

# In-Campus Locator

## *Midterm Final Report*

**INTERACTION DESIGN METHODS: HCI - 541**

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# 1. Prototype and Evaluation Report

## 1.1 Prototype Methods

### 1.1.1 Whiteboard sketches

Ideas only described verbally are quite abstract until one can visualize them. Whiteboards sketches gave these ideas concrete definitions that were quick and flexible, yet powerful enough to convey a message. For us, each team member had different ideas of the ideal user interface in mind. The whiteboard gave us the ability to sketch these out and begin to understand one another's ideas better. Many of us had overlapping ideas, while others had solutions not even imagined yet, and all these were combined into a final sketch used for low fidelity prototyping.

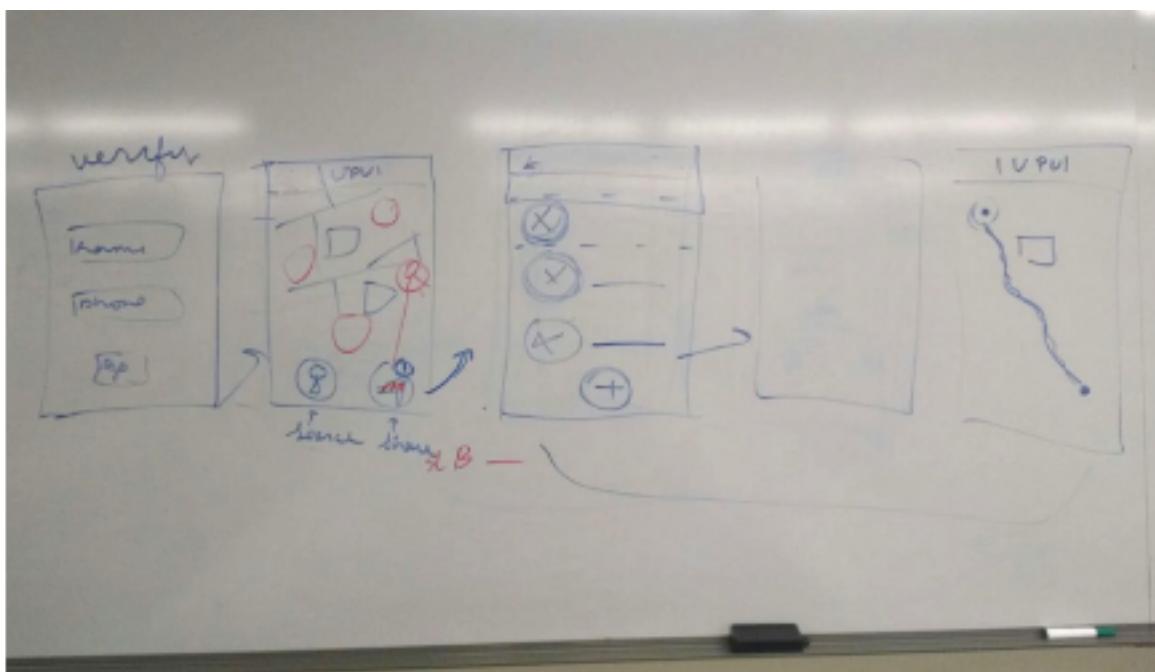


Figure 1: A whiteboard sketch depicting navigation to a building

### 1.1.2 Balsamiq

After finalizing concrete ideas with whiteboard sketches, we used Balsamiq, a desktop mockup tool, to visualize our sketches as proofs of concept. Balsamiq's interface allowed for any person to use it with ease, requiring no prior expertise or coding knowledge. Again, this method was quick, flexible, and allowed us to see our sketches come to life, without investing time into the details of the interface or its interactions. Balsamiq also gave us the "sketchy" look to our mockups, which indicated that our concept was still

ideating and not complete. This allowed us to change design decisions over many iterations, until the concept was finalized. This tool led us to our next phase, where we could focus on the specific interactions between elements and pages.

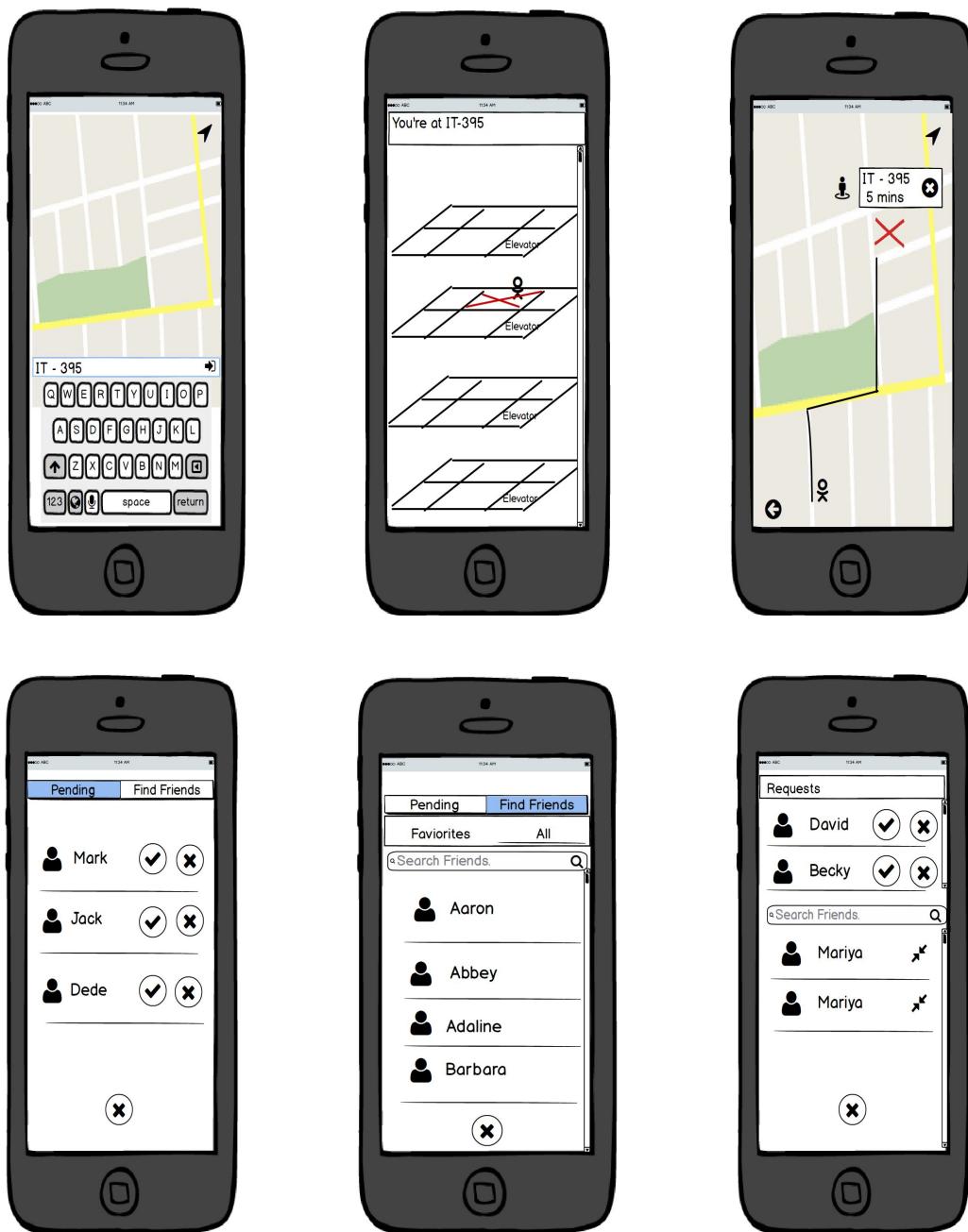


Figure 2: Mockups from Balsamiq depicting the exchanging process

### 1.1.3 Axure, Photoshop and InVision

After two stages of iteration, our idea was beginning to emerge, including user flows and key features. During this stage, we used Axure to build the first low fidelity prototype because it provided tools to allow designers to build frameworks easily and effectively that could be altered or edited within minutes. Although we could have created interactive prototypes in Axure, it lacked in its ability to make pixel level design, what would make the low fidelity prototypes look more realistic. Therefore, based on the key pages from Axure, we created the black and white versions for every page in Photoshop. Photoshop allowed us to carefully consider each design element's style and size, such as the dimensions of a button in order for a user to be able to tap on it properly, while not occupying too much real estate on the screen. After all the static interfaces were finished, we created an interactive prototype using InVision. InVision assisted in demonstrating interactive prototypes because it was simple to modify at anytime, especially when receiving feedback during usability evaluations. It was also easy to send a link to end users and have them test the prototype on their phones. For reference, a link to our Invision application is attached here:

<https://invis.io/B68YULC3S>.

