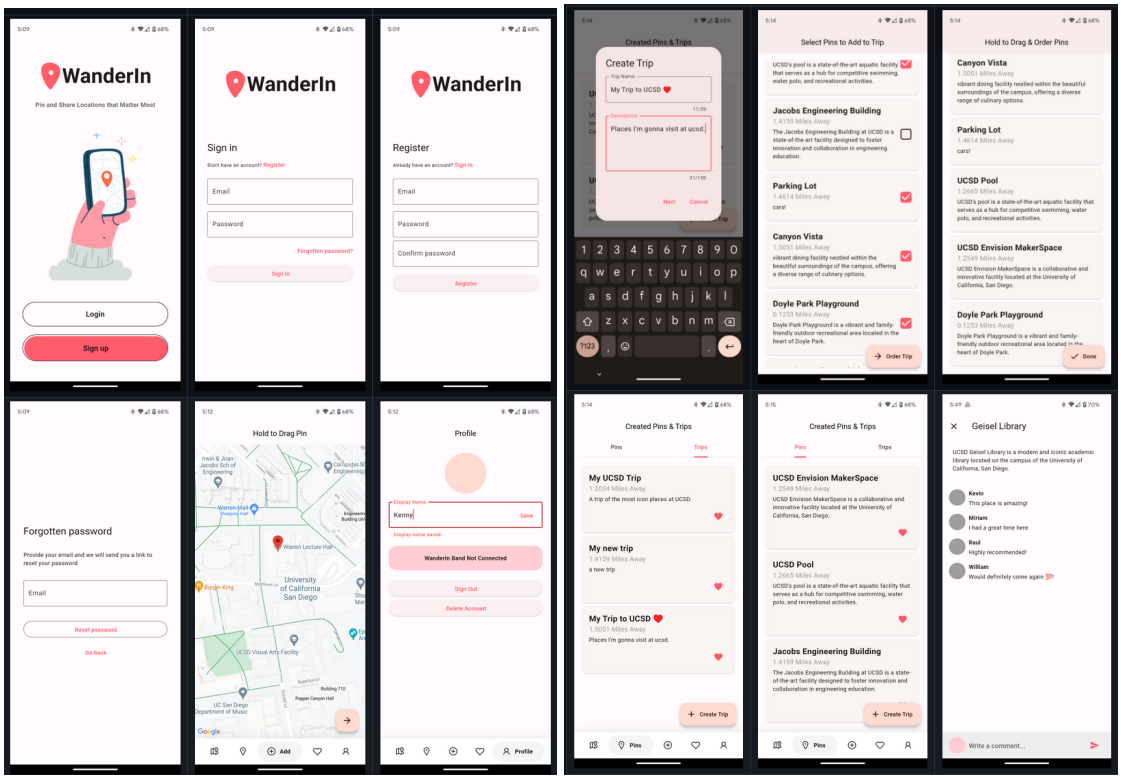
Our main job for our product was to build two components which include the IoT wristband (WanderIn Band) and smartphone application to send data to the IoT such as geolocation data, and pin data such as the name of the pinned locations. We needed to design a way for users to create trips as

our main customers would be tourists such as museums and campuses such as UCSD. We came up with the idea of pins and trips where pins are locations that contain post data such as the description of the place, title, and comments of the place while trips are a collection of pins which would be used to help the user to navigate to multiple pins as well as to be able to share the location to friends. (future feature) We also wanted the IoT wristband to have additional value which the phone did not provide such as ease of navigation by displaying a compass on the watch and loading trips and pins for offline viewing. Additionally, this wristband would have to be as inexpensive as possible since we are essentially also competing with smartwatches.

