



AIRPORT WAYFINDER

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Executive Summary

Passenger experience and innovations in airport terminal design has long been an important aspect in the airport and aviation community as a whole. As airports have grown, so has the need for advancements in wayfinding (navigation around the airport). According to Report 52 from the ACRP, “There is no single document or guidebook available to airport operators illustrating best practices for wayfinding and signing the airport terminal and landside”. This challenge presents an opportunity to employ leading-edge technology which can help increase passenger experience from a navigational perspective. The proposed solution is a mobile application (app) that provides passengers with real-time directions in and around the airport. The proposed Airport Wayfinder app will use multiple features in an easy-to-read format that will allow passengers to navigate airports from parking to the gates with support from digital graphic directions, thus helping passenger wayfinding difficulties in the palm of their hand. Passengers should be quite familiar with following a directional line due to the popularity of apps such as Apple and Google maps. Airport Wayfinder will help build on this familiarity to allow for a smooth transition to the app. The directional line for navigation on the app will provide passengers with real-time easy to follow directions, which will enhance airport wayfinding even in unfamiliar airports.

Overall, Airport Wayfinder will provide navigation in and around airports, decrease confusion, along with increasing passenger awareness and experience. All these benefits will come to fruition with an initial cost of \$100,000.

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2. Problem Statement and Background

Navigating in and around airports is often a stressful time for passengers. With the expansion of terminals, the process of wayfinding has become more difficult. Research done in 2007 by Alexandre De Barros found that wayfinding is the fourth most significant variable among 21 customer service variables for connecting passengers. The following year in 2008 another researcher found wayfinding to be the third highest ranked among 10 levels of service variables (Correia 2008).

As airports continue to grow, so does the need for innovative ways to increase passenger experience. Although wayfinding is not the most significant variable of customer service variables for connecting passengers, it is clear that there is a need for an innovative app to help lessen the workload on airports.

Attempts have been made before for airport wayfinding on a mobile device. These attempts were from legacy carriers such as American, Delta, and United. Although these apps have airport terminal maps on them and can give real-time directions, the apps were originally designed for that specific airline. The apps that are in place do not come from the point of view of airports, but instead from airlines, they miss certain important aspects of airports.

3. Literature Review

3.1 Airport Wayfinding

Research done in 2007 by Alexandre De Barros found that wayfinding is the fourth most significant variable among 21 customer service variables for connecting passengers. Airport wayfinding has been around since the middle of the 20th century. After being around for over half a century it has changed significantly. From static signage to now the digital world has brought changes, but with those changes difficulties still remain. Some potential difficulty in airport wayfinding can stem from building design, layout internally along with exteriorly, and signage (Churchill, 2008). Churchill brings up the idea that wayfinding difficulty can be more than just the signs posted. The building design of airport terminals can be an aspect. With the building design, it can mean more than just where the gates are found, it can be the size (length or width) of the terminals. The layout of the airport brings up an interesting point on how airports should be laid out. Whether airport designs inside the terminal are adequate and if they can be improved upon can be an important topic discussed. Signage is an important part of airport wayfinding because it can direct the passengers to where they should be going. The end goal with Airport Wayfinder is to not only aid passengers in wayfinding, but also airports with that level of stress that comes with wayfinding.

3.2 Passenger Experience

One example of what can be a key part of a passenger's experience are airport lounges. Lounges are an integral part of the airline's customer satisfaction, enabling an airport to differentiate from other airports and get a cutting-edge competitive advantage over the latter (Han et al., 2012; Tsafarakis et al., 2018). Lounges can play a pivotal role in shaping the overall experience of passengers with an airport.

Another aspect of an airport that can affect the passenger experience is parking. A study done in 2009 reports that around one fifth of airport commercial revenues are coming from parking space management (Graham). Parking is an integral part of airport revenues. Understanding the current systems in place for navigating passengers through parking at airports can greatly help a mobile app.

Furthermore, another aspect of an airport that can affect the passenger experience would be delays. Although delays can be associated with the airlines, delays can also be brought on from the airport. Delays are fundamentally related to one of several issues: (a) higher scheduled demand than capacity or over-scheduling (b) a larger arrival rate than scheduled, (c) a lower service rate than scheduled, or (d) a smaller number of servers than scheduled (Wang, 2011). Delays at airports can affect how passengers perceive the airport.

3.3 ACRP Published Resources

The Airport Cooperative Research Program (ACRP) grants access to documents, webinars, and many other resources for airport managers along with consultants alike.

