U S A B I L I T Y R E P O R T

DATE: May 1, 2022

TO: Chris Hundhausen, CptS 443/543 Professor

FROM: WSU WayFinding Team

RE: WSU WayFinding Usability Test

SUMMARY

Purpose and Scope

On April 20th through 25th, we conducted a usability study of WSU WayFinding. WSU WayFinding is a mobile-based software that enables you to find a room in a building. In the study, participants explored a high-fidelity prototype and completed a set of tasks in order to get a feel for the software's functionality. Questionnaires and interviews were employed throughout the study sessions to elicit data that gave us insight into the extent to which WSU WayFinding supported what the participants wanted to accomplish.

Methods

We recruited five participants for this preliminary usability study. These participants were recruited from different department of Washington State University.

We ran the study in the Zoom, where users interacted with the WSU WayFinding prototype running on their own laptop.

We allotted 25 minutes for each study session. At the beginning of the test, participants filled out a background questionnaire. See Appendix A: Background Questionnaire Results for a copy of the questions and their responses. Next, they were given a brief description of the WSU WayFinding prototype software, and then asked to think aloud while they explored the software interface for 5 to 10 minutes. Appendix B: Software Overview presents an overview of the software.

After reading the instructions, we have given a background of a prospective user or presented a scenario, and we provided the Figma link to access our prototype. Participants were asked to complete a series of six task sets with the WSU WayFinding. See Appendix C: Tasks for a copy of the task descriptions that participants received for the test, Appendix D: Task Details for details the rationale for each task. As they worked through these tasks, participants were instructed to

think aloud by verbalizing their thoughts and actions. If they became silent, or if it was unclear what they were up to, they were prompted to explain what they were doing.

Upon completion of the tasks, participants filled out an exit questionnaire that solicited their impressions of the WSU WayFinding software. Appendix E: QUIS Results includes the exit questionnaire and participants' responses.

FINDINGS

Overview

Overall, the WSU WayFinding can be considered a moderate success. The software received the following QUIS ratings (out of 10; See Appendix E for full details):

- Average Overall Ease of Use: 7
- Average Learnability: 7.6
- Average Usefulness: 8

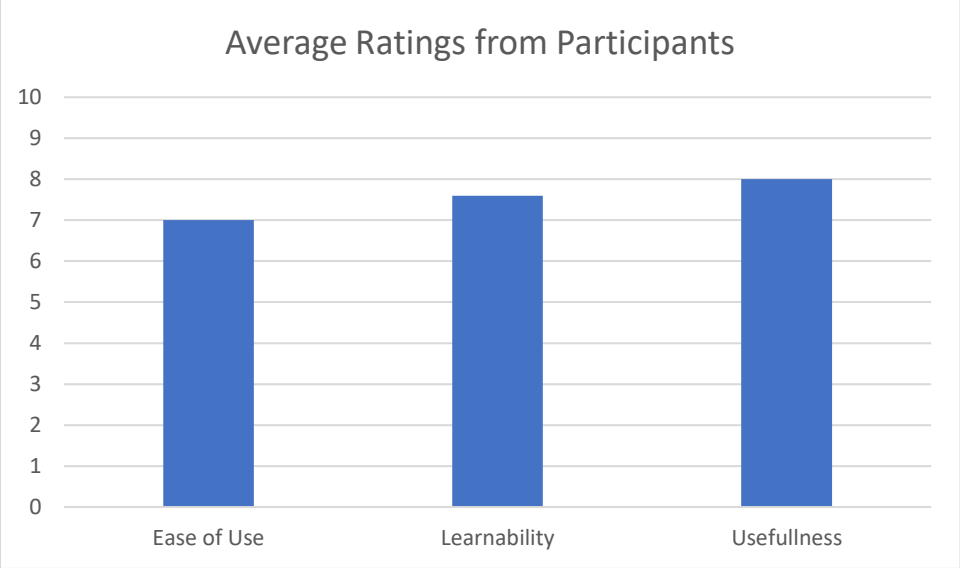


Figure 1. Ratings retrieved from the participants.