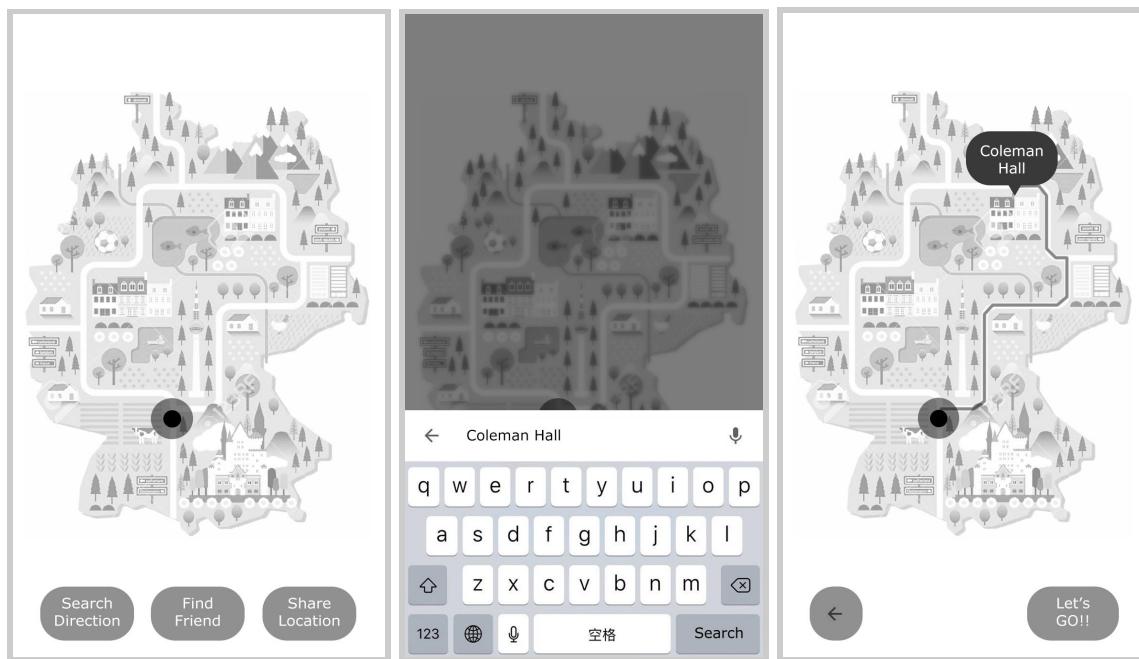




Figure 3: Axure prototypes depicting a user flow for navigating to a building

#### 1.1.4 Photoshop

Our final prototyping stage was made possible using Photoshop, a tool that provided the most customization when focusing on the user interface design. We were able to create the style, size, and layout of every single element that we used, making it resemble as close to the real application as possible. Using the results from the evaluations, we tailored the designs to match not only the original user flow, but also the positive and negative feedback from the novice and expert users. Although this process took exceptionally longer than the originally three phases, we felt much better creating the detailed designs knowing that we had seen the progression of the layout, concept, and user feedback to create the most robust user interface possible. A link to the demo reel of the high fidelity mockup can be found at this link:

<https://drive.google.com/file/d/0Bxn8T0l6zADMcG1ZdzNocU9xUjQ/view?usp=sharing>

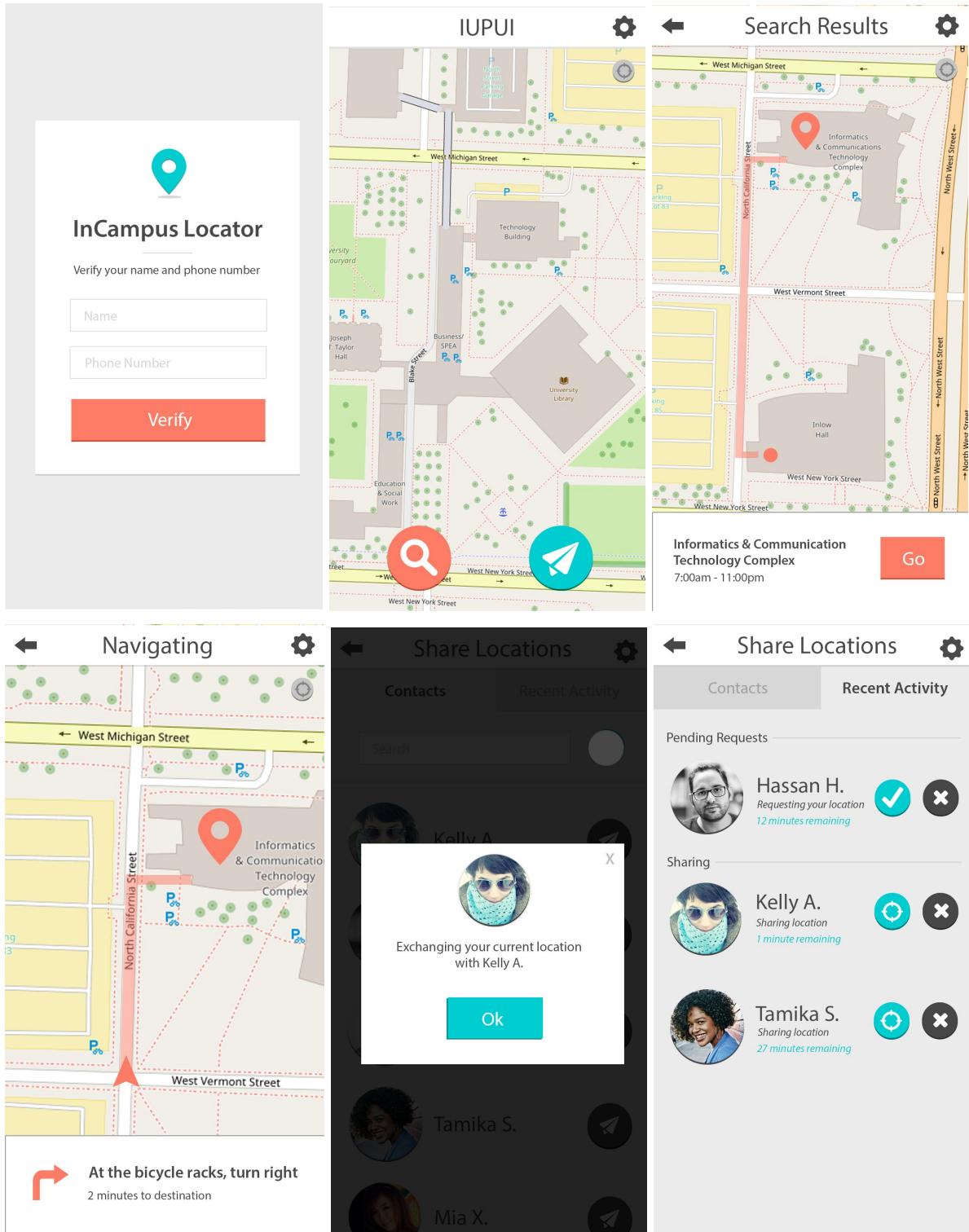


Figure 4: Photoshop mockups depicting some of the final designed screens for navigating and exchanging locations

## 1.2 Prototype Reflection

Overall, whiteboard sketching, Balsamiq, Axure, and InVision were the easiest prototyping tools for us to use throughout this project. They were the quickest methods for iteration, and provided the most flexibility when there were edits or additional features. Prototypes, mockups, and demos could be easily shared to one another because of software compatibility and lack of experience needed prior to using the method. Photoshop, on the other hand, took several days worth of time and effort to complete, and had to wait until after the results of the user testing and expert reviews. If a change needed to occur, it took some time to go back and change on one or more screens. In the future, using sketching Balsamiq, Axure, and InVision will all be options for prototyping. Photoshop may be an alternative; however, it needs to be the last iteration of prototyping so that it requires little to no revisions.

## 2. Evaluations

### 2.1 Task Analysis

Below are the ideal task flows for the following user scenarios, along with the screenshots for visualization:

#### 2.1.1 Locating a classroom

1. User types the room number in the input box (i.e. Coleman Hall Room 222)
2. Routes will be displayed on the screen
3. User initiates navigation
4. User begins walking to the building
5. User enters the building (external direction finish)
6. User continues towards room
7. Confirmation that the user made it to the correct room