ACRP published a report in 2011 called the ACRP Report 52-Wayfinding and Signing Guidelines for Airport Terminals and Landside. In this report it goes over how airports have more users than just passengers. In the ACRP Report 52 it categorizes airport users into seven such categories. These categories are, unfamiliar passengers or drivers picking up or dropping off passengers, familiar passengers or drivers picking up or dropping off passengers (when changes are made), passengers with disabilities of various kinds, non-traveling visitors who are there to greet/sendoff passengers, ground transportation drivers, delivery drivers, and airport employees (ACRP, 2011). With the various different users that airports have, signage must be considered as well. Airports must display signage that makes sense to all the distinct categories. The structuring of airport signage can be a time-consuming endeavor. ACRP Report 52 said this about signage, "A simple hierarchy of guiding passengers from the gate to baggage claim and ground transportation can simplify the number of messages without having to use a comprehensive list that creates information overload." A key factor in airport wayfinding stems from the posted signage, understanding this can greatly help the developing of an app to improve upon such aspects.

Another document published by ACRP in 2017 is called ACRP Report 177-Enhancing Airport Wayfinding for Aging Travelers and Persons with Disabilities. This document provided guidance on the needs for passengers that have disabilities along with what disabilities airports work with when deciding their wayfinding system. It also

provided guidance on the strategies that should be implemented to further better the communication at airports.

One final document that is used is ACRP Report 131-A Guidebook for Safety Risk Management for Airports. This document helped offer the guidance needed in the aspect of the conducting safety risk management process. A safety risk management process was taken by the Airport Wayfinder personnel in part with the development process. One of the critical components needed in deciding the feasibility of implementing Airport Wayfinder in the real world is an exact determination of the risks that are involved with the project. These risks could be in the physical world (passengers glued to the screen and not seeing the surrounding area) or in the digital world (passengers providing their location and the connection to one's personal phone).

4. Problem Solving Approach and Design of Airport Wayfinder

4.1 Design Overview

Navigating airports can be a challenging task especially when it comes to ones that are unfamiliar. Although airports have maps and signs in the terminals, wayfinding can still be difficult when it comes to finding a gate or security or even parking. This may be even more intensified when it comes to passengers that are in a time crunch. In order to help passengers, airport staff, airline staff, and the airport as a whole when it comes

to passenger experience, Airport Wayfinder has been developed to bridge that gap for the community. Airport Wayfinder brings a map of the airport to people's fingertips. The map uses the current airport diagram from the parking lot to the terminal and illustrates the directions provided on a user-friendly interface to give passengers another tool to where they need to be.

4.2 User Interface

Having a user-friendly interface is crucial for mobile applications. The app must be easy to use, have the correct information, and primarily be functional for what the person is trying to find. Other apps have been developed that are similar to what Airport Wayfinder would bring to the table, but they have more than just airport information due to the fact they are airline applications. Airlines such as United, Delta, and American have their own apps. On the United app they offer a variety of airline centric offerings such as booking flights, switching flights, managing trips, and flight status. On the airport side they have airport maps for around 30 United States airports along with a few international airports. Along with having that map, it also allows the individual to click through the many different tabs they offer which are coffee, bars, ATM, lounges, charging stations, headphones, restrooms, baggage claim, and shuttles. Once you click on a place you need to go to, it also offers individual directions to said location. These maps show all the features a passenger would need when they are inside the airport terminal. Americans' app has around all the same features as United, but some of the airports they have listed are different due to the routes they fly. Even the airport's maps have the

same tabs along with offering directions to whatever said place a passenger needs inside that terminal. Delta's app has all the same airline features the other two airlines offer as well, but on the other hand their map varies just a little differently. Once you look up a commercial airport on Delta's app it will take the individual directly to Google Maps. While the legacy carriers do offer their own airport maps, Airport Wayfinder, the proposed app, will bring together all of these concepts the airlines have brought forth to the table and put it in one centralized airport wayfinding app, along with bringing an expansion of those ideas to the rest of the airport. Apps from the legacy carriers have the airport maps or will bring an individual to a place that shows the full map and they can even give an individual said directions to whatever place one will need inside the airport terminal, but there are other essential places at airports that are considerably left out. While the app on one hand would not be associated with the airlines, meaning that passengers would not be able to manage their trip, alternating as they seem fit, but on the other hand passengers would be getting an all in one airport app that can not only give directions inside the terminal, but from the very moment an individual requests it. This would allow individuals with another choice to use, for example, when finding parking lots at an airport, Airport Wayfinder can be a helpful tool instead of just using signage. With this tool, confusion and frustration at airports can be minimized for passengers. Overall, the goal of Airport Wayfinder is to help with passenger experience at airports from the very first moment a passenger arrives. By creating an app specifically

designed for airport wayfinding, we believe airports will be less frustrating and confusing for passengers, ultimately increasing the passenger experience.