5.2 Detailed Design (Mobile Application)

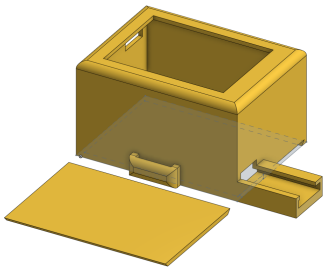
For the mobile application, we decided that we needed a way to create an application that is cross platform so that both Ios and Android users would be able to use our application. We also wanted a framework that would also support low level functionality such as bluetooth as this is the primary way of communication between the mobile application and wristband. From a developers perspective, we also wanted a framework that would be able to quickly prototype a MVP as quickly and efficiently as possible while still being able to design an elegant UI. We decided to choose Flutter as our framework and Firebase for our database as integration such as Firebase Auth and Flutter is really easy as both are Google products which allowed us to quickly prototype and build an authentication system as well as a consistent UI design with Google's Material Design pattern. With this, we were able to build a cross platform, performant, and user-friendly interface for WanderIn. As for the trip creation, we wanted a way for the user to be able to easily create trips in the most intuitive way possible while also reducing development time due to strict deadlines. We came up with a solution where the

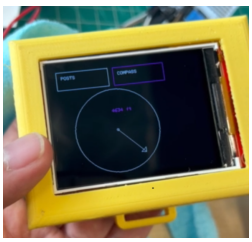
user would use their already existing pins to create trips by selecting their pins and dragging them to reorder the trip's order which can be seen below. Check out our [github] for a full video demo!



5.2 Detailed Design (IoT WanderIn Band)

For the wearable, we wanted something that is simple and easy to use. We tried to make it as small as we possibly can so that users can easily wear this device around as they are wandering. The case of the wearable has been designed using OnShape and 3D printed. The components within the wearable consists of an SparkFun ESP32 Thing Plus, an OLED display, a GPS chip, a battery, and a rotary encoder.





5.3 UI Considerations, UX Considerations, and Accessibility

For our UI, we wanted a consistent design layout while also having a consistent UI layout. We decided to take inspiration from Instagram's UI navigation layout and used Google's Material UI design to help us with colors and user accessibility such as color impairment and font spacing. Using Google's material UI framework allowed us to create a modern-looking and familiar feeling UI that is consistent across both Android and Ios ecosystems to ensure that our application is available to as many users as possible. We also made sure to design a way for the user to be able to know whether their WanderIn band is connected to their mobile device in the profile page to help with any troubleshooting with the bluetooth device. We also used Google Maps API as their map interface is very familiar, making it more accessible and easier to use for the user. As for account accessibility, we used Firebase Auth to allow the user to be able to delete their account, change their username, etc. Firebase Auth would also allow users to be able to easily sign in with third party auth providers such as Google, Apple, Facebook, etc.

6. Cost and Revenue Models

6.1 Advertising-Based + One-Time Purchase Revenue Model

The primary source of revenue for WanderIn would be advertisement. Specifically, we would have a cost per view system for each advertisement post. Having a system that is cost per view rather than cost-per-click (CPC), or cort per thousand impressions (CPM) makes sense because the value of a post on WanderIn makes sense because it places value on every single view($0.05). This makes sense because foot traffic is inevitably going to be less than online traffic. Additionally, the value of an ad on WanderIn is more valuable than anywhere else because of the proximity and convenience factor. Since every ad will only be displayed upon proximity to the location of redemption, customers will be inclined to stop by because of the convenience. This works functionally the same as a counter of on sale or miniature items presented to a retail shopper before checking out, so is not to foreign of a concept.

The benefits of this model is it is easy to set-up on our side and allows for good targeting of audiences. The only drawback is a unique platform and so companies may be unsure about whether they will generate revenue from our ads. In order to remedy this issue we will allot a small portion of our initial budget to third party market research on our proposed model. Although it will be a bigger cost compared to some other initial ones, this decision will allow us to position ourselves better in a market that has not really seen such precise ad targeting before.

The secondary source of income is the one time purchase of the hardware for the wristband. See the section below to view more details on the components and projections we are making for this part.