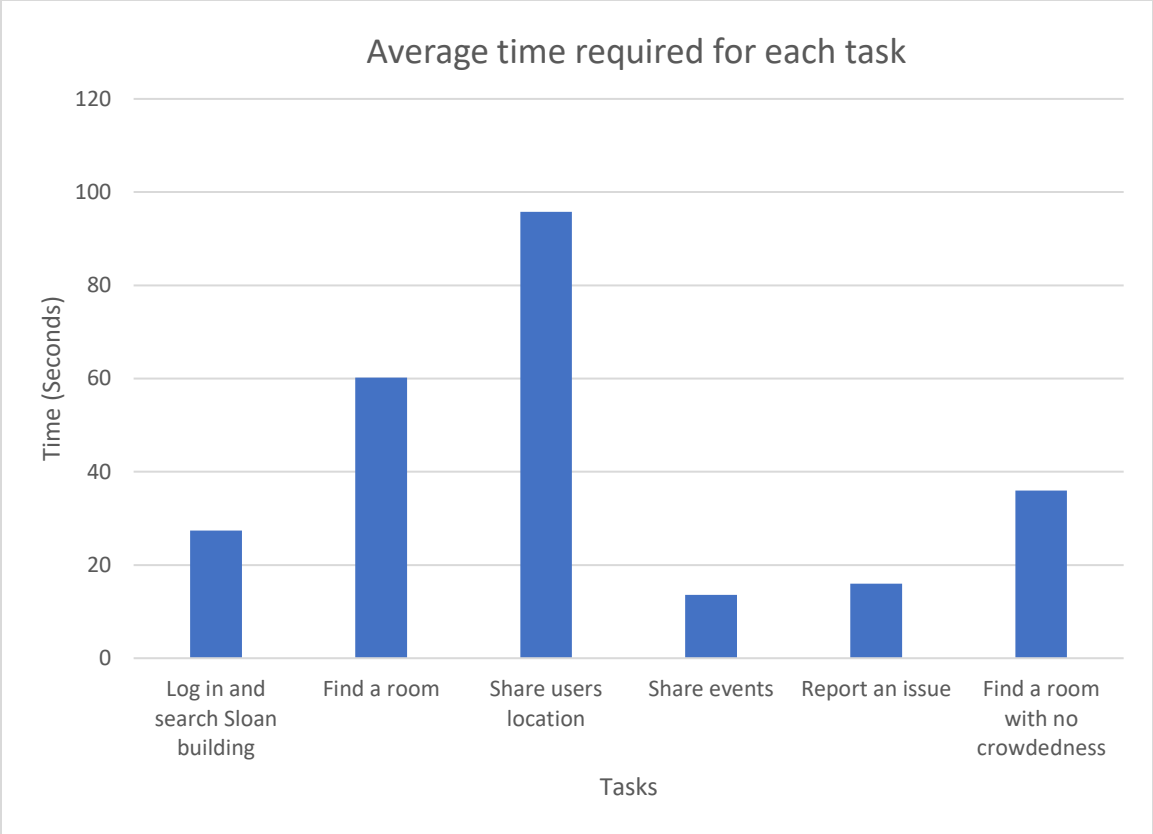


Figure 2. Average time required for each task.

Usability or U.E. Goal	**Relevant Empirical Result**	**Commentary**
User must be able to log in to WSU WayFinding Application and find a building.	All participants were able to log in the application and find the building in application.	This task was easy, and participants did not face any difficulty. However, some participants tried to use the search bar. Instructor informed that it is not implemented in that page.
User must be able find a room in a building	3 participants out of 5, tried to find a room manually. After giving the hint, they have used the searched bar	Since they saw the last page search bar was only for demo, most of the participants started to search for the room manually. Instructor informed that search can be used now, and rest of the task was completed without any guidance.

User must be able to share his/her location.	All of participants found difficulties finding the location sharing option.	The menu item was available on the top left corner of the screen under user profile icon. All the participants tried to find the option in the hamburger menu that located at top right of the screen.
User must be able to share events in a building.	All the participants easily find the option in the menu and share an event.	User easily find the option in the hamburger menu and completed it.
User must be able to report maintenance problem in the application.	All the participants successfully find the option in the menu and report a maintenance issue.	User easily find the option in the hamburger menu and completed it. However, one participant expressed concern about the naming of the menu item.
User must be able to see how much crowded a room building is.	4 participants out of 5, successfully completed this task. One user opened the heatmap but pressed back immediately.	In the usability test introduction, it was mentioned what is purpose of the heatmap. However, most of the participants did not recall that. After instructor gave this information, use successfully completed the task.

Table 1: Summary of key results of the usability and user experience goals

We begin each subsection below with a brief description of the user subtask to which the problems listed in the subsection pertain. Next, in order of decreasing severity, we describe the associated usability problems, and provide "Severity" and "Scope" ratings[1] based on the empirical evidence. Following the problems, we cite evidence of, and a diagnosis of, each problem. Each subsection concludes with specific design recommendations that we believe will remedy the problems.

1. Sharing location

Task:

User can use the top left profile icon and access the "Location Sharing" option. From here, user can send location with latest used contacts or can simply copy the link and share with other medium.