The users of Airport Wayfinder will find a user-friendly interface that would be ultimately comparable to what the legacy carriers offer. Users will be given upcoming directions on their phones, similar to Apple and Google maps, where they will be able to see the route, they are on, along with the time left to get to said place. The home page of the app will have different sections that users would be able to click on to help them get directions. Figure 1 will show the home page of the application. The example airport for these figures is Chicago O’Hare International Airport (ORD).



Figure 1. Homepage

Figure 1 is the homepage of the app. On the homepage the user can search the airport they want to find directions for, or they would also be able to click on the direction

arrow next to the search bar to enable their location. On the homepage of the user's desired airport the following sections will be shown, parking, food, restrooms, airlines, relax, shop, TSA, and airport information. Along with those sections, the airport diagram will also be shown to the right of those tabs. Once a user clicks on the parking section of the home page Figure 2 will be shown.



Chicago O'Hare International Airport		
Parking		
Hourly	Open	\$3/first hour
Daily	Open	\$42/day
Economy F	Open	\$22/day
Economy G	Open	\$15/day
Economy H	Open	\$15/day
Terminal 5 - Lot D	Open	\$3/first hour
Click to get Directions		

Figure 2. Parking Tab

Figure 2 is shown as an easy-to-read section for passengers to accurately see what parking lots the airport offers, along with the rates, and whether the parking lots are open or full. The click for directions button at the bottom of the screen will take the user to Figure 3.

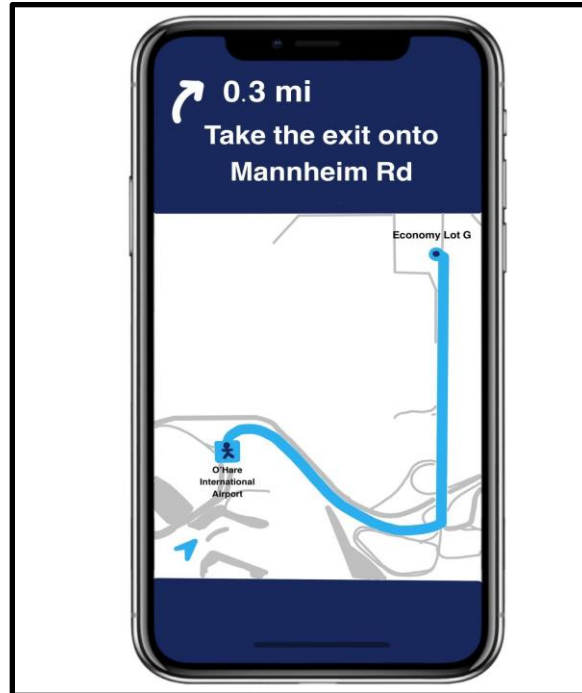


Figure 3. User Takes Directions to Economy Lot G

Once a user chooses their desired lot, in this example the lot is Economy Lot G, the user will be given directions from their location. As shown in Figure 3 the directions given are similar to the likes of Apple and Google maps. The arrow shown is the user's car on the highway. The location of the user will be located by GPS to give the user accurate directions and placement. As shown in Figure 3 the user will be guided to the parking lot by a blue line. Figure 3 shows the upcoming exit the user must take in order to get to their desired parking lot. In this picture we see that the user is 0.3 miles from the exit and the exit will be a slight right turn. Figure 3 also shows the other various roads that the user should not take, which are that gray color.

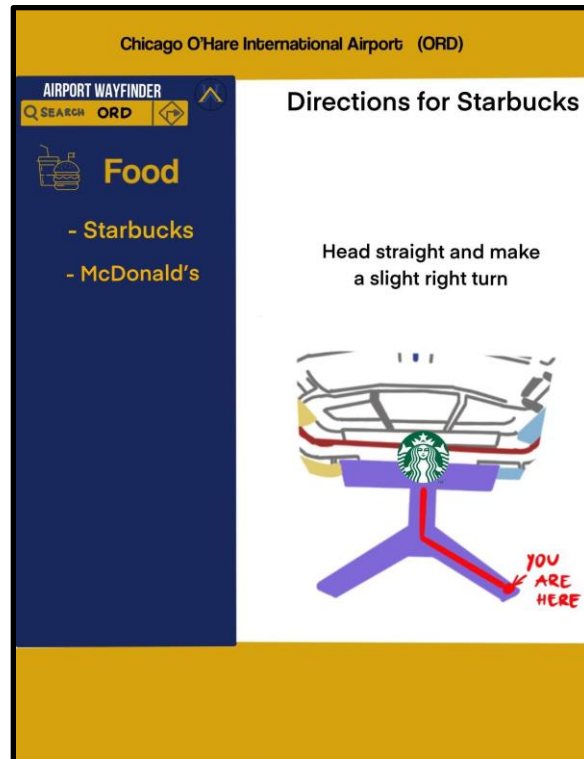


Figure 4. Food Tab

The section after parking on the homepage is food. As seen in Figure 4, the selected spot from the user is Starbucks. The app will take the user's location if allowed from the user, to find where the user is and then create a route from there. The route shown is red with verbal directions on top of the diagram that would be audio verbal directions if the volume is up for users with visual disabilities.