6.2 Material and Business Costs

Material Costs

- ESP32: $10
- 4IN OLED: $2
- GPS CHIP: $5
- BATTERY: $3
- ROTARY ENC: $3 Total Material Cost per Unit: $23

Business Costs

- Manufacturing Cost per Unit: $3
- Employee Cost: $500,000 per year
- Office Cost: $500 per month

Profit Calculation

- Selling Price per Unit: $45
- Profit per Unit: $45 - $23 - $3 = $19

6.3 Profitability Timeline

Based on the provided information and assuming the sale of 30,000 units in the first year, we can calculate the financial outlook as follows: Material Cost for 30,000 units: $23 * 30,000 = $690,000 and manufacturing cost for 30,000 units: $3 * 30,000 = $90,000, Total Cost (Material + Manufacturing)

for 30,000 units: $690,000 + $90,000 = $780,000 and we have a total profit for 30,000 units to be $19 * 30,000 = $570,000. For our initial plan, we plan to produce about 1000 units for people to try on campus tours by allowing them to try the wristbands for free to test the market and to perform research and development on our product. From there, if we have enough market attraction or success we plan to produce 30,000 units as mentioned.

7. Traction to Date

So far we have been able to get the initial prototype completed for this class. To keep the momentum going, the best next approach would be trying to understand how to use the time and location data gathered to build a strong relevance algorithm. We could group people with events, and those events with keywords that would inform which posts would be most relevant to them. This way, while navigating, the user could select "most relevant" when they have less time to explore. How and where a person spends their time is a powerful indicator of the kinds of content that they would be interested in.

Another smart next step would be to build relationships with local destinations that would allow for better user testing of the app. We could test a variety of settings and demographics with the final MVP to inform the best way to proceed. Since there are a number of things that will have to change upon the miniaturization of the wristband, more testing would allow for a more defined priority list of features for different demographics.

8. Project Review

8.1 Summary of Efforts

In short, in the last 10 weeks we have designed, prototyped, and conducted user testing on our design for the WanderIn app and wristband to reach our final MVP product. We were able to narrow down our target audience, focus on reliability. We iterated through several different approaches after merging teams and came to a better solution in the end. After merging, we prioritized giving the wristband features that could be used without a phone in order to ensure its ability to stand alone.

8.2 Problems

Initially upon merging our group was unsure about which direction the product would take. We had a hard time coming to an agreement about the best use for the iot device. After hearing in class that we needed to narrow the scope, we decided the best direction to meet both challenges would be to focus on tourists. This made sense because it allowed for clear growth from one market to the next over time despite making a more targeted start point. The focus on tourists also made the IOT component more of a necessity because it created a greater need for a reliable secondary device to a phone

8.3 Successes

We were able to completely finish our goal for the MVP. We learned a lot about new programming languages, interfaces between platforms using bluetooth, hardware best practices, and 3D printing along the way. We collaborated across Figma, LucidChart, Flutter, Arduino, and Python to meet our goals. We were also able to learn more about business considerations like cost of the bill of materials and best revenue model for our app.

8.4 Lessons Learned

The greatest lesson this project has taught us is that having a variety of opinions, no matter how opposite they might be, are helpful in improving the final product. Because our groups merged, we were able to gain new perspectives that improved the overall design.

9. Accessibility and Ethical Considerations

The accessibility of the app was a major consideration in the design process. The UI design of the app is unique and simple to use for an absolute beginner. For the homepage, the login screen allows users to quickly enter that account and provides an option to reset a password if the user forgot it. We also allow the user to quickly make an account by answering only a few questions, making the app accessible to quickly use. When the user logins to their account, a detailed list of landmarks appear which are local attractions nearby. With a list of local attractions, the app is accessible for those who want to explore nearby places. We allow users to create trips, where users could add existing pins on destinations already implemented in the app. With the self-custom pins, we allow users to create their own trip based on their own individual choices. We provide a connection to the Google Map API framework, where we allow the user to create a pin on any location they want, making the app accessible for users who want to make their own destinations. To provide more accessibility, we allow users to rearrange the pins for each trip, whether or not they choose pre-existing ones or self-custom choices, to avoid having to worry about having pins in order. We also allow users to comment on pre-existing pins to provide suggestions to other users on whether or not that landmark is something worth visiting, making the app more accessible to users who have trouble deciding where they want to

go. With the hardware component, we allow users to connect to the app with it and there, it serves as a compass to navigate the user to the nearest destination. The hardware component serves as a convenience for users who might have little battery on their phones to navigate their trip or need something more portable and convenient that could make their trip easier to follow.