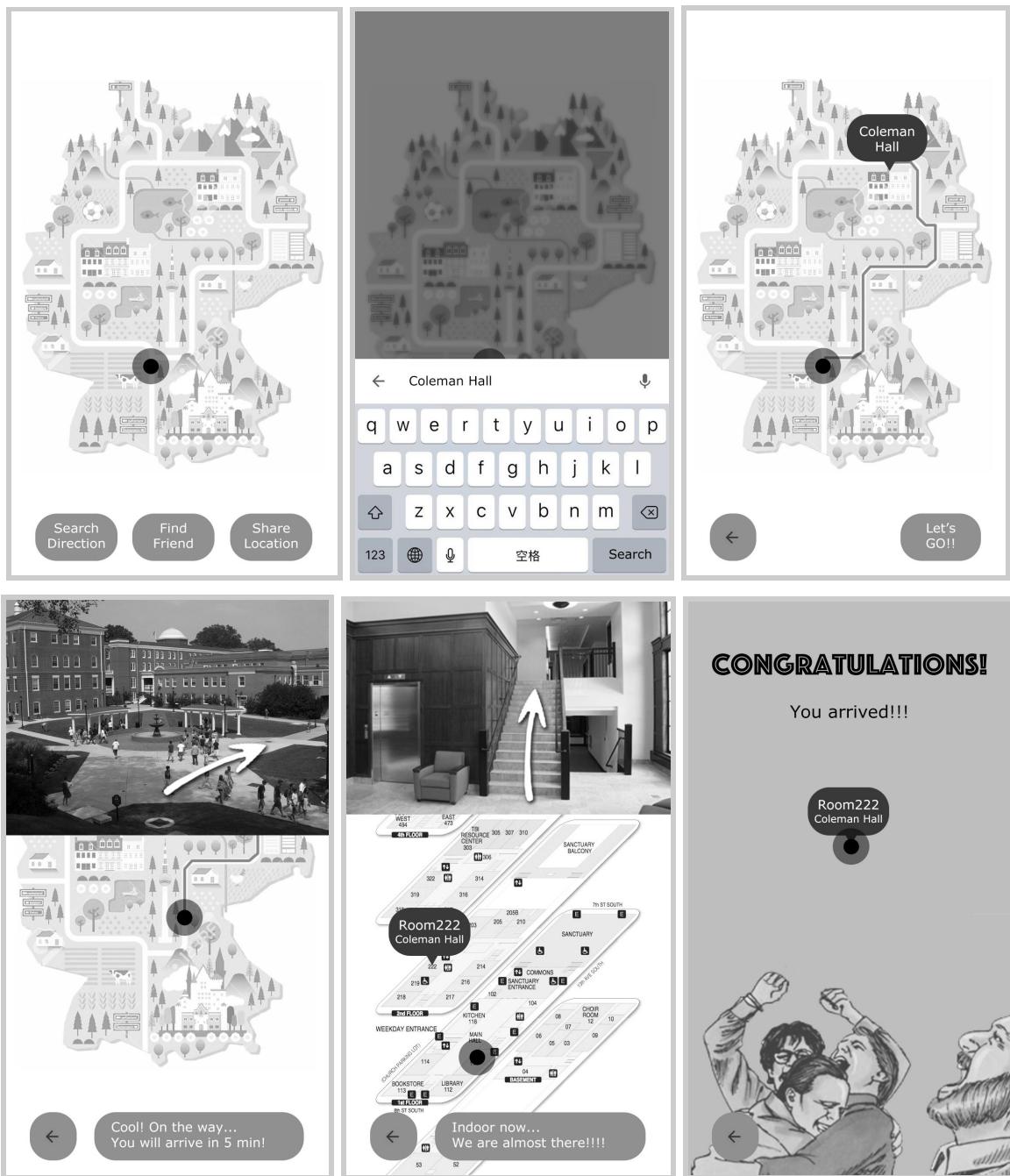


Figure 5: Task flow 1, depicting a user navigating to a specific classroom

### 2.1.2 Find a friend

1. User locates the contact list (visited place, existed contact list, add new contact)
2. User selects a contact and requests the friend's location
3. Friend receives notification to allow or deny access to their location

*\*\*If the friend allows their location to be accessed:*

- 3.1.1 User views routes to their friend

3.1.2 User selects a route and proceed to navigation

*\*\*If the friend denies their location to be accessed:*

3.2.1 Task ends

*\*\*If friend does not have the Incampus Locator application:*

1. Application pulls contact list from user's device
2. User selects a contact from the list
3. Application Send access request to your friend's (message/email/Whatsapp/etc.)
4. Friend receives notification to allow or deny access to their location

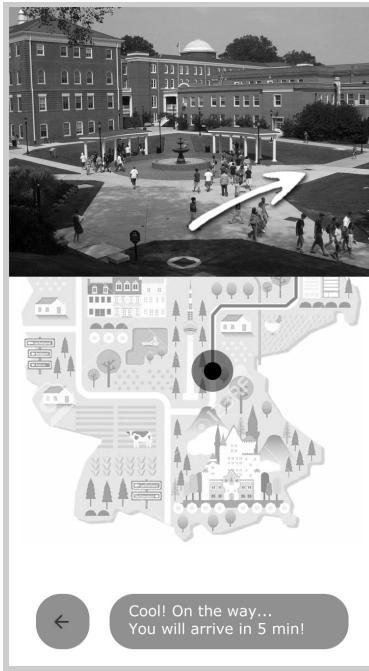
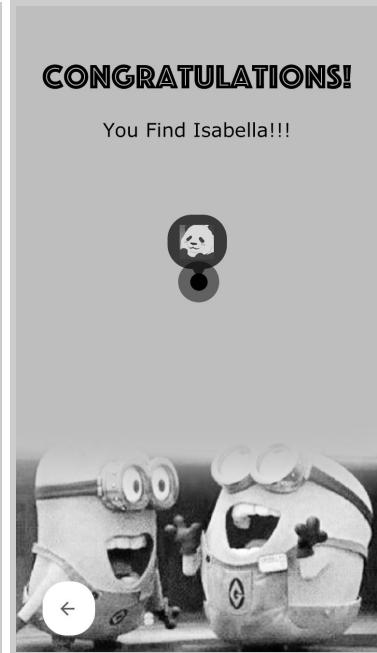
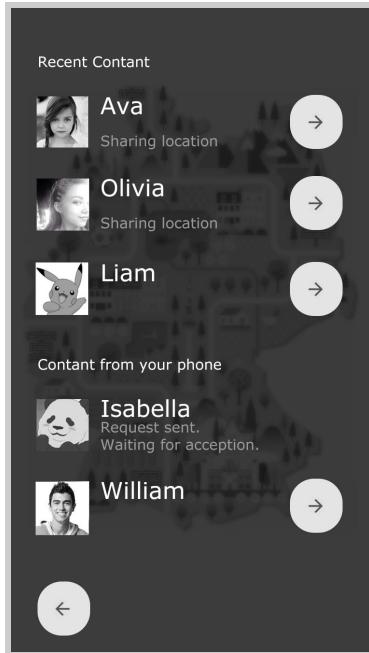




Figure 6: Task flow 2, depicting a user requesting to find a friend's location

### 2.1.3 Reply request from your friend

***\*\*If IUPUI Locator is installed:***

1. Friend receives request from the APP (top bar notification or center or any default status)
2. Friend chooses to allow or deny

***\*\*If IUPUI Locator is not installed:***

1. Friend receives request from message/email/whatsapp/etc.)
2. Friend clicks a link in the message
3. Friend is redirected to the InCampus Locator webpage
4. Friend chooses to allow or deny



Figure 7: Task flow 3, depicting a user friend's replying to a request

#### 2.1.4 Share your current location to a friend

1. User locates the contact list (visited place, existed contact list, add new contact)
2. User selects a contact and shares current location

*\*\*If add new contact:*

1. Send your current location to your friend (message/email/whatsapp/etc.)

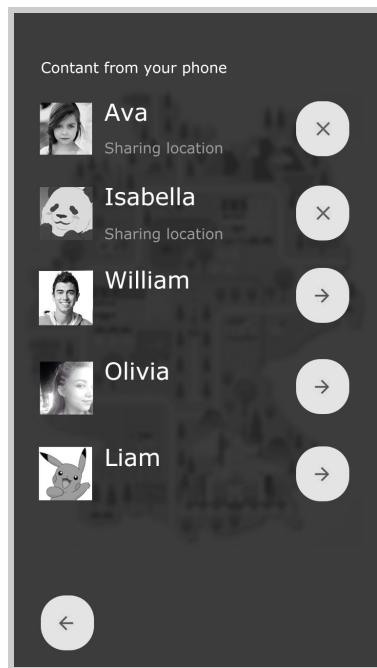


Figure 8: Task flow 4, depicting a user sharing his/her current location

### 2.1.5 Receive location information from your friend

**\*\*If IUPUI Locator is installed:**

1. User receives location from the APP (top bar notification or center or any default status)
2. User chooses to either find friend or dismiss

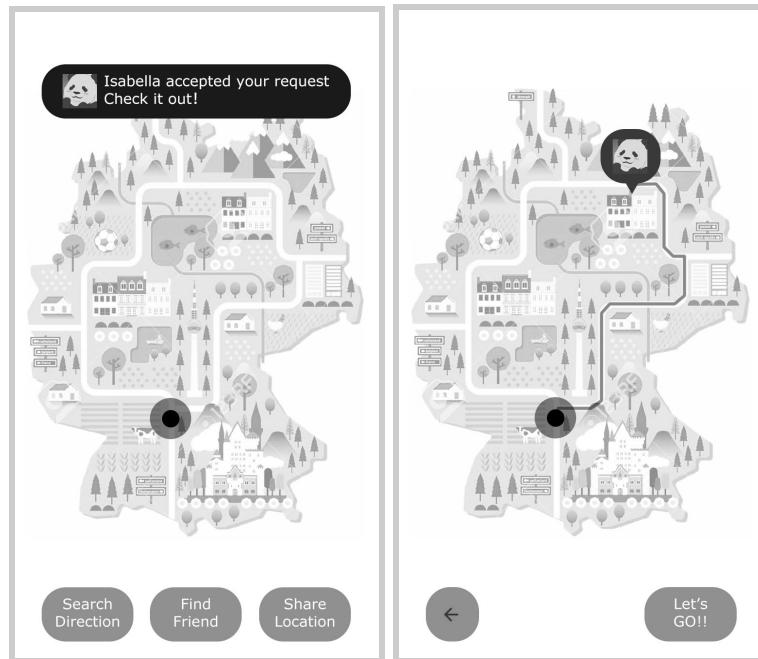


Figure 9: Task flow 5, depicting a user receiving his/her friend's current location

## 2.2 Evaluation Methods

### 2.2.1 Expert Testing

Once the low fidelity prototype was created, we carried out two expert studies for the design using two different methods: Heuristic Evaluation [**Refer Appendix C for detailed report**] and Cognitive Walkthrough [**Refer Appendix D for detailed report**]. Each method provides excellent insights about the prototypes before we started the high fidelity prototypes. We found some major problems and some minor problems during the usability testing process which we improved in the following iteration of the design.