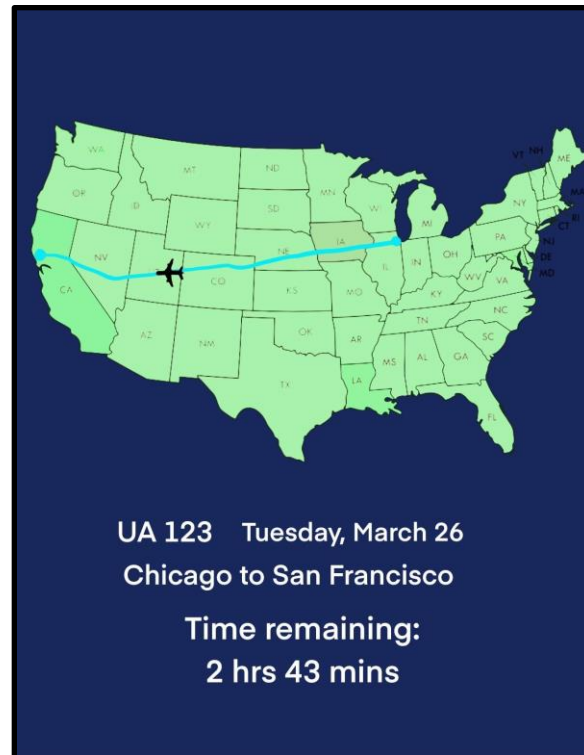


Figure 5. Airline Tab

As shown in Figure 5, the user is following a flight from Chicago to San Francisco. This ability is under the airline tab shown in Figure 1. Under the airline tab users would be able to search for flights they are on or ones that family and friends are on. Users would be able to see where the plane is from and where it is going, along with the time still being on the flight. This can be a helpful tool whether in flight for passengers to see how much longer they have left or for the people picking them up at the airport to see where the flight is currently at.

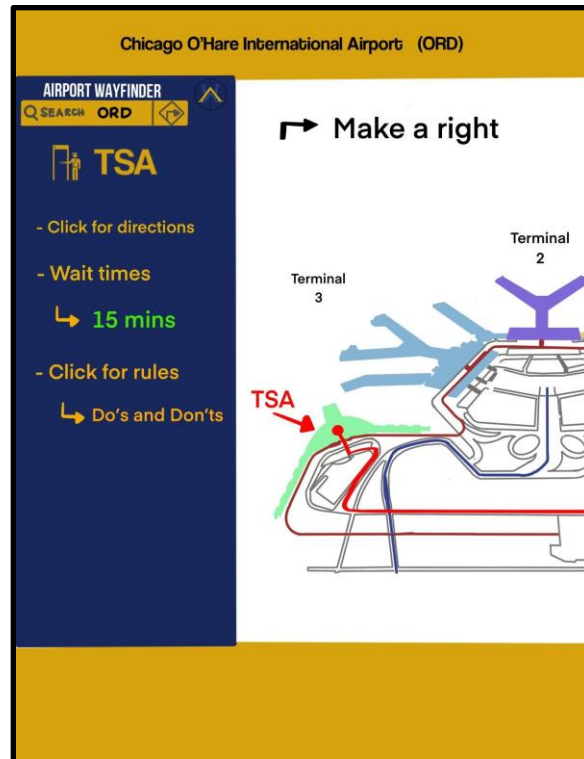


Figure 6. TSA Tab

Figure 6 shows what is included in the TSA tab that is shown in Figure 1. The TSA tab has a click for directions button so the user can have correct directions to security. The directions will be shown to the right of the tabs as Figure 6 shows and the route will be shown in red along with a mark for TSA. Directions for the user will be above the diagram and will also be told verbally if the volume is up for users with visual disabilities. The tab also shows the wait times so users can get an idea of how long they should plan for. Along with all of that, there is another button that if users click on it, it will take them directly to the TSA website where the rules and regulations are.