Instead of having a touchscreen hardware component, we decided to use a potentiometer which is better because it requires less controlled movement. With screens, fingers can easily slide. With something that can be turned and pressed using straight on force, less precision is required. With the feature, the product is more accessible to those who may have impaired use of their hands. The colors in the app provide contrast for a good visual, rather than having dark and light colors mixed together all at once. With the colors, we also accommodate the users who are sensitive to color impairment, and instead provide a stable color design that blends with one another. The hardware component also does not need wifi to function, where if the user is in a place where there is no wifi, he/she could still continue to explore with the app. The trips do not need wifi to function for the user to explore local destinations.

Critics have questioned competitors such as Snapchat Maps and Yik Yak regarding their ethical practices. In the article "Snapchat's Newest Feature Is Also Its Biggest Privacy Threat," written by a popular news company, The Verge, they criticize Snapchat for invading the privacy of users, where they collect data of a user's exact location and share it to other users nearby. The concern raises issues for younger children who are not primarily aware of the dangers of sharing their exact location, especially towards random strangers. With collecting data of a user's exact location, Snapchat is using it to make more profit with selling the data to third party companies. YikYak is also criticized for unethical

practices. According to "In Rise of Yik Yak App, Ethics and Profits Collide," written by the New York Times, its location service was manipulated by criminals to identify large gatherings within multiple college campuses, including Clemson, Emory, and Colgate and issue threats of mass violence. The app also is being manipulated by criminals through its chat system, where users could chat with others within a nearby radius, to promote cyberbullying to other users.

However, WanderIn respects the privacy of all users. The app does not collect data about the location of any user as is. If we chose to add that to our app in the future, it would routinely ask for permission. Despite the app requiring the location of the user through making a pin, the app does not save this data into a database and location of the user is only used when running the app. Also, WanderIn does not collect information of a user's exact location and sell it to third parties. We plan to only use it for algorithms that improve relevance, and to keep that data stored locally. We also do not plan to share live locations except amongst friends, which prevents any collection of data that might infer large gatherings. With this, we prevent criminals from exploiting our app to use it to identify large areas of gathering to issue threats to our users. WanderIn does not promote cyberbullying and will provide content filtering and reporting to prevent such attacks.

10. Appendix

Interview 1:

Raul: Hello, can you introduce yourself?

Yuliana: Hello, my name is Yuliana Chavez. I'm a second-year computer science major here at UCSD.

Raul: And where are you originally from?

Yuliana: I am from Pico Rivera, which is in LA County.

Raul: So I have some questions. Would you be interested in having a personal tour guide at a more affordable price?

Yuliana: Yeah, I'd be interested in that. It would make going places more interesting knowing about the facts, about the location, so I would be interested in that.

Raul: What are some things you would like from a personal tour if it was provided virtually?

Yuliana: Well, when I go to new places, I like actual personal insights. For example, if I go somewhere to eat, real recommendations from real people or if it is a place that has facts, I'd like the facts to be kind of personalized towards me and like what I need.

Raul: What is something that you wish that tours, museums, and other areas of interest had to make or would do in order to make them more engaging? If there was no problem in making these things?

Yuliana: Something more engaging that I could think of would be maybe fun facts about the locations or different places you could visit nearby these locations to learn more about the place you were visiting. For example, if I go to a museum, maybe they could give recommendations of interesting museums that I would like nearby or interesting places to eat or any ideas or facts that would be personalized towards my needs.

Raul: Many times the maps could not be as accurate. Would you be interested in having an arrow be able to point you to the nearest point of interest?

Yuliana: Yeah, I think that'd be useful. If an arrow would point me towards the location, I think that would be useful.

Raul: Yeah. Specifically inside of buildings. Maybe show you exactly where this exhibit is and stuff.
Yuliana: Yeah, if the arrows accurately depict where I should be walking towards, that would be very helpful.