#### 2.2.1.1 Major Problems:

- Missing self locating feature in location finder app.
- Using text based buttons instead of using icons
- Intellisense feature missing in searching location

-Missing search feature in contact list

#### 2.2.1.2 Minor Problems:

- Grammatically incorrect feedback messages.
- Missing building names on the map
- Your own location icon was not confusing and not much informative.
- No instructional overlays or short tutorials for new users.

#### 2.2.2. User Testing

Apart from expert testing, we conducted two user testings. This phase helped us to understand how well the user interacted with the design and how satisfactory it was for the user.

##### **[Refer Appendix E for the detailed User Testing]**

Both the user participants had some insightful suggestions for our design. A few of their thoughts were:

- They both seemed really interested in the idea of the application since it targeted a problem faced by them on a quite frequently.
- Both the users wanted more details on the map and felt that the map is incomplete
- Also they felt that the once the location share request has been accepted by a friend, their details must pop up immediately, instead of them clicking the notification
- The map must show details of the friend sharing the location's position and name
- Both the users seem to like the simplicity of the interface

A few interesting points that they pointed out were

- The map must contain the information about the well-lit and well crowded areas for times such as late night
- The map must update real-time with the gps location of the friend sharing the location
- Clicking the map must select the location too

Overall, the evaluation was a success. We were able to analyze the way the user thinks while they used the app, making us aware of the ways we can make the application intuitive. Here is the comment from the real user:

<https://drive.google.com/file/d/0BwKj1nJBzYYN2dnOXVXckhDeG8/view?usp=sharing>

### 2.3 Next steps

Throughout the duration of this project, we had established our design focus on IUPUI external and internal navigation and exchanging locations with friends on campus. Based on the evaluations we conducted, we were able to identify the following key problems:

1. Interaction specifics, such as how the user would zoom in on a location or be asked for GPS services, were not included
2. Key information elements, like providing hours of operations to a building, were still missing from the interface
3. How to make send and receiving of information from one friend to another happen in as little steps as possible .

If there was more time to work on this project, we would focus the high priority items as follows for the next iteration design:

1. Provide streetscape wherever user points out on the map.
2. Provide the open hour of the building.
3. Provide information about whether there are many people or not.
4. Improve the readability of IUPUI map. For example, provide the landmark of on IUPUI campus, like library, campus center, etc.
5. Provide real time streetscape be controlled to see 360° environment.
6. Provide solution for the situation that when the route in real world is unavailable, how to choose another route?
7. Provide friend's location with detailed address (E.g. 12 Blake Str.)
8. Provide solution for user who want to set a meeting place for allowing several friends to meet up.
9. Provide an access to send feedback to the developers of the app.

In response to the feedback, we were able to change the sending and receiving of friend's locations by creating an "exchanging" process. When the user shares their location, they are also requesting the friend's location back at the same time. This eliminates the need for additional buttons and functionalities, and are the two elements needed for navigating to one another. Many of the other items that were more technical, like 360 environment, offline map, and sending feedback were not changed because those expanded beyond the basic functionalities of the first iteration.

## 2.4 Evaluation Reflection

All the issues found throughout the evaluation process fall into two main classifications. The first is the functionality of the application. For example, the user wanted to specify a meet up location for the user and his/her friend to travel to, which does not exist currently. The second is the interaction of the application. For example, the user wants to see the 360° streetscape by gesture interaction on the app because it enable user to freely control the application.

As we conducted our four evaluations of the applications, we received valuable insight and feedback for design on different elements. The cognitive walkthrough assisted in verifying the task flow throughout the application, while heuristic evaluations helped us revise our designs to meet rigid design guidelines. Think-aloud based user testing provided us with fresh ideas that were previously overlooked. We, as designers, cannot act as end users, and running user tests

helped us understand whether our solution met the user's expectations. The expert reviews worked best with our time schedule and provided us the most input for this initial iteration. The majority of our edits came from the heuristic evaluations and cognitive walkthrough. Running user testing took time, and available end users, which proved to be difficult. More user testing would be necessary as the solution progresses in its lifecycle.

## Appendix A: Data Collection and Problem Framing Report

# In-Campus Locator

*MidTerm Design Project*

***INTERACTION DESIGN METHODS: HCI - 541***

**FA16**

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# Executive Summary

As IUPUI college students, we have experienced, first hand, the struggles of navigating and locating different areas of campus. Whether this was our 1st semester attending or our 7th, we have never ceased to encounter ways to become lost and frustrated. For our midterm project, we chose to combat this problem by researching a new solution to helping students, both novices and experts, have a better campus experience.

The four areas we chose to focus on including events, classes/buildings, dining, and parking. Collectively, these were the top ‘pain points’ that we assumed students would have the most difficulties experiencing on campus. Since there were multiple areas for studying, we split the four areas amongst the group members and tasked each student with researching and becoming the ‘resident expert’ in that specific area. For example, Pushkar was in charge of observing events, while Mikaylah observed parking. For our interviews, However, we all used the same interview template so that we could collect a large amount of data to develop better conclusion.

## *On Campus Events :*

After interviews and observations we found out that students were quite interested in attending on campus events that are happening, but were having trouble finding details and location of the buildings. The main concern was there was no such list where students could find out all the events that may take place in upcoming days. They were getting emails and flyers of the events, updates through facebook or information from their friends. However, the sources were scattered and information was disorganized. All these sources were bombarding information to them and either they would forget about most of the events or would have hard time to find out about the event that would cater their interests. Most of the times, they would disregard or never receive updates of events like changes in place or timing of the event. One participant mentioned that if they cannot find or locate the room/building of the event, they “**give up, because they assume that the event will no longer be going on by the time they arrive.**” There was no way to know if a particular event is open for all or for specific target audience. If they are waiting for some meeting at a particular building and have time to spend then there was little to no information if that building is hosting any event that they could attend.

### *On Campus Dining:*

From the interview we found that two main reasons to why students who don't consider to have meals on campus are that 1) "food are costly on campus", and 2) not familiar with food venues on campus. For the first point, interviewees mentioned that even food provided by the same chain store like Einstein's is priced higher on campus than off campus. "**I bring my lunch because I can't afford the cost of food and I don't have time to wait in line,**" one participant noted fairly consistently during his interview. For the second point, they mentioned that when they needed to find food, they weren't able to identify hours of operation, foods that catered to their wants or needs, or longs that didn't have massive lines during 12pm and 6pm (**this was noticed in observation by Chaolan**).

### *Locating Classrooms/Buildings:*

Even if user is new to campus or has spent a year at campus, finding specific building locations was still a struggle, and if the building is new then finding particular classroom inside building would be even more difficult. To find a particular building, the student has to have a general idea of the name and street name. Google Maps doesn't help if you know just the abbreviation of the building and in real life people usually use abbreviation in their day to day conversation and not full forms. For example, a person is not able to search "IT Building", and must search the physical address of the building. Another participant stated that "**If a location doesn't appear in google maps, then maybe that location doesn't exist.**" They assume that the Map is incorrect or doesn't understand the search query when, in fact, Google Maps doesn't have every building on campus programmed into their interface. Also Google Maps requires data, and an offline electronic map is not available if students have weak wifi connection and no data. Remembering classroom names was difficult, along with finding available classrooms for collaboration or studying was a struggle. At the majority of the buildings, a thorough floorplan was missing to detail individual classroom numbers.

### **Design exploration/Design directions**

After analysing list of problems in every category we separated them into two major sections. First was locating elements(i.e buildings, events, dining places) around the campus and second was locating elements inside the building(classrooms, vending machines, meeting rooms, auditoriums, etc)

For first category, we thought an app would be useful. An example could be an application working in conjunction with Google Maps, which would give options to locate buildings, or dining halls. User will be able to search the location of the buildings using building's abbreviation or full forms. If technically possible, the app may try to show inter building connected routes for reaching from one building to another, as it'd be helpful in rainy days and long winter. The app can also provide feature of viewing menu of a specific dining hall and ordering food, so that students won't have to wait in long line to order the food, for convenience payment option can also be integrated in the app.

The app will also provide list of events that are scheduled in coming days with other details like GPS location of event, category of event, date and timing, targeted users, and other minor details like is there any free food and drinks, etc.

For the second category, we thought of providing kiosk inside every building at each entrance. Using kiosk user will be able to locate classrooms, halls, vending machines inside the building. Kiosk will also give list of events that are happening inside the building for the current date, and which classrooms are occupied at what time and if they are free to utilize for studying or group meetings. Adding to the kiosk, a detailed floorplan on every floor showing the classroom numbers near staircase/elevator would be quite helpful for students or any new comer in the campus. And lastly, signs at every turn showing these range of classrooms are on left side and these range of classrooms are at right side.

We think this solution will greatly help any novice or expert users who are new to the campus or not. Also this will help reduce the stress on help desk attendant's as majority of the questions are related to finding the location on the campus or inside a particular building.