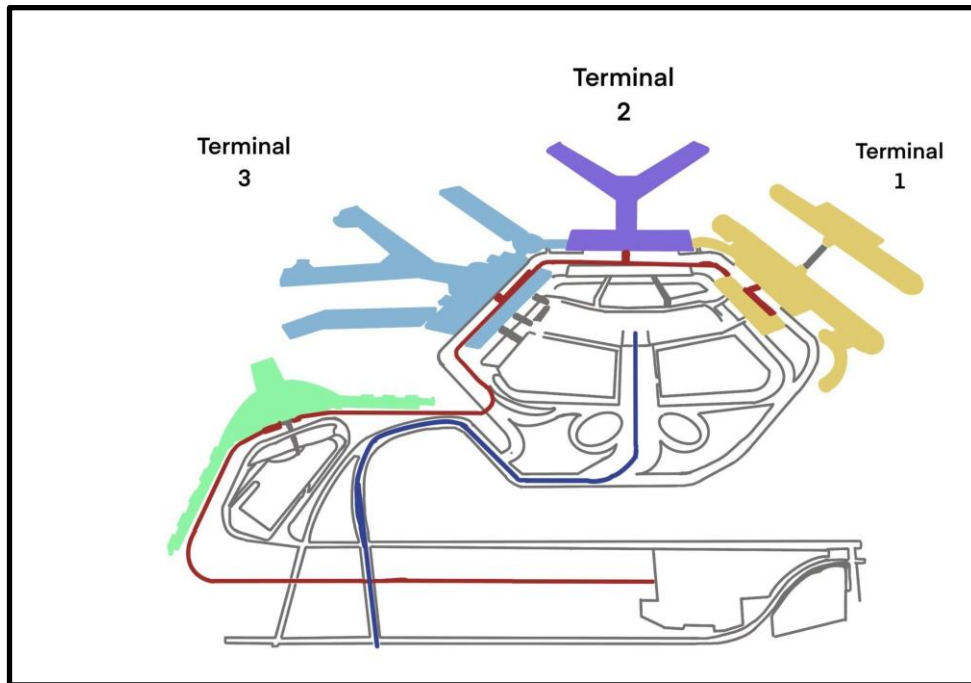


Figure 6. Airport Info Tab

Figure 6 shows a full airport diagram. When a user clicks on the airport info tab, as shown in Figure 1, the airport diagram will be shown. This tab can give users a different understanding about airports and why they are shaped the way they are. Users will be able to see the full picture of the airport they are visiting. Not shown in Figure 6 but would be in the airport info tab would be the history of the airport. Users interested in the history of the airport would be able to read a brief summary of when the airport started and a few fun facts about it. For example, Chicago O'Hare International Airport has had a few films filmed there such as Home Alone. This would be shown in the fun facts section.

4.3 Industry Interaction

Dr. Chien-tsung Lu

Dr. Chien-tsung Lu is a professor at Purdue University in West Lafayette, IN. His aviation education experience includes a PhD. in aviation administration, a MS in aviation safety, and he has earned his A&P along with an FCC avionics license at Houston Rice Aviation College. For many years he also acted as the Dean for the Nanshan Aeronautical College. Dr. Lu also served as the Chairman of Qingdao Airlines and the board director for Virgin Australia Airlines overseeing the security side of the airline.

When presented with the proposed idea of Airport Wayfinder, Dr. Lu liked the concept, but still had some safety questions about it. Dr. Lu brought up that with an app can malfunction, passengers can be too reliant on the app, hackers can tap in, and the safety of the airport from outsiders. In order to pass all the safety checks Dr. Lu said that the app would need to work with the airports and the FAA to see what can be included for the airports that would keep the safety along with security of all people there. In order for passengers to not become so reliant on the app Dr. Lu pointed out how important it is for this to be known as a tool to help guide passengers through an airport. Whether the app malfunctions or is working simply fine, signage at airports should be what passengers look for from using the app.

Other than safety Dr. Lu brought up that airport's directors should be allowed to login to the mobile app in order to update the airport. Whether that airport is doing construction or many other things that go on at an airport day in and day out the app

needs to have up-to-date information for the passengers. Dr. Lu also pointed out how this app would not only help the passenger experience because it can help passengers navigate airport parking and terminals, but also the industry in general, allowing for airports to collect data on what is being searched the most from passengers. He believes that this app can not only be popular nationally, but also internationally at many major hubs around the world.

Lastly, Dr. Lu discussed the interface of the app. He heavily discussed the idea of the app possibly giving verbal directions for passengers with visual disabilities along with the app being disability friendly for passengers.

Kenneth Godwin

Ken Godwin is a professor at the University of Dubuque. He has been a professor at UD for over 15 years where he has taught level 200 classes up to level 400 classes. Before he was a professor he worked for American West as an analyst until they merged with US Airways and transferred into the revenue management section. Although he worked for the revenue side of the airlines, he was still able to see and influence passenger experience at airports. One of his duties was visiting and working with the station manager for the airline.