[1] Severity indicates the level of difficulty that the problem caused users (1 = most severe). Scope indicates the range of users that the problem is likely to impact (1 = broadest). See Appendix E for precise definitions of these terms.

Problems:

User may not find the location sharing option. (Severity = 1, Scope = 1)

Evidence:

All participants encountered this problem. One participant was not able to complete this task because Instructor also did not give any hints. After interviewing first participant, we started to give hints to participants if they could not find the option.

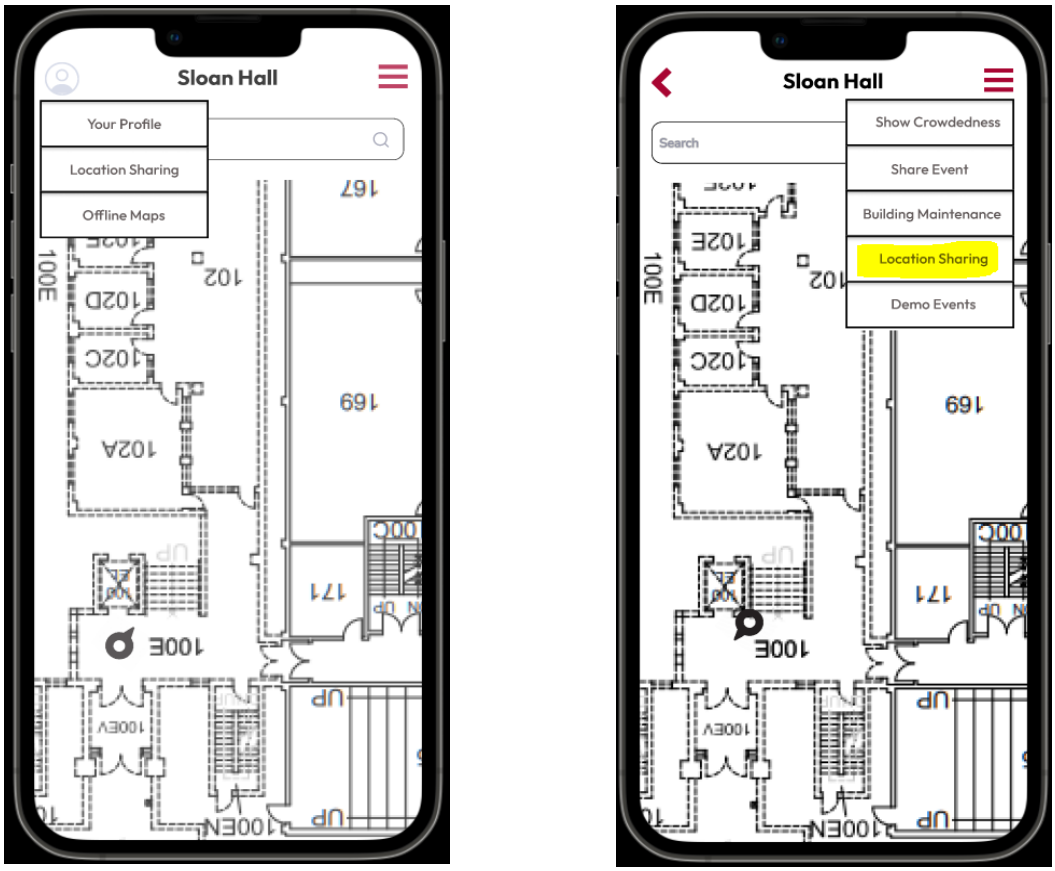
Diagnosis:

We have two types of menus in our application: profile menu and hamburger menu. Profile menu located at the top left corner of the screen and the hamburger menu located at the top right corner of the screen. While investing the issue we found:

1. All participants click on hamburger menu to find the location sharing option. They have clicked on “Share Event” menu item since this menu item has the “Share” word in common. (Nielsen Heuristics-Consistency and standards)
2. After seeing the functionality of the share event menu item, they transfer back to the building map UI and search for a room again. While searching for a room they keep looking for the location sharing option. (Transfer effect)
3. The profile menu was invisible to them, and they expected that all the options were available in the hamburger menu. (Johnson-humans seek and use visual structure.)

Recommendations:

We transfer location sharing option to hamburger menu and removed profile icon.



(a) Previous design **(b) New design**

Figure 3: Moved Location sharing to hamburger menu.

2. Heatmap

Task:

User can see the crowdedness of a building by going to the hamburger menu and selecting the “Heatmap” option.

Problems:

User may not understand the meaning of the heatmap. (Severity = 2, Scope = 1)

Evidence:

Four out of five participants needed hints where they need to look for this feature. Participant 1, 2, 3 and 5 faced this issue.