A potential third solution that may help student with navigational struggles could be physical signs or landmarks located around campus. This solution could help combat locating buildings or classes/events. This could include almost an interactive 'mini-kiosk' near intersections of roads or at common areas so that people know where they were, and how much farther until they reached their destination. It could help students who do not have the phone application and can't access the kiosk indoors to find where they are.

### **Additional user study required:**

Along with above mentioned categorized, we also found out that parking is quite an issue on campus. Many students in our interviews mentioned the struggles and frustrations with parking. As we began to conduct more interviews and observations, along with diagramming, solutions for parking became radically different from locating classes, buildings, events, and dining. We had so many solutions, and had more room to do more observations and interviews to learn more, and felt that this would make for an excellent final project topic. For the purpose of this report, we added the information gathered for it to show data collection.

## OBSERVATIONS

### Field Notes

#### 1. On Campus Events



*Image 1 - IT building front desk : observation 2*

IT Building:  
help desk

Date 14-Sep-2016

3:08 → A Man came in & is discussing about some issue on the 3rd floor  
 → Another girl came in → talking about vending machines

3:18 → Nobody came in to ask for help  
 3:20 From like 10 mins

3:22 → A boy is looking for class room & he's not sure about number, But he knows which class.  
 → Attendant doesn't know about the class.  
 → Boy elaborates the class nature & name, attendant is still not sure about the class name. still no success.

3:25 → A girl has meeting with professor at some lab, & she's asking where the lab is,  
 → Attendant redirected her to 3rd flr

LOCATION: University Center  
(Main desk)  
help

DATE: 14-Sep-2016

This can help you remember locations. Now I know where's parking!

10:00 → At campus center, main desk:  
 → Nobody's here Except the helpdesk girl  
 → Few people playing Pokémon near the desk, I suspect Pokstop or gym nearby.

10:10 → A guy came at desk and asked the girl about location of OIA office.  
 10:15 → They are talking & She's showing him location on hard copy of paper map of campus  
 → He's quite confused

10:20 → First guy went outside & another girl came this time to ask about printing machine & went.  
 → First guy came back as he's still not sure about the OIA. Now she showed the guy where it is on the (paper map) & I guess wrote (draw?) something on that map.  
 User understood better if the visual is the info

10:30 → Now he looks OK & he's laughing

Image 2- Notes: On campus events

## 2. On Campus Parking



Image 4 - Cars coming and going from Gateway to Blackford garage:observation 1 &amp; 2

observation 1

9/15/16 @ 11:40  
Blackford & gateway garage

11:40 - large influx because of noon classes

11:47 - one person looks incredibly irritated/frustrated

11:49 - congestion at lights from people needing to get in and out of garage

11:50 many people leaving from morning classes

11:54 - parking service golf cart is driving back and forth trying to monitor parking

11:59 - cars are speeding/rushing, may be late for class?

observation 2

9/16/16 @ 12:20 pm  
Blackford and gateway

12:20 - relatively calm, assume people are in classes

12:30 - drivers pulls into gate of blackford, and then physically backed up and drove over to gateway

↳ maybe so noticed the influx in people coming out of gateway garage

12:32 - many people are now leaving gateway garage.

Image 5 and 6- Notes: On campus Parking

1st observation:  
11/11

2nd observation  
11/11

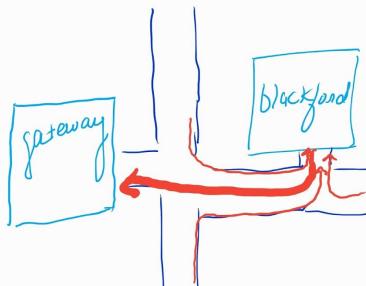
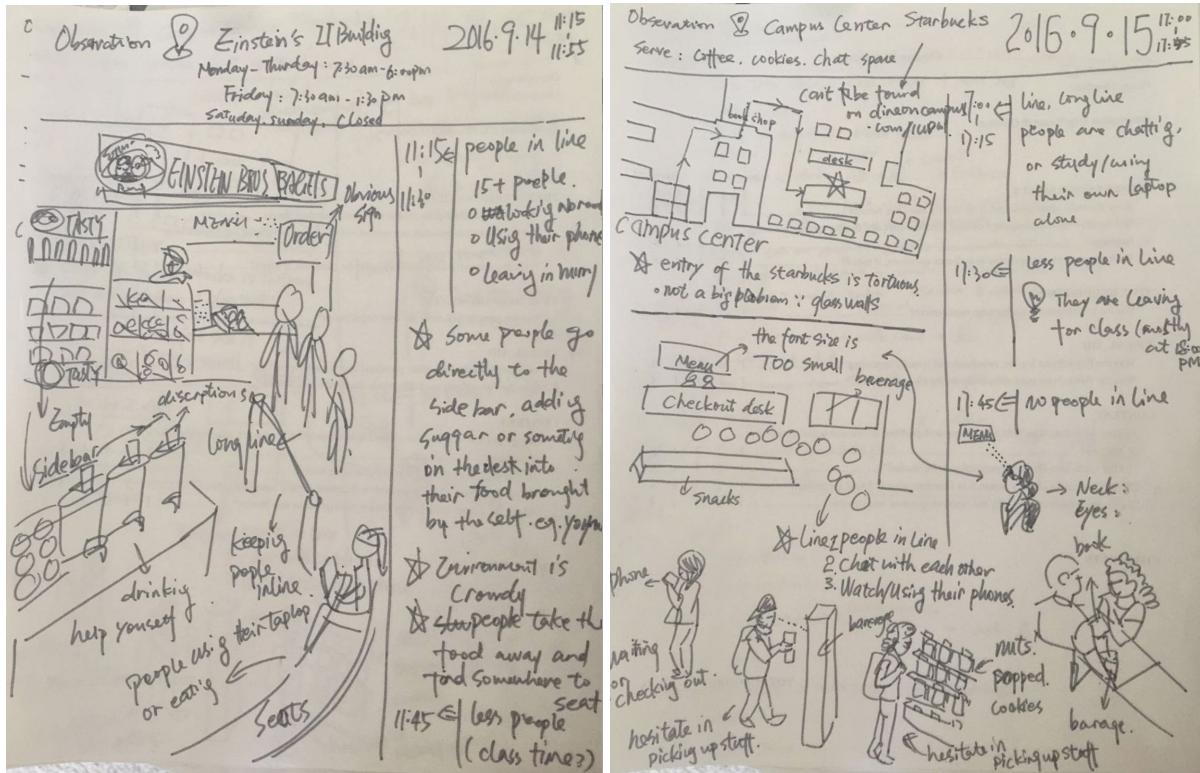


Image 7- Notes: On campus Parking

### 3. On Campus Dining



### *Image 8 and 9 - Notes: On campus Dining*



*Image 10 and 11- People getting food throughout the day on campus; observation 1 & 2*

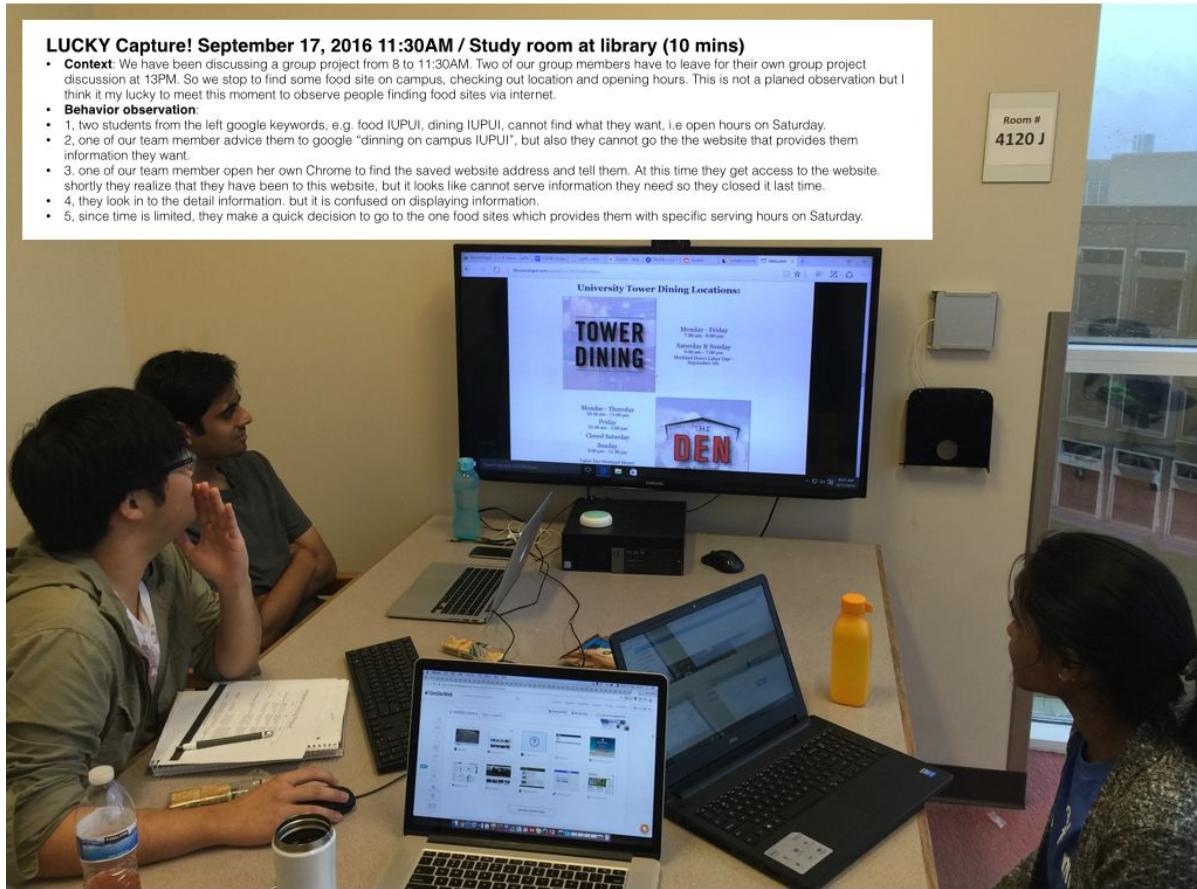


Image 12 - Students are searching information on food venues and opening hours: observation 1