When presented with the proposed idea of Airport Wayfinder he quickly became giddy. He believes that there is a market that would be popular for an app from the airport perspective. He is familiar with the other apps in the market from the airlines but believes that an app specifically designed for airports could help alleviate some of the stress for

airlines. From his experience at US Airways and some of the contacts he has there, he believes that airlines would welcome an app like this to help passengers find their flights more efficiently.

Lastly, some of the ideas Professor Godwin believes the app should heavily point out for passengers are bathroom locations, different food spots, airline lounges, baby feeding stations, money exchange, charging locations, and airline customer service counters. Professor Godwin believes that this app would not only help passenger experience, but also the airlines and the airport.

5. Safety and Security Risk Assessment

With the implementation of an airport wayfinding app like Airport Wayfinder certain risks may arise. According to the International Civil Aviation Organization (ICAO), a hazard can be defined as a condition or object that may cause injury, damage, or reduce the ability to perform prescribed activities safely and effectively (ICAO, 2014). With those associated risks a conduction of a safety and security risk assessment was completed in order to decide the possible hazards that could arise with the usage of Airport Wayfinder. In the completion of the safety and security risk assessment the following topics arose, passengers bumping into obstacles, hacking, and airport security concerns.

Severity \ Likelihood	Minimal 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
Frequent A					
Probable B					
Remote C			Passengers bumping into obstacles		
Extremely Remote D				Airport Security Concerns	
Extremely Improbable E			Hacking		*

Figure 7. FAA's AC 150/5200-37A Safety Risk Form

5.1 Passengers Bumping into Obstacles

Airport Wayfinder is a human operated system designed by and for humans. With such a system, human error may occur as a result of looking at your device instead of remaining alert of your surroundings while following the information on your screen. As a result, a passenger may be glued to their device and walk into their surroundings.

A passenger must be able to remain alert to their surroundings when using the system, otherwise the risk of an incident increases. Based on the FAA guided risk matrix, the severity of this risk was identified as major due to the potential injuries and damage to personal items. The likelihood of this risk was identified as remote. While human error may occur as a result of just looking at one's device, there are measures in place from the airport that may minimize this event from happening.

This risk can be managed with many different methods from the airport perspective. Although this risk may not be cut it can be minimized through the daily operations at the airport. Airports have signage all around the terminals so that passengers can double check Airport Wayfinder with the signage. Terminals at airports also have many different sounds such as the carts staff use to transport goods and or people that can alert someone to look up. From the parking perspective at airports there are signs that passengers can use to double check along with other cars that may honk at a passenger, and finally some cars now have the technology to detect obstacles to notify the driver to look up. While human error may arise from passengers looking at their device, there are already ways to minimize the risk of this incident occurring.

5.2 Hacking

Airport Wayfinder would be software designed to aid passengers at an airport, but with software comes the possibility of issues that could arise. Software can be altered whether by the creator or by other parties that hack into the system. If a system was to be hacked, a hacker could alter users' paths to somewhere that was not their intended destination.

If a malicious user (hacker) were to hack into the Airport Wayfinder system, they could access users' live locations in the app. Thus, being able to track passengers and or lead them the wrong way. Based on the FAA guided risk matrix, the severity of this risk was identified as major due to the potential users' locations being available. The likelihood of this was considered as extremely improbable. At the worst, a malicious user could have users' locations and alter the airport systems on the digital maps.

To combat malicious users the app would only ask for users' live locations. The users could create an account if they would like to use the app, but it would not be necessary. Users would not be asked for any payments to use the app so no cards would be saved in the app. The likelihood of this event would be extremely improbable, but if it were to occur users would be able to go back and use the airport's wayfinding techniques to use.

5.3 Airport Security Concerns

At its core Airport Wayfinder would be a tool to help passengers navigate airports safely and efficiently from parking to passengers' gates. With this tool users would be

able to see the entire airport diagram. With that information some users may take advantage of that. Airports would be able to call or notify the system if airport terminals are closed due to construction or any other reason. With that information out to the public, users may either be led down a wrong path or take advantage of that to look for into construction sites.

Based on the FAA guided risk matrix, the severity of this risk was identified as hazardous due to the potential security issues and damage that could occur. Users could enter restricted areas of the airport due to the system altering users to those places. A user could intentionally or unintentionally enter restricted areas of an airport. At the worst, a user could enter a landslide or even the airside operations of an airport that could lead to severe consequences or damage to users and or planes.