Raul: Okay. So what are some things that you do not like about taking a tour? Maybe if you went on a UCSD tour or any other college tour, is there anything that you wish could be different?

Yuliana: Something that I wish would be different would probably be not giving boring facts. Maybe like, let's say I'm going to Geisel Library, and they tell me when it was built and who built it. I'd probably want to know what places I could study, like which places have less crowded people and more available space for me, places nearby that I could go. So just like not facts that you could find on any website, maybe like facts that are geared more towards...

Raul: Personal input that someone who attends here would be able to give you?

Yuliana: Yeah, it would be interesting to hear what other people think that are actual UCSD students and not just like the workers.

Raul: Sometimes this might be something because it is a group, and maybe on one-on-ones they are able to maybe give you a more personal experience. What are some aspects of a human-led tour that

you think a virtual tour could incorporate or draw inspiration from in order to improve? So what are some aspects of real-life touring that you think virtual touring might not do as well?

Yuliana: Yeah, similarly like what I mentioned, just being honest about places and giving their own personal stories or interactions they had at certain locations of the tour. I feel like that would be more interesting than just hearing a monotone robot saying facts, but hearing an actual person's voice speaking about their experiences.

Raul: Okay. Thank you.

Interview 2:

Raul: Hello, can you introduce yourself?

Eugene: Hello, my name is Eugene, and I major in psychology and communications.

Raul: And where are you from?

Eugene: I'm from South Korea, and I'm an exchange student here for one year.

Raul: Okay. I have some questions to ask you. Would you be interested in having a personal tour guide at a more affordable price?

Eugene: Personal tour guide? Sounds fun. Yeah.

Raul: What are some things you would like from a personal tour provided virtually?

Eugene: Provided virtually? Do you mean like... so if it wasn't an actual person, maybe like on a screen or something like that? Like what is something that you would like from that?

Eugene: I'd like it if they could provide, like, maybe if we're going to a historical monument, I'd like to know some history behind it or some fun facts about the place that normally people won't be able to know. Also, it might be helpful if they could include pictures or short videos to show specifically where I might need to go because it's easy to get lost as a tourist.

Raul: Okay. What is something you wish that tours and museums had to make them more engaging? If you can think of anything.

Eugene: More engaging, huh? I know these days there are these AR things coming out. If you scan an image, sometimes you can make it more interactive. That might be a fun kind of addition to museum exhibitions, but I don't know how possible that is. (Laughs)

Raul: Um, would you be interested in maybe a device that's on your wrist and then it points to where the nearest location is with information, and then it sends that information to your phone?

Eugene: Yeah, that would definitely be helpful for people like me who are very bad at finding directions. Also, if there's a search feature, that'd be pretty nice. Like, where would the next Van Gogh exhibition be, you know? So maybe like a map feature.

Raul: That'd be pretty cool. I would like that.

Eugene: Uh, what are some aspects of a human-led tour that you think a virtual tour could incorporate in order to improve? So for instance, everyone has human tours, but when you think of a virtual tour, what are some things that you think might not be as good as if a human were doing it?

Eugene: Um, definitely some humor aspects might be harder or like on-the-spot kind of comments because these virtual tours are very programmed and you can't have human interactions with it. So maybe you may be able to joke with your tour guide, like, "Oh, this picture looks funny because of something." But with a virtual tour guide, that would be quite impossible in my imagination.

Raul: Okay. Thank you.

Interview 3:

Raul: Hello, can you introduce yourself?

Justin: Hi my name is Justin Unkefer and I'm currently enrolled in UCSD as a Political Science major

Raul: And where are you originally from?

Justin: I'm from Colton CA.

Raul: So I have some questions. Would you be interested in having a personal tour guide at a more affordable price?

Yuliana: Sure, it would be convenient to have someone show me spots instead of having to wander around

Raul: What are some things you would like from a personal tour if it was provided virtually?