#### 4. Locating Classrooms/Buildings

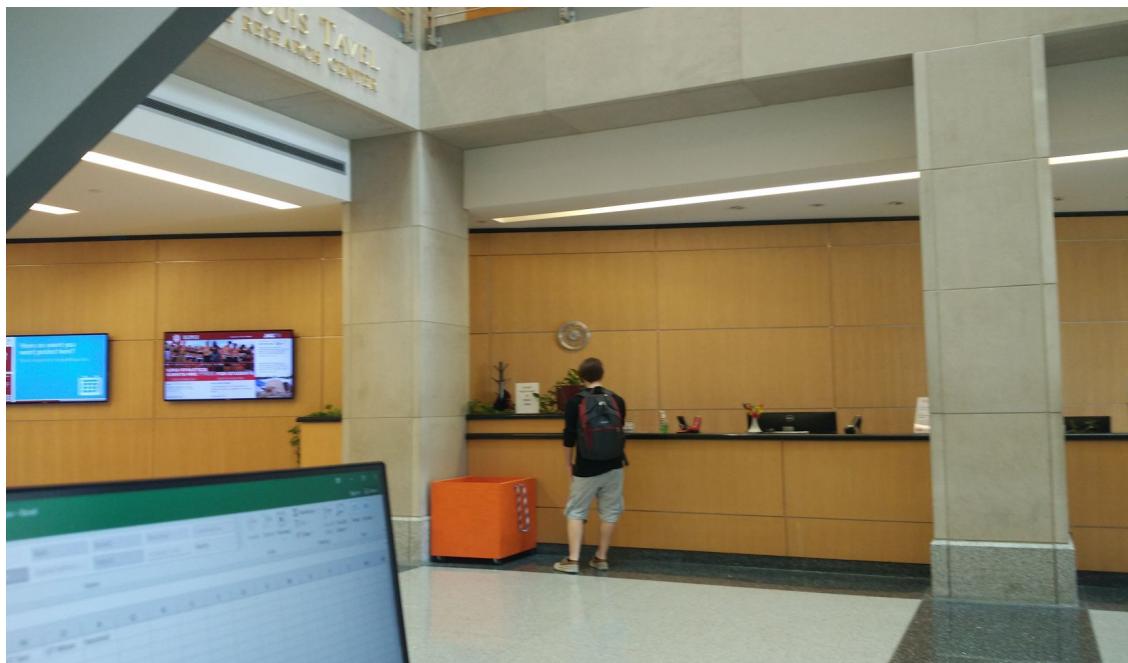


Image 13- A boy waiting at the information desk at the IT building: observation 1

- OBSERVATION 1
- IT BUILDING 15<sup>th</sup> Sept 2016 3:00pm.
- Observation Notes-
- 3:00 - due to class timings a lot of rush
  - Most people know where to go
  - On phones - III III II
  - Big line in front of coffee shop - Einstein Coffee.
  - One boy wants to ask for info at info desk.
  - ↓
  - desk is empty — he's waiting
  - ↓
  - someone comes & directs him.
  - One Indian girl - stops near stairs  
Seems like she doesn't know the way
  - ↓
  - Walks to VITS
  - )
  - Then goes to coffee shop but still wanders around lost.
- 3:10 - 3:15 - Rush reduces.
- The hallway is quiet
- People sitting & working quietly  
Not many looking for classrooms
- OBSERVATION 2 (16<sup>th</sup> Sept 2016)  
at 12:00 pm
- 12:00 pm - 2-3 people sitting outside library
- Most walking with phones
  - Students walk in groups of 2 or more while leaving or going into library
  - One girl seems lost... looking around
  - ↓
  - waits for a while - Is she lost?
  - ↓
  - Calls someone
  - Waiting for a friend - Not lost

- People prefer skateboards than walking.
- One girl asked a random person for directions
- ↓ from the way he pointed -  
Maybe Mostly Campus centre
- People know where they are going
- A group of students on google maps
- ↓ wonder what address they put in  
∴ building names aren't there
- An Indian boy - asked directions
- SOTC building
- Conclusion - People familiar with the roads they need to follow that day

Image 14, 15 and 16- Notes: Locating classrooms/buildings

## Observation Summary

### 1. On Campus Events

- General observations: We did two general observations at university center and at IT building near their respective front desks. We thought observing near front desk would give us good amount of information about people's general queries. And surprisingly enough, most of the people's queries were about finding locations of different places or things in the campus. People were either new to buildings or were having trouble in finding location to a particular class.
- Front desk attendant had some trouble in pointing out few classrooms, sometimes people didn't know the exact room number they only knew either the purpose of their visit of the person whom they came to meet, and attendants only knew the classroom numbers. A student was asking about a classroom and he didn't know the exact classroom number, he tried describing the nature of the class but attendant couldn't help him out because she didn't know what boy was talking about.
- When attendant helped people with paper map, people were able to understand the location quickly than just oral communication.

### 2. On Campus Parking

- As many people have mentioned to us, parking is a very large roadblock on campus. People struggle to find parking and must 'garage hop' until they are able to locate a parking spot. This could potentially take upwards of 30 minutes. We chose the the **Blackford and Gateway garage intersection**. The first day was 15-Sept-2016: 11:40-12:10pm and the second day was 16-Sept-2016: 12:20pm-12:50pm. Our hopes were to observe people struggling to locate parking and potentially determine the root cause for this issue.

- The main observation was that people would drive into one garage, spend approximately 2 to 3 minutes inside, and then try the next nearest garage to them. This observation happened a total of 10 different times over the course of 2 days. One driver drove into the entrance way of Blackford, backed up, turned around, and drove over to Gateway instead.
- Some other observations were incidents like congestion with cars coming in and out of the parking garages. If there was a large amount of people leaving at the same time, it caused back ups not only in the garage, but at the intersection too. This kept new drivers from being able to go through lights or get into garages in a timely manner. By the time they make it in, the spots may have already been taken. Another interesting incident was how often IUPUI Parking Services had to drive back and forth between the garages, driving up and down the floors to estimate if the parking lot was full or not. Many people, especially closer to class start times, would speed/rush into the parking garages, which is quite dangerous for drivers inside and outside the garage, along with pedestrians making their way to and from cars.

### 3. On Campus Dining

- We did dining observation on campus food sites including **Einstein's** (IT Building, September 14th, 2016), **Starbucks** (Campus Center, September 15th, 2016), both of which took around 30 minutes respectively. Since we conducted an interview in the basement of IUPUI library where there is a **Outtakes** (September 12th, 2016), we had an opportunities to observe how people come in, looking for food and made purchase. Additionally, when we were doing group project together in a **student room of library** (September 17th, 2016), we happen to meet the situation that how students generated a motivation to find food and how they made their dining decision on dining on campus, which were inspiring.
- Our main findings on dining on campus are that students purchase food happen at meal time, mostly flock before class at 12 AM and 06 PM. Learning from interview, we have already known that what urges students go for dining on campus is mostly that they are hungry and in a hurry. For people who are familiar with the food site, they go swiftly and firmly, having decided what to buy before they arrive the shelf or order desk. For people who are not familiar with the food site, they show hesitate on choosing or ordering food, looking at the price tag and food type. When they are waiting for ordering or purchasing food in a line, people who

comes alone are mostly playing their phones, while people who come with other people, they chat with each other. After getting their food, 3 out of 5 will have their food on site before leaving.

- Beside observing on site, when we observe students searching internet for finding information of dining on campus, we found that online information are organized in confusing way, impeding people to find key information, e.g. location, open hour, etc., efficiently.

#### 4. Locating Classrooms/Buildings

- We chose classes and buildings as one of our major subtopics of our midterm project. Searching for a classroom or a building is very confusing and time-consuming when lost. We chose our **IT building**(15-Sept 2016: 3:00-3:30 pm) and the **bench in front of the library**(16-Sept 2016: 12:00-12:30 pm) for this observation. The aim of this observation was to keep a look out for the people who were walking towards their classrooms and make a note of their actions and reactions.
- **IT BUILDING:**
  - Main Observation: Most people knew their way around campus by now since it's already been about a month since the classes began.
  - Other Observations: The time we began our observation in the IT building, many students filled up the hallway for about 10 minutes. People came in from both doors confident about the way to their classrooms. Most of them used the staircase instead of the lift. Not as many as I expected were on their phones while going to their classes. I observed a few of them look at the board with the classroom and their numbers listed on them. One girl, an international student, amongst the crowd, walked through the door and stopped right in front of the staircase and looked around. Then she went to the information desk near UITS to ask directions. After 10 minutes had passed there weren't many students in the hallway.
- **LIBRARY:**
  - Main Observation: Most people were on their phone while passing the library.
  - Other Observations: The area outside the library was not very crowded for most of my time there. The people passing the library mostly knew their way around the campus since they were quite confident about where they were headed. Although, I did notice two international students ask fellow

students for directions to the campus center and the SOIC building, respectively.