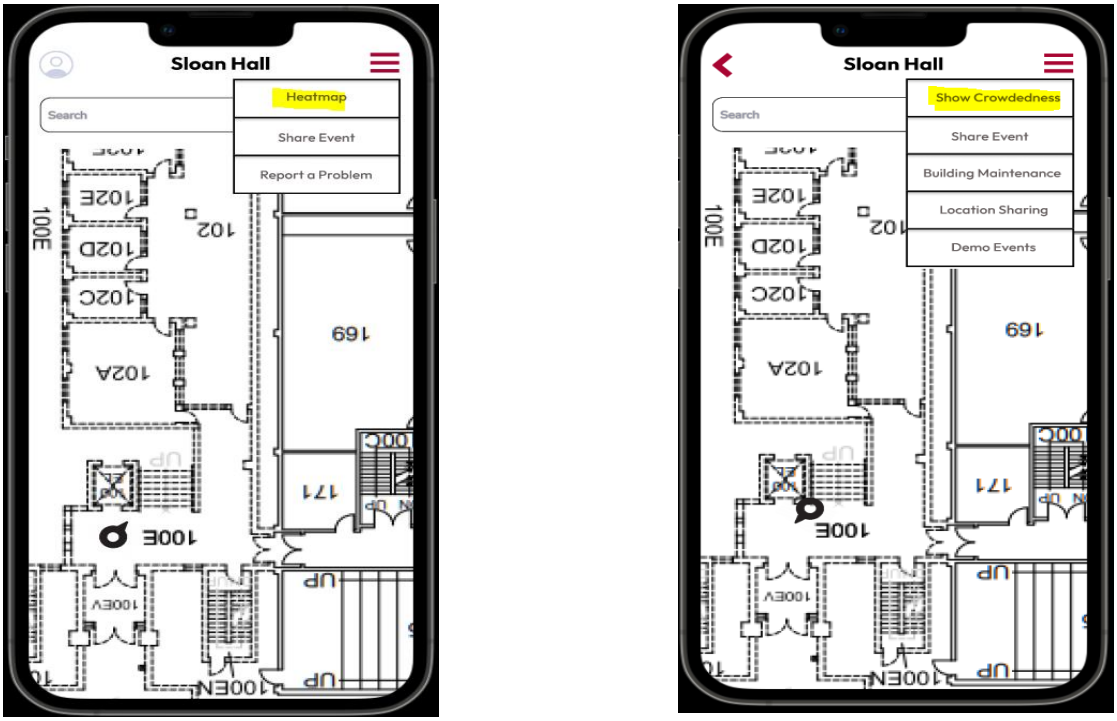
Diagnosis:

Most of the participants thought heatmap was associated something with heat. We find out that the word “Heatmap” is esoteric to engineering field and normal users may not remember the functionality of a heatmap (Norman’s- signifier). We reached to this conclusion because we have mentioned the usage of heatmap in the introduction. However, users did not

recall that information while testing the application. (Nielsen Heuristic-Recognition rather than recall.)

Recommendations:

We renamed the menu item “Heatmap” to “Show crowdedness”



(a) Previous design **(b) New design**

Figure 4: Renamed “Heatmap” to “Show Crowdedness”.

3. Logging in the application and find Sloan building:

Task Description:

At first, user needs to log in the application and enter a building. We have provided credentials in the prototype and user used that information to log in. After logging in, user can access to the Sloan building (pointing as red circle) by clicking on it.

Problems:

User may think the search bar will work on the interface and tried to search directly. (Severity: 3, Scope: 3)

Evidence:

Two out of the five participants exhibited this problem. Participants one and two face this problem.

Diagnosis:

We did not implement the search functionality in that interface. After informing this, users were able to complete the task.

Recommendations:

We will implement similar search functionality for also finding a building.

4. Finding a room in Sloan building:

Task Description:

User can search for a room when he/she enters the building. We have implemented search functionality in this task. User clicked on the search bar and “Sloan 155” will appear on the search box. User can click on the search icon and the map will show the location of the room. User can click on the direction to get the direction to the room. Additional information like the directions needs any lift or staircase is also shown on the map.

Problems:

Users may not be able to find his location after he searched for a room. (Severity = 3, Scope = 3).