Justin: Having reviews or facts about somewhere would be informative. It would be cool to have some context about where I'm at or where I'm going

Raul: What is something that you wish that tours, museums, and other areas of interest had to make or would do in order to make them more engaging? If there was no problem in making these things?

Justin: More demonstrations instead of just hearing about something. I remember going to the LA science museum In elementary school and there was a platform that mimicked seismic activity. It makes retaining information easier when I can associate a sensation with what I learned- that's why I still remember what I learned there after all these years

Raul: Many times the maps could not be as accurate. Would you be interested in having an arrow be able to point you to

Justin: Of course. It would help keep me from losing my sense of direction

Raul: Yeah. Specifically inside of buildings. Maybe show you exactly where this exhibit is and stuff.

Justin: That would be a massive help because so many exhibits are close by each other. Knowing exactly where to go would save time

Raul: Okay. So what are some things that you do not like about taking a tour? Maybe if you went on a UCSD tour or any other college tour, is there anything that you wish could

Justin: Getting information that I could've just Googled is always a let down. I remember looking up information on Geisel and the facts that I saw were pretty basic (for lack of a better term). However, I heard from a friend of mine that it was used in the movie "inception", and that shocked me more than anything I was presented with on Google.

Raul: Sometimes this might be something because it is a group, and maybe on one-on-ones they are able to maybe give you a more personal experience. What are some aspects of a human-led tour that you think a virtual tour could incorporate or draw inspiration from in order to improve? So what are some aspects of real-life touring that you think virtual touring might not do as well?

Justin: The only thing that comes to mind is the human interaction aspect of it. A person can always ask questions and build some kind of connection, or maybe crack a few jokes about what they're showing me. However, a virtual assisted tour guide won't be able to do any of that from a genuine place of interest, it would just be programmed to do so .

Raul: Okay. Thank you.

Interview 4:
Raul: Hello, can you introduce yourself?

Anthony: Hello, my name is Anthony Lopez and I am a Junior student studying Communications.

Raul: Would you be interested in having a personal tour guide at a more affordable price?

Anthony: I would enjoy having a personal tour guide because they provide the knowledge of the area you are at. Based on my own experiences, having someone that is knowledgeable of the location is a great time saver.

Raul: What are some things you would like from a personal tour if it was provided virtually?

Anthony: I would like a virtual guide to provide reservations to sightseeing locations and dine-in spots available for us. I would want the virtual personal tour to have everything organize and keep me at ease the whole trip. Some alerts notifying me that our next excursion will begin.

Raul: What is something that you wish that tours, museums, and other areas of interest had to make or would do in order to make them more engaging? If there was no problem in making these things?

Anthony: I believe having hands on interaction to something similar to the topic. Such as if we had a tour of Italy and the rich meals they used to make due to crops available and then we had to make a meal that we can enjoy. That would be a great way to learn about the history of the topic.

Raul: Many times the maps could not be as accurate. Would you be interested in having an arrow be able to point you to the nearest point of interest?

Anthony: I believe that would be great especially when you aren't in a vehicle, maps has a lot more trouble getting me around when I am walking on the streets. Especially in buildings as well, I am trying to look for the specific point of interest but it isn't very specific.

Raul: What are some things that you do not like about taking a tour? Maybe if you went on a UCSD tour or any other college tour, is there anything that you wish could be different?

Anthony: The thing I hate about tours are the fact that you are in a group with others. I don't mind the group but I would enjoy a private tour either with my friends or just myself. Most tours have to be with random strangers. I also hate if I want to change my mind on what I want to do I won't be able to because the tour is set.

Raul: Personal input that someone who attends here would be able to give you?

Anthony: yeah personal input form someone who attends would be really great. Especially if it's something that is more pertained to your interests.

Raul: What are some aspects of a human-led tour that you think a virtual tour could incorporate or draw inspiration from in order to improve?

Anthony: I believe just having that human tour guide gives more of honest feedback back of awesome locations to go to and places to see. Especially with information provided to you, you are able to get that sense of realism instead of having a robot voice talk to you.

Raul: Okay. Thank you.