- The observation was made one month after classes began. Therefore, most people were pretty confident about their routes around campus.

## Observation Reflection

### 1. On Campus Events

Overall observation reflection was not as insightful as interviews, but it did help to see how people actually do things in real life. Every interaction they make has a purpose to achieve some goals (minor or major) and every major goal requires completing few minor goals even though user don't want it. To be in the flow to achieve the major goal, minor goals are more like a distractions or just required and necessary tasks. If we could completely remove the requirement of minor goal, then we can make the it easier for the user to achieve the major goal. For example, to locate the classroom, primary goal is to locate a particular classroom so that student can attend the class/meeting. Not knowing where the class is problem and distraction. Asking at the front desk is the minor goal in order to achieve the major goal. And even sometimes that minor goal doesn't help much in achieving the major goal which lefts user frustrated. So if we could remove the minor goal by providing an app or inbuilt kiosk or floor plan near staircase of every floor for that particular building then user will be able to achieve the major goal and stress on the front desk can also be reduced.

We were particularly surprised that people ask too many queries at front desk just for locating things inside the building, a kiosk will reduce so much of stress for the front desk attendant. Next time while doing observations I will try to collect more demographic and environment data. Sitting alone and doing nothing was quite easy, but once you start actually looking and taking notes, then you have to keep your eyes and ears open. Conversations can go fast and most of the times they are short, so listening from a distance and writing the notes sometimes becomes a tedious process and it goes quickly out of hand. You cannot solely be dependent upon the audio, you have to observe the facial expressions and body language, which tells a lot more things. Sometimes there can be more than 1 event that you have to observe simultaneously and other times there is none, and you just sit there alone waiting for something to happen.

## 2. On Campus Parking

Observing parking struggles, honestly, didn't provide quite as much data as I wanted. During the times that I assumed people would be attempting to park, and during the times I struggle the most, there didn't seem to be quite as many people trying to park. After all my observations happened, I noticed that the worst times to try and park actually happen around 10:30 am, when people are attempting to potentially make noon classes, and must come early to school. It would have been helpful to sit outside a parking garage for longer than 30 minutes to see if I could find the specific times where traffic seems to be the worst, although I could resort to a questionnaire from students for that. I may go do some more observations in my free time, potentially on different days, times, and locations to get a better idea of the issues. I would have also liked to observe the parking lots themselves; however, finding a specific time to observe where the most action would have occurred proved to be very difficult.

## 3. On Campus Dining

What people says doesn't reflect what they does. As a saying goes, a bystander is always clear-minded. In the interview section, most of our interviewees told us that they don't have a need on campus dining and thus they don't care about such information about food sites. However, they don't realize that actually sometimes they have to find something to eat on campus. Examples are when they stay on campus longer than they plan for group project or talking to professor after class. When they are really hungry, finding food is the top issue on campus which they don't know before. As designers, we should not only focus on solving high frequent issues, but also care about low frequent issues which will rise up in certain context.

## 4. Locating Classrooms/Buildings

Inference: Our aim was to observe how well a new student can move around campus and find buildings and classes. Thus, observation would have been more fruitful if the students were new to the routes or were going to a new classroom. Remembering 3 classes is easy, but that still doesn't tell us whether they know the campus properly or just their classes. I would really like to observe a student going to, for example, a meeting in another building in the 10-mile radius of the campus. The route s/he would pick, the help s/he would prefer while going and how s/he would actually find the place, and would s/he be able to do it on time. Moreover, I was also considering visitors and parents and/or relatives of students

while thinking of this problem. Observing them walk through the campus with the available help of displays, floor maps, and information desk, would really help this problem and find valuable observation results.

# INTERVIEWS

## Interview Questions

### Introduction

*Thank you so much for taking the time out of your day to participant in my interview. My name is [Name] and I am a graduate student in HCI. We are studying ways to help students navigate to areas around IUPUI, including events, parking, dining, and classes.*

*We will be recording audio for the duration of the interview. Is that ok?*

*Your responses will only be used for the purpose of this project and will not be released to the public.*

### Warm up questions

1. *Talk a little bit about your background? (where are you from? Hobbies? What course are you studying? Expectation for your school life? Where do you live? How often you will go to campus and for what? How far do you live from campus? How do you commute to campus?)*
2. *How is your campus life going? / Walk me through a typical week in your life. (What is your struggle on campus? How often it happens? When it will happen? How do you deal with it currently? How often do you use internet on campus? What computers or devices do you use?)*
3. *What kind of problem you concern most? (Snack shop, Parking, Activity, Classroom or other? Could you rank them?) Was there a time that you faced an issue with any of them? Can u describe it..?*
4. *Could you tell me how you deal with these problems?/ Can u describe how you dealt with it in the above situation/s?*
5. *How often do you use your mobile phone? Which website or app helps you most in solving your problems? (The use of technology in general) How*

*would you like to incorporate technology in helping you with the above problems? How would an app help you with your problems? Could you show me how you use it? - take picture or video)*

## Main body questions

1. On Campus Events
  1. *How do you find out about events that are happening on campus?*
  2. *How do you physically find the location of that event?*
  3. *Tell me about the time where you struggled finding a particular event.*
  4. *How many times you have to go to a particular location so that you can remember it next time?*
  5. *What options do you explore when you cannot find that particular location?*
  6. *If we develop an app for it, what would be your suggestions that we should be adding in it?*
2. On Campus Parking
  1. *How many days a week must you drive and park on campus?*
  2. *What resources are you currently using to locate parking on campus?*
  3. *Take me through a typical day of location parking.*
  4. *Tell me about a time where you struggled to look for parking.*
  5. *If you cannot find parking, what is your “go-to” solution?*
  6. *If we developed a solution for parking, what recommendations or “must haves” would you like to see?*
3. On Campus Dining
  1. *How do you deal with your dinner on campus?*  
*If purchase food on campus:*
  2. *How frequently do you visit a dining place?*

3. *Which dining place?*
4. *What prompts you to go?*
5. *How do you think about the dining venues on campus?*
6. *How do you normally locate where to get food, snacks, or drinks on campus?*
7. *What are the concerns or attractions that help you to choose a snack shop on campus?*
8. *Recall some dining experience on campus.*
9. *If we developed a solution for finding where food is located on campus, what recommendations or “must haves” would you like to see?*

#### 4. Locating Classrooms/Buildings

1. *Are the classes for your course located in the same building or different buildings?*
2. *How was your first day on campus when you had to look for the classes/Office? How did you get to the class? Were you late? (If you travelled in group, was it easier? Would it be similar if you had been alone?)*
3. *What is your “go-to” solution to locate the building? How reliable is it?*
4. *After being told the route, how difficult is it to remember the route, till you get used to it? Would it be better to have an app guide you the first couple of times till you are comfortable with the routes and the buildings? What are your views?*
5. *Once in the building, how tough was it to locate the classroom?*
6. *If we developed a solution for locating buildings and classrooms using a map and internal building maps, what recommendations or “must haves” would you like to see?*

#### Wrap up

1. *Do you have anything you would like to add or ask?*
2. *Is there anything that you would like to share with me that I might have missed?*

3. Is there anyone else who'd be interested in having this discussion that I can meet with?

*Thank you for your time and contribution towards our research.*

## INTERVIEW SUMMARY:

### **Pushkar Joshi**

Interview 1: (16 Sep 2016 13:00 )

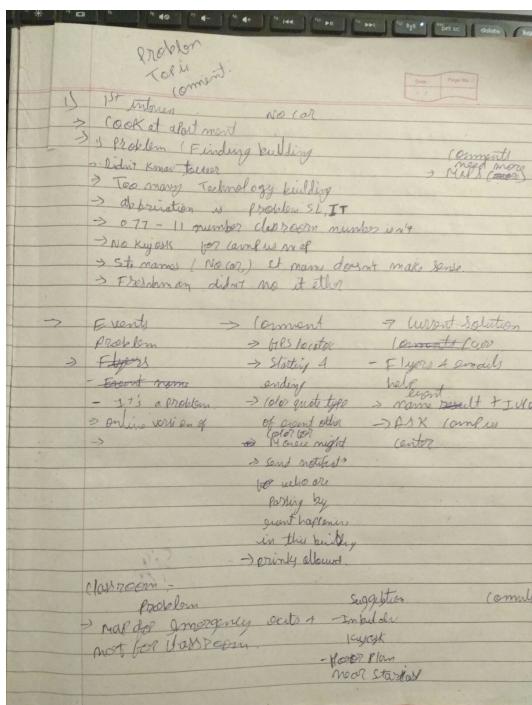


Image 17 - Interview Notes

**Background Information:**

Interviewee is my coworker and we worked on an assignment together. She should be around 23-24 years old and is a second year graduate student at IUPUI. She lives on campus, and don't have car. As her apartment is 20 minutes away she don't buy on campus meal and cooks. She likes to attend on campus events. Interview lasted approximately for 30 minutes and audio recording is of 23:00 mins.