The best way to manage the risk in this scenario would be to provide and keep the security measures at airports. Airports could alert the Airport Wayfinder system which would then be told to users to avoid such areas. Workers at construction sites may also be able to alter users to not enter the area. The likelihood of such an event would be extremely remote, but if it were to occur the events could be catastrophic.

6. Project Impacts of Design

The proposed Airport Wayfinder app aims to improve airport navigation for passengers of all ages along with people with disabilities. With the integration of this system airport navigation for passengers will significantly be improved. Furthermore, improving the passenger experience at airports for people of all ages with the easy-to-use interface of the app. Airport Wayfinder offers an innovative approach for the **ACRP Passenger Experience and Innovations in Airport Terminal Design Challenges -** Passenger experience technologies such as restroom cleanliness monitoring, passenger wayfinding, smart building systems, etc.

6.1 ACRP Goals

As technology continues to grow people become increasingly dependent on it. This design offers a way to connect handheld technology to the airport system by giving passengers an airport centric app for people of all ages. This proposed design not only explores the issues found in Research Report 52, related to Wayfinding and Signing Guidelines for Airport Terminals and Landside, it updates, and expands on those issues. It does this by focusing on the digital aspect of signage at airports and presents innovative solutions for emerging technology to ease the transition for passengers of all categories.

Finally, this design raises awareness to the digital community. Airport Wayfinder points out the importance for a design such as this to not only scholars and students, but to the airport community by emphasizing the need for a design like this.

6.2 Cost Analysis

The proposed design must be reasonable and accessible through a cost-benefit analysis. A summary of the cost-benefit analysis will take place in two phases. Phase one is front end development and phase two would be the back-end implementation of the app for a final prototype.

The Airport Wayfinder app will use the idea of the front end and back-end development style. The front end will be the user facing part of the app. This provides both the user interface in terms of user input of information, along with the visuals a user will see while using Airport Wayfinder. The back end will be the interaction with servers and other devices. One of the major parts of Airport Wayfinder is the correct GPS positioning for passengers in and around the airport. This section would ultimately be similar to what Apple and Google Maps offer for accurate positioning of users.

When it comes to app development the costs may vary depending on the desired features and complexity of the app. Airport Wayfinder can offer advertisements for revenue along with the implementation of a feature that could take away advertisements. Users would be allowed to login to the app if they wanted to, which could save the various airports they have visited. Table 1 below will provide the implementation of Airport Wayfinder and the associated costs with it.

Table 1. Airport Wayfinder Development Cost			
Version	Front End	Back End	Total
1.0	5 weeks = 25000	5 weeks = 25000	\$ 50,000
2.0	5 weeks = 25000	5 weeks = 25000	\$ 50,000
Grand Total			\$ 100,000

Although development costs are one aspect of what it would cost. With the implementation of the app, there are regular costs for that as well. Table 2 will describe the fixed cost that will come with having the app on the app store along with server cost, notifications, and maintenance for various needs on that app.

Table 2. Airport Wayfinder Fixed Cost Per Year		
Server	1200/Monthly	\$ 14,400
Notifications	10/Monthly	\$ 120
App Store	99/Annual Fee	\$ 99
Maintenance	320/Monthly	\$ 3,840
Grand Total		\$ 18,459

Table 3. Airport Cost		
Airport Site Work	120/Monthly	\$ 1,440
Advertisement	1200/Monthly	\$ 14,400
Grand Total		\$ 15,840

6.3 Cost-Benefit Ratio

Although Airport Wayfinder comes with a first cost of \$100,000 for development, the overall benefit of this airport wayfinding app would be much greater. Airport Wayfinder is an app that would be beneficial for not only the airport in general, but also the airlines. That is why the benefit of this app would lead to millions of dollars in benefits for the airport and airlines.

7. Conclusion

Passenger experience and innovations in airport terminal design when it comes to wayfinding continues to be a challenge for the aviation community. Airports have continued to grow and by doing so, the need for advancements in wayfinding continues to grow as well. Therefore, implementing a user-friendly app such as Airport Wayfinder that communicates the information related to the services at airports in an easy-to-follow format, will prove the opportunity airports have to alleviate the struggle of wayfinding for passengers.

Airport Wayfinder offers an innovative solution to “*Passenger experience technologies as it pertains to passenger wayfinding,*” providing an airport centric app for passengers in order to help alleviate stress at airports, decrease confusion, improve passenger satisfaction, and provide a helpful tool to use for airports.

Overall, Airport Wayfinder offers an innovative solution to address the challenges associated with passenger experience as it pertains to wayfinding by the use of a mobile application.