Evidence:

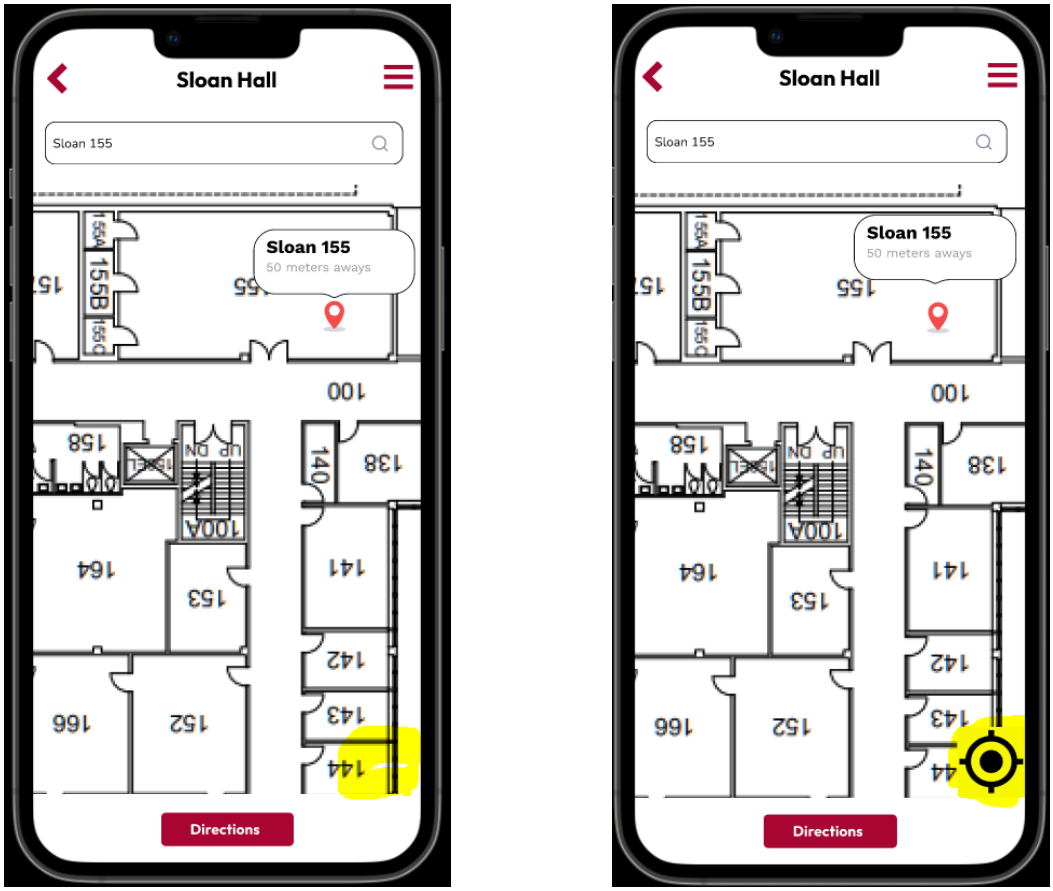
One of five participants encountered this problem. Participant 1 faces this problem.

Diagnosis:

Since after searching for a room, the map will move to the searched room, user was not able to find his current location.

Recommendations:

We created a new icon that will redirect the users to their current location. (Nielsen Heuristic- User control and freedom)



(a) Previous design **(b) New design**

Figure 5: Added an icon to show user's current location.

5. Reporting a maintenance issue

Task:

User can report a maintenance issue by going to the hamburger and selecting "Report a problem". After submitting a report, user will get feedback and an incident number which can be used for further reference.

Problems:

User may confuse this option with reporting an issue of the application. (Severity = 3, Scope = 3)

Evidence:

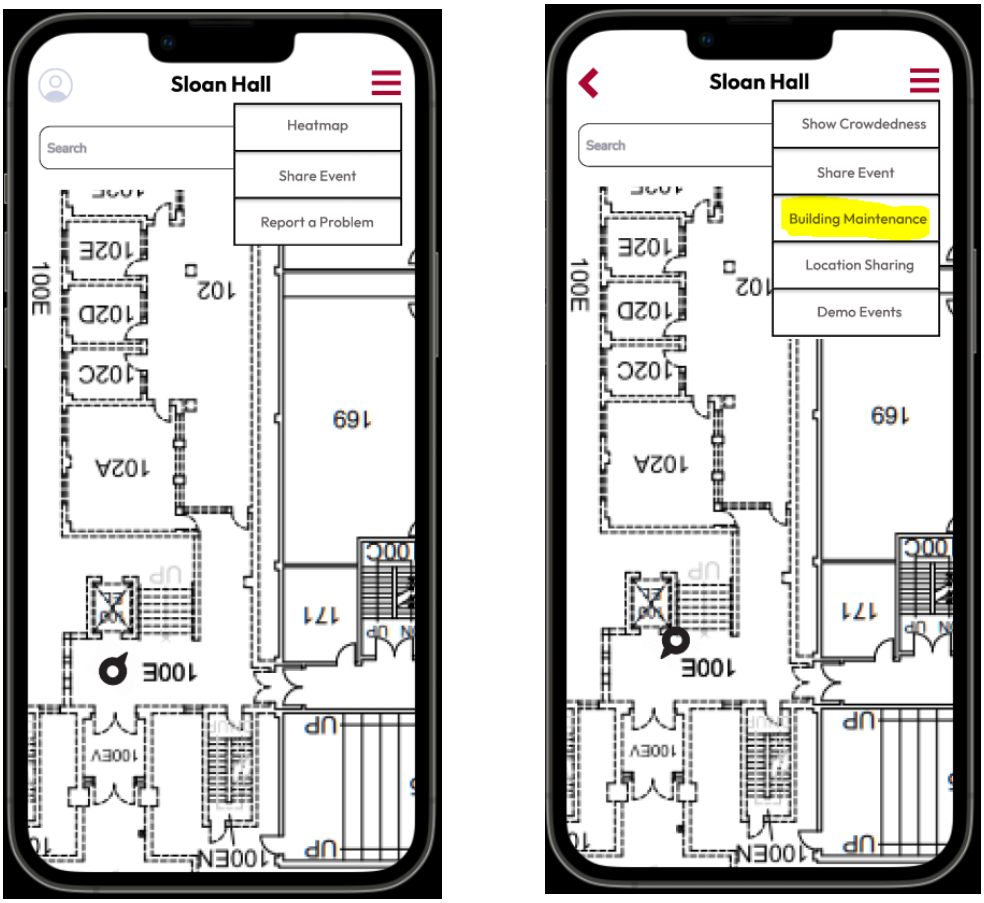
Although all the participants completed the task successfully, participant 4 expressed concern about the naming of the menu item.

Diagnosis:

In the modern application, there is an option available for reporting an issue regarding the application. User can easily confuse reporting a maintenance item with reporting a problem of the application. (Norman- Signifiers)

Recommendations:

We renamed the menu item to “Building Maintenance”.



(a) Previous design **(b) New design**

Figure 6: Renamed “Report an issue” to “Building Maintenance”.

6. Sharing an event of a building.

Task:

User can share an ongoing event of a building by going to the hamburger menu. For demonstration purposes, all the information were given. After sharing the event feedback will be shown.

Problems:

No usability problem found in this task.

Evidence:

All the participants completed the task within 15.8 seconds. The time required to complete for this task is low because user do not need to type any information. They went through all the information and then shared the event.

APPENDIX A: BACKGROUND QUESTIONNAIRE RESULTS

StartDate	Q8	Q26	Q9	Q10	Q11	Q12	Q13
Start Date	I consent to this usability study.	What is your employment status? - Selected Choice	If employed, what do you do? If in school, what year are you and what is your major?	How often do you use Google Maps?	How much experience do you have with testing mobile applications or user interfaces with users?	How much experience do you have with Android or Apple Smartphones?	Which software you use the most for navigation?
4/19/2022 22:07	Yes	Employed	Research assistant	A great deal	A moderate amour	A great deal	Google Map
4/20/2022 16:45	Yes	In School	Landscape Architec	A lot	None at all	A great deal	google map
4/23/2022 16:56	Yes	In School	Psychology Senior	A lot	A little	A great deal	Google Map
4/24/2022 15:34	Yes	In School	Electrical Engineeri	A moderate amour	A little	A lot	Google Maps
4/25/2022 15:46	Yes	Employed	TA and RA.	A great deal	A lot	A great deal	google map

The survey result is available in the following file:
https://drive.google.com/file/d/14WxXb9c9l7A7BPkTcXcxg-aLRZlqI0Le/view?usp=sharing

APPENDIX B: SOFTWARE OVERVIEW

WSU WayFinding is a mobile-based software that enables a user to find a room in a building. When user enter a WSU building, user can see the blueprint of that building. There will be a search box for searching a room. User can also share his/her location to his/her friends using the mobile app. User can share an event and report an issue through the application. There is another feature named heatmap which will show you how crowded a building currently is.

APPENDIX C: TASKS

1. Log in WSU WayFinding application and access to Sloan building
2. Find “Sloan 155” room in the application.
3. Share users’ current location.
4. Share an event of a building.
5. Report a maintenance issue.
6. Find out a room which is empty.

APPENDIX D: TASK DETAILS

Task 1:
In WSU WayFinding app, you can find a room in the building and directions to reach that room. Initially the application will ask you for username and password. For demonstration purpose, the username and password are given in the prototype. Log in with the given credentials and enter the Sloan building.

Task 2:
Search for Sloan 155 room and ask the app for the directions.