**Key Findings:**

- **Second year at school and there's still confusion in location of buildings.** This is her second year at IUPUI, and there are times where she struggles to find a particular building, as the name and abbreviation of many buildings resembles and there are too many technology buildings.
- **No reason to remember street names.** As she doesn't use car, she has no reason to remember street names or the popular landmarks that car owners know.
- **Classroom:** In many buildings there are only exit plans and not for classrooms, so finding a particular classroom gets very confusing.
- **Events information is not organized.** Many events takes place on campus and information is very disorganized and scattered all over the internet. She gets emails and gets to see few flyers of events, but she'd like them to see all of them at one place with GPS co-ordinates of the venue, and other information like if there's food, drinks. If that event is open for all university or specific departments etc. She'd also like to get notifications if she's passing by any building and there's going to be an event at the building nearby.

Interview 2: 19 sep 2016 (13:00)

**Background Information:**

Interviewee is 28 years old and we are working on a same project this semester. She's second year graduate student at IUPUI, and has architecture background so she has lots of insights about architectures of buildings. She owns a car, dines frequently at on campus and enjoys attending events that takes place in campus if her schedule permits, she comes to campus almost every day including weekends.

### Key Findings:

- **Events:** Giving location and time of an event is one of the important for any kind of promotions, if a particular location doesn't appear in google maps then it doesn't exist physically.
- **Parking:** She said she has to come early to find parking spots to park. If the meeting is at 10:00 then she has to come by 9:30 to find the parking space otherwise by 10:00 almost all the parking spots get filled up. She has noticed that on few three particular weekdays like Monday, Tuesday and Thursday it's particularly hard to find the parking spots, on the other days it's relatively easier.
- **Problem in finding classrooms.** Classroom numbers are confusing in first floor and basement. At many buildings there's no front desk and floor plans near staircase. So in building kiosk can help and signs showing these range of classrooms are at left side, these range of classrooms are at right side. Her suggestion for applications was, if app could provide inter building routes to travel from one building to another then it'd help in winter or rainy days, google map doesn't provide this feature.

The screenshot shows a Google Docs document titled "iew3 notes". The document contains a list of findings from an interview:

- Notes
- Go with the script I don't
- The information they are getting is not that accurate.
- Ask for examples, if you don't have one, give users one example
- Events on campus: connected to school email system, a notification in application
- Do you purchase food? Einstein hall
- Every day 1
- Time: whenever you're hungry
- Location of foods or snacks: look for hints or signs for food
- What do you do when you don't find vending machine? Look for food station, look for vending machine
- If you can't find anything: drink water
- App for food: app or signs? Similar function in map, where it is around me, pokemon Pikachu
- Classrooms:
- Same building
- First day: struggle in finding classes
- How long it took for adjusting? same floor: much easier to find
- But in 1<sup>st</sup> floor or basement then 10 mins
- How do you locate physical building? Google maps
- Address: cannot remember street name, landmark would help, plaq,
- Locate the classroom inside building: nursing building: first own location, which way is your nearest location of group and then figure out the destination location
- Application: Map inside building is necessary.
- HCI master's, 23.
- new students s

Image 18: - Interview Notes

**Mikaylah Gross**

Interview 3: ( E.g. 16 Sep 2016 17:00 )



*Image 19 : Interview with participant, currently discussing parking issues: Interview 3*

1. Grew up in Indianapolis, graphic designer for 7 years, 3d artist
2. 3 years here at IUPUI, garages to park in the morning, arrive at 9am; may come in on the weekends, complete hw, research, student organization, assisting students (tutoring and teaching)
3. Parking issue, student housing (lack of it) how buildings are being constructed (not sustainable)
4. Arrive hours earlier than class time
5. All day every day, Facebook Messenger, Calendar, alarm clock, music, social media

**Choice to not get a parking pass**

**Events:**

- 1) Follow Facebook page ( have marketing outside, not inside) Can't rely on JagNews, OSI (Den), have better funneling option
- 2) Ask a professor that I feel would know the answer
- 3) Didn't know what room to go to. Went to a room tucked away.
- 4) Give up looking, wasn't sure if they were still meeting
- 5) No night classes, leave availability open, increase student involvement

**Parking:**

(answers these questions in relation to his experience last semester with a parking pass)

- 1) 5-6 days a week
- 2) No, just looking
- 3) Arrive early (9am), Gateway garage
- 4) Arrive later in the day, no parking spots, had to park off campus and walk in
- 5) Park far away, keep searching
- 6) Build more garages

**Dining**

- 1) Don't anymore, charge too much
- 2) Off campus, bring lunch

**Class/Offices and Internal Building Map:**

- 1) Same building
- 2) Too easy
- 3) Look up campus map online, go to front desk or ask or look at maps
- 4) Easy
- 5) Dont know how its laid out
- 6) 3d modeling the entire campus, virtual world for campus, kiosk around campus

**Demographics:**

- Junior, White, 24, MAS, 3d modeling



- PLC 9/12/16
1. - sophomore IPvN  
informatics, CS, cybersecurity  
- longboard, gamer  
- 20 minutes (80 min) - 1 hr / car
  2. - 3x day a week, once class a day only on class
  3. - no huge park point  
- hard to find dining  
- parking
  4. -  
5. apple, everyday (large portion)  
emails, contacts, twitter, facebook, chase,  
canvas  
- discard (apple, chatting)
- TASK  
events.
1. Facebook, word of mouth normally don't seek  
↳ not physically available for events
  2. maps, figure it out
  3. CS clubs, never told location
  4. just once
  5. social media, reach out
  6. interactive map of campus, list of events
- Parking
1. 3 day / 4 day
  2. none, just guesses, learn
  3. go through entire garage
  4. frustrated that she could not find
  5. past in wrong spot
  6. sensor per row, counter for number of cars

Image 20 and 21- Interview Notes

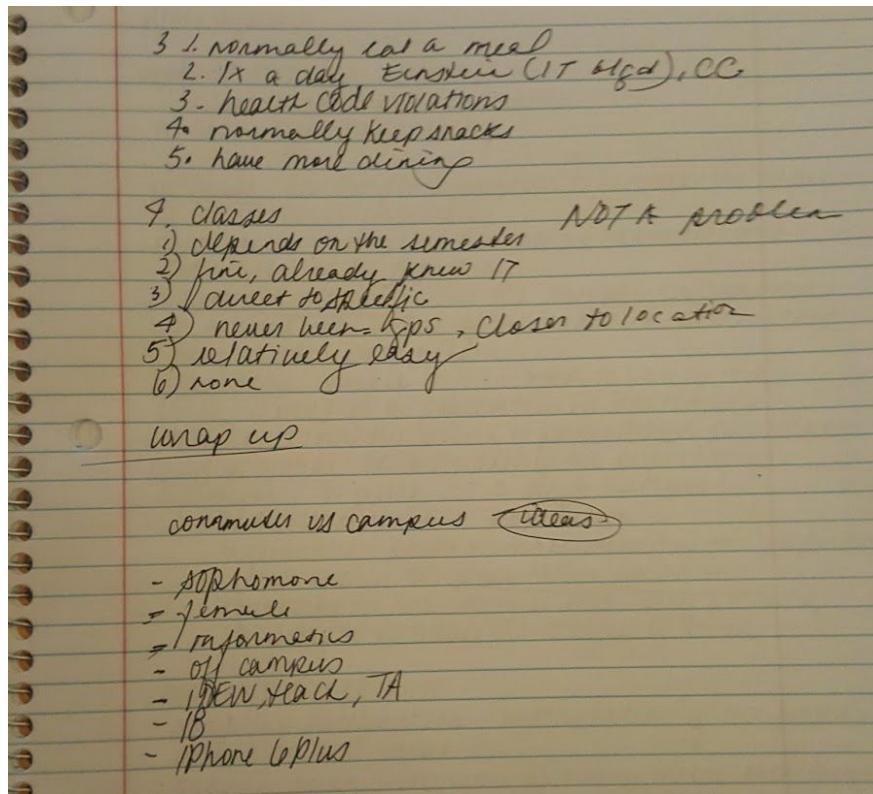


Image 22- Interview Notes: On campus parking

Interview 4: (16 Sep 2016 13:00 )

**Background Information:**

The first participant was a friend of mine who I spend several days a week with, whether that is socializing, having coffee, or studying for school. She is 18 years, and a sophomore in Informatics with a Computer Science minor, and teaches programming several days a week at local high schools. Participant 1 is a commuter, and must drive on campus multiple days a week. She does not bring her lunch and depends on dining halls, food carts, and vending machines as her main source of food each day. Considering this is her second year at IUPUI, navigating campus isn't a struggle, unless it's potentially finding a professor's office or an event. Where was it conducted and for how long: This study was conducted at a local coffee shop off campus for 30 minutes. We chose to do video and audio recorded, because I was the first on the team to conduct an interview, and they were curious what an interview looked like.

**Key Findings:**

- **Events:** This participant used social media to receive all of her updates for events, including dates, times, and location. She was unfamiliar with the current