Appendix A - Contact Information

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Appendix B - Description of University

University of Dubuque

University of Dubuque is a private, non-profit university found in the “Masterpiece on the Mississippi” Dubuque, Iowa. Founded in 1852 as a university to help German speaking immigrants become pastors. University of Dubuque is now a private presbyterian school with about 1600 undergraduate students and a 15:1 student to faculty ratio. The university offers over 40 undergraduate programs including flight operations and aviation management. University of Dubuque is a small university that helps students make connections in and outside their field. As a division three university they offer a variety of sports whether collegiately or intramurals.

Appendix C - Industry Experts

Dr. Chien-tsung Lu

Dr. Chien-tsung Lu is a professor at Purdue University in West Lafayette, IN. His aviation education experience includes a PhD. in aviation administration, a MS in aviation safety, and he has earned his A&P along with an FCC avionics license at Houston Rice Aviation College. For many years he also functioned as the Dean for the Nanshan Aeronautical College. Dr. Lu also served as the Chairman of Qingdao Airlines and the board director for Virgin Australia Airlines overseeing the security side of the airline.

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Appendix E - Evaluation of Educational Experience

Student

1. Did the Airport Cooperative Research Program (ACRP) University Design Competition for Addressing Airports Needs provide a meaningful learning experience for you? Why or why not?

I believe that the ACRP University Design Competition for addressing airport needs provided a very meaningful learning experience for me because I am the first student to ever do this at the University. Just entering this competition by myself helped me as a student and in my career field. As the airport manager for KPVB it allowed me to get a glimpse into what larger airports deal with on a day-to-day basis.

2. What challenges did you and/or your team encounter in undertaking the competition? How did you overcome them?

The challenges I met were the fact that many people in the industry did not respond to my emails for interviews. It was difficult to find industry experts that wanted to help. I overcame this challenge by reading more research and relying on that then just doing interviews.

3. Describe the process you or your team used for developing your hypothesis.

The process I used to develop my hypothesis was simply doing research at the beginning to see if wayfinding is truly a problem. Then I asked my professors and friends in the field

to get their perspective. Then I asked my family who know little about the aviation field and they seemed to really like the idea. The process was research after research then writing ideas out and drawing pictures to get a full idea about the project.

4. Was participation by industry in the project appropriate, meaningful and useful?

Why or why not?

With the participation I received from the industry, it was extremely helpful. Dr. Lu especially helped with giving myself ideas to think about when it came to security. Professor Godwin gave a glimpse from a passenger perspective when he travels all the time. Even knowing all the airports, he has gone to and still thinks it would be a clever idea for him to have been very insightful.

5. What did you learn? Did this project help you with skills and knowledge you need to be successful for entry in the workforce or to pursue further study? Why or why not?

I learned that wayfinding systems are more than just throwing signs up at an airport. There is a science behind it, knowing when passengers will be overstimulated or whether a sign needs to be bigger or smaller. Wayfinding is a key aspect in airports, and it seems too often be overlooked. I believe this project helped with developing skills and gaining knowledge for my future in the industry. The fact I was able to research airports that are

significantly larger than the airport I manage and seeing how I can improve that airport is an immense help with confidence and knowledge for the future.

Professor

I. Describe the value of the educational experience for your student(s) participating in this competition submission.

Students at our university do not typically have many opportunities to tackle a technical challenge, especially within the aviation department. The University Design Competition gives several of our management students the chance to explore an area of our industry that they may have never addressed otherwise. In particular, this project provided great learning experiences in networking with experts and exploring the impacts technology will have on the future of airports.

2. Was the learning experience appropriate to the course level or context in which the competition was undertaken?

This experience was very much at the expected level as the student had many questions related to the topic. It also provided a new challenge in writing and constructing a different type of research. Due to the niche areas of parts of the project, it required the student to use much of their previous years of education to complete this to an acceptable standard.

3. What challenges did the students face and overcome?

The student had extraordinarily little exposure to technology within the context of industry. As a result, they had to research a great deal before beginning the challenge so that they could better understand current issues. Aside from that, there was difficulty in finding qualified industry experts that were willing to give their time. The student had reached out to many app developers of similar platforms but because they didn't want to reveal too much about their own applications, the student had to find ways to chase many leads that were unable to be executed. The student overcame this challenge by relying more heavily on published information about this topic and personally exploring mobile and internet applications, rather than meeting with specific experts.

4. Would you use this competition as an educational vehicle in the future? Why or why not?

This project will regularly be used to help students solidify the foundations of their careers going forward. Curriculums can only provide so much before the students need to learn on their own or find areas of passion.

5. Are there changes to the competition that you would suggest for future years?

There is nothing in particular that I would change. The competition provides our students with the chance to pave and explore their own path within the industry while gaining the knowledge to be extremely relevant upon graduation.

Appendix F - References

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