Task 3:
Suppose some of your friends are coming over to meet you in Sloan building. They have never been in Sloan building. You want to share your location with your friends so that they can easily find you using the WSU WayFinding application. Share you location via WSU WayFinding app.

Task 4:
Now you are passing by a room and saw that there is free food event organized by the architecture department. You get some food and want to share this event with others who are in the building now. Share the event with WSU WayFinding app.

Task 5:
You are studying in a room in Sloan building. Suddenly, you saw the lights were automatically turned off. You have tried to turn off and then on the switch again. However, it did not work. You want to report this issue to the authority of the building. Use WSU WayFinding to report this issue.

Task 6:
You want to give a demo presentation in a classroom for practice. However, you do not know which classroom is empty now. Use WSU WayFinding application to find a room a which is currently empty.

APPENDIX E: QUIS RESULTS

The survey result is available in the following file:
https://drive.google.com/file/d/14WxXb9c9l7A7BPkTcXcxg-aLRZlqI0Le/view?usp=sharing

APPENDIX F: CRITICAL INCIDENTS

Participant 1
Video Link:
https://drive.google.com/file/d/1df-1QPgf5hAFnLOWtvM0MGauqrmx1Hh_/view?usp=sharing

Time	Task	Description of Incident
05:48	Task 1	User started Task 1
05:51	Task 1	User tries search Sloan building from search menu
06:01	Task 1	Instructor informs the user that this search option is not enabled.
06:34	Task 1	Instructor hints to access the Sloan building by clicking on the red circle
06:40	Task 1	User completed task 1.
07:10	Task 2	User Started Task 2.
07:26	Task 2	After the application shows Sloan 155 room, user wanted to where he is currently.
07:32	Task 2	After clicking on the direction, the confusion was clear.
07:42	Task 2	User have completed the task 2
07:46	Task 3	User started Task 3.
08:30	Task 3	User searched the option in the hamburger menu.
08:36	Task 3	User clicked on “Share event” menu to see whether it is the correct menu for the task.
09:07	Task 3	User tried to access Sloan 155 room again to see if he found any option or not.

09:16	Task 3	User clicks on the menu item and finds “Location Sharing” option.
10:27	Task 3	User completed task 3.
10:50	Task 4	User stated Task 4.
11:12	Task 4	User completed task 4
11:54	Task 5	User stated Task 5.
12:16	Task 5	User completed task 5
12:59	Task 6	User started task 6.
13:34	Task 6	User completed task 6.

Participant 2

Video link:
https://wsu.zoom.us/rec/share/50GRIhIRPIi9O53sHr4u0OEEVTdhHv1CcjORVVneyXtCo7i4Y714az1ANrMnDR4D.YCRIlFIZd850mnIz

Time	Task	Description of Incident
00:30	Task 1	User started the task.
00:36	Task 1	User tried to search Sloan building
00:52	Task 1	Instructor gave hints how to access Sloan building.
01:10	Task 1	User completed task 1.
01:30	Task 2	User Started Task 2.
01:40	Task 2	User tried to manually search for the room.
02:20	Task 2	Instructor gave hint to search the room.
02:22	Task 2	User searched the room and find it.
02:51	Task 2	User completed task 2.
03:23	Task 3	User Started task 3.
03:37	Task 3	User clicked on “Share event”.
04:41	Task 3	User tried to share Sloan 155 options to share the location.
05:04	Task 3	User failed to complete the Task 3 and moved to task 4
05:32	Task 4	User started the task 4.
05:43	Task 4	User completed the 4.
06:15	Task 5	User started the task 5.
06:23	Task 5	User completed the task 5
06:46	Task 6	User started the task 6.
07:29	Task 6	User completed task 6.

Participant 3

Video link: https://wsu.zoom.us/rec/share/YwG-0ZoeIfcbnU3qrX5bI3_LY4PYaZ2ClvORkZbUXJMG8hkAcxSOvs1q0RIM-ODY.-d22bIcvtjCRKfhQ

Time	Task	Description of Incident
01:15	Task 1	User started task 1.
01:37	Task 1	User completed task 1.

01:54	Task 2	User started task 2.
02:00	Task 2	User tried to find the manually.
02:03	Task 2	User searched for the room.
02:22	Task 2	User completed task 2.
02:48	Task 3	User started task 3.
03:01	Task 3	User clicked on “Share Event” to complete the task.
03:08	Task 3	User tried to search a room and share the location.
03:40	Task 3	Instructor gave hints to complete the task.
04:12	Task 3	User completed task 3.
04:38	Task 4	User started task 4.
04:47	Task 4	User completed task 4.
05:10	Task 5	User started task 5.
05:30	Task 5	User completed task 5.
05:50	Task 6	User started task 6.
06:09	Task 6	User completed task 6.

