AirportLogic: Usability Testing, Prototyping, and Analysis of an Airport Wayfinding Application

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Abstract. As air travel continues to be prevalent in our lives, and as the use of mobile devices designed to assist us become more common, the creation of wayfinding applications for mobile devices continues to be a challenge for both developers and interface designers. Unfortunately, many airport specific wayfinding applications do not live up to user expectations. In preliminary project phases, usability testing and evaluation of existing applications was performed, followed by prototyping and evaluation of a proposed application. Task-based user testing was performed to address two primary questions: 1) are current and proposed applications efficient for users?, and 2) is the information architecture and navigation suitable for average users? A prototype application and corresponding website were developed, and tested, with user testing confirming enhancements over previous airport way finding applications.

Keywords: user interface design, mobile application, wayfinding.

1 Introduction

Responsible for predicting user needs and technological capacity, most airport specific way finding applications ultimately do not live up to user expectations. After investigating a several airport navigational tools and applications for the iPhone, it was discovered that there is no single application that provides both basic and specific functionality necessary for travelers to effectively locate essential airport services and locations.

The primary problem is that existing airport wayfinding and navigational assistance applications, which are designed for use on mobile devices have failed to provide both effective user interfaces, and useful way finding tools and information, essentially rendering them useless to travelers. Many existing applications contained unnecessarily large amounts of information in visual interfaces that were nearly impossible for individuals to fully use. In addition, several other applications were specific to only certain airport attractions such as pubs, airlines, or shopping, leaving all other potential points of interest up to the traveler to locate without the assistance of the application.

In this project, the tasks included creating a simplified and intuitive mobile application for the iPhone in order to assist with common wayfinding tasks in both United States and global airports, as well as a developing corresponding websites that

would provide valuable pre-travel assistance with tasks such as booking airline, hotel, and rental car reservations; and creating an effective linking system between the mobile application and website. Tasks within the mobile application are assigned a rank order based on preliminary user feedback and evaluation of existing mobile applications in order to increase the speed and efficiency of wayfinding and location determination through a more intuitive user interface.

Using task-based user testing with eight participants for the full testing, each participant was asked to complete several tasks based on a researcher provided scenario. Each participant was asked to complete basic operations within the *AirportLogic* application such as navigating to a gate within a selected airport, locating power outlets, and locating public transportation to the nearest city.

2   Method

Preliminary user testing was performed using six participants selected from a design course, using existing airport wayfinding applications in order to effectively determine both necessary and unnecessary functionality, as well as isolating problem areas within each application. After preliminary user testing, a prototype application was developed and produced as a task-specific-functional[1] prototype.   Having designed the application to meet only essential users needs while traveling, the navigational structure was simplified through several stages of refinement prior to user testing, which was shown to be successful (100% of participants were able to perform the requested tasks).

This task based user testing was designed to address three primary questions: 1) is the application efficient for the user? Does it allow a user to locate primary facilities, functions, and directions within an airport? 2) is the information architecture and navigation suitable for average users? and 3) are average users able to expediently find what they are looking for within the application?

Fig. 1. Left to right: Identification of problem areas during user testing, and solutions

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[1] Only pages, and information relevant to assigned tasks airport wayfinding application were made available. Participants were presented with an error screen when attempting to navigate to areas of the application that were not part of the user testing**.**

2.1   Participants

Eight participants were randomly selected from a pool of participants for this research, each travelling by airplane at least 1 time per year (round trip).

Table 1. Participant Information

Age	Gender	Native Language	ISU Status	Computer Use Frequency	Mobile App Use Frequency	Mobile Travel App Use	Annual Trips
24-29	Female	Japanese	Student	Daily	No	No	5
42-47	Male	Turkish	Faculty	Daily	Daily	No	6
30-35	Male	English	No-ISU	Daily	Weekly	No	1
54+	Female	English	No-ISU	Daily	No	No	3
42-47	Male	English	No-ISU	Daily	No	No	6
30-35	Female	English	No-ISU	Daily	No	No	1
30-35	Male	English	No-ISU	Daily	Daily	Yes	6
36-41	Female	English	Faculty	Daily	Daily	No	3

2.2   Procedure

Participants were asked to complete a pre-testing user profile indicating gender, native language, university status, computer and mobile application usage frequency, specific mobile travel application usage, and number of annual trips by airplane, after which they were directed to a task list.   Participants were instructed to proceed through each task while thinking aloud. The list of tasks they were asked to complete are shown in Table 2. *AirportLogic* testing was performed using an iPhone simulator on a 15" MacBook Pro, using an external two-button scroll mouse while user application interactions were recorded internally using QuickTime's screen recording feature.   A researcher was present throughout the user testing to answer questions, take notes, and when necessary, redirect participants.   After completion of user testing, participants were asked to complete a post use questionnaire that requested feedback on application usability and functionality, organization, overall impressions, and freeform comments.

2.3   Measures

Data collected included user information, total number of user clicks per task, total time per task, number of errors per task, number of incorrect menu items selected, and number of incorrect icons selected[2], and information regarding perceived usability. Data was analyzed and grouped by demographic variables, task, and user average as compared to ideal[3] number of clicks or time spent on task.

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[2] Incorrect icon selection was determined by participant selection of a navigational icon that had already been selected, or was available with fewer steps.

[3] Ideal refers to the maximum number of selections, or time as determined by researchers through preliminary testing of the *AirportLogic* application.

Table 2. Task list and description

Locate and initialize *AirportLogic*	Used to determine icon legibility
Locate an international airport	No analysis: single option only
Navigate to a gate	Locate and identify terminal 1, concourse C, gate 20
Locate a restroom near the gate	Locating the nearest restroom to current user location
Locate a power outlet near the gate	Locating the nearest power outlet to current location
Locate favorites within the application	Locate frequently used options within AirportLogic
Locate a Starbucks near current location	Locate Starbucks, and add to favorites menu. Multiple-step task
Locate public transportation to the city	Locate a train from the airport to downtown.

3   Results

User testing showed positive results for the *AirportLogic* prototype; 100% of participants were able to successfully complete the user testing, 87.5% of participants were satisfied with the application, and there were no tasks rated as "difficult" or "problematic" by users. While a number of participants selected areas on screen that were not attached to menu items, resulting in an increased number of attempted item selections for locating tasks located within map display items, the majority of tasks were completed using minimal item selection, and were rated as being successful as compared to the researcher ideal number of selections and time periods.

4   Discussions and Conclusion

This analysis of existing airport wayfinding applications, and design of a more focused and usable wayfinding application proved to be successful. Though there were problems identified within the interface used for testing and analysis, user ability to navigate through primary functionality was dramatically improved, while the final implementation of the *AirportLogic* application addresses all user-testing located issues. This ultimately led to the generation and implementation of innovative new ways of allowing individuals to navigate to primary locations of interest within airports.

Future directions for this research include the implementation of iPhone-based prototype for user testing, as well as performing user testing within an airport.