Participant 4

Video link:
https://drive.google.com/file/d/1ZmsCx3r7aSlNmpIfAEHSDGQZ7ocXAE6n/view?usp=sharing

Time	Task	Description of Incident
04:14	Task 1	User started task 1.
04:17	Task 1	User completed task 1.
04:25	Task 2	User started task 2.
05:25	Task 2	User tried to search for the room.
06:20	Task 2	User completed task 2.
06:33	Task 3	User started task 3.
06:48	Task 3	User clicked on “Share Event” to see whether that’s the option for location sharing or not.
07:18	Task 3	User found the option for location sharing.
07:39	Task 3	User completed task 3.
07:51	Task 4	User started the task 4.
08:05	Task 4	User completed task 4.
08:22	Task 5	User started task 5.
08:25	Task 5	User shared what he thought about “Report a problem” initially.
08:46	Task 5	User completed the task.
08:50	Task 5	Instructor asked user what he would he liked to rename “Report a problem” menu item
10:25	Task 6	User started task 6.
10:49	Task 6	User found scale in the bottom of the screen of the heatmap.
11:00	Task 6	User states some advice for the feature.
11:40	Task 6	User completed task 6.

Participant 5

Video link:
https://drive.google.com/file/d/1PV0Fxwq5tkUlEVL_0B-SoK1W3MxADst7/view?usp=sharing

Time	Task	Description of Incident
04:39	Task 1	User started task 1.
04:55	Task 1	User finished task 1.
05:29	Task 2	User started task 2.
05:40	Task 2	User tried to manually search for the room.
06:15	Task 2	User finished task 2
06:45	Task 3	User started task 3.
07:06	Task 3	User clicked on “Share Event” to perform the task.
07:25	Task 3	User again search for room to see if it gives the option to share.
07:50	Task 3	Instructor gave hint about left menu.
08:55	Task 3	User finished the task.
09:23	Task 4	User started task 4.
09:35	Task 4	User finished task 4.
10:08	Task 5	User Started task 5.
10:15	Task 5	User finished task 5.
10:32	Task 6	User Started task 6.
11:20	Task 6	User found the heatmap. However, immediately pressed back button.
11:25	Task 6	Instructor gave some hint.

APPENDIX G: SUMMARY OF USABILITY PROBLEMS

Problem Description	Evidence	Severity	Scope	Diagnosis	Design Recommendation
User may not find the location sharing option.	P4: 8:31	1	1	See diagnosis of problem 1 (UD1)	Transferred location sharing option to hamburger menu and removed profile icon.
User may not understand the meaning of the heatmap.	P5: 9:09	2	1	See diagnosis of problem 2 (UD2)	Renamed the menu item to "Show crowdedness"
User may think the search bar will work on the interface and tried to search directly.	P1: 10:05	3	3	See diagnosis of problem 3 (UD3)	Did not implemented the search functionality in that UI.
Users may not be able to find his location after he searched for a room.	P1: 10:27	3	3	See diagnosis of problem 4 (UD4)	Created a new icon that will redirect the users to their current location.
User may confuse this option with reporting an issue of the application.	P5: 10:54	3	3	See diagnosis of problem 5 (UD5)	Renamed the menu item to "Building Maintenance"

APPENDIX H: SEVERITY AND SCOPE RATINGS

Severity and scope ratings are included to communicate which problems are most important.

Severity

Severity is an assessment of a problem's impact on user performance. The following scale is derived from Dumas and Redish (1993):

* **Severity 1** problems prevent users from completing a task. Participants give up after a few tries or they need a hint to continue. For example, users consistently select an incorrect dialog option and do not know what else to do.
* **Severity 2** problems create significant delay and frustration.

Participants continue to get lost or to use inefficient methods to accomplish a goal. For example, the lack of feedback to users confirming what they have just done causes them to do the task over to make sure they did it correctly.

* **Severity 3** problems have a minor effect on usability. For example, an unusual term in a dialog causes users to hesitate for a moment before making the correct choice.

* **Improvements**. While not problems *per se*, improvements will make the task even easier to perform or learn. The interface doesn't hamper users but there is something that could make it even better.

Scope

Scope is an assessment of how frequently users will encounter a problem. The more users that a problem affects, wider its scope.

* **Scope 1** problems will affect almost all users.

* **Scope 2** problems will affect many users.

* **Scope 3** problems will affect few users.

APPENDIX I: CONSENT FORMS

https://drive.google.com/drive/folders/1D-UIvCBQJ33g62X0mV3fQSEIY2ZObufa?usp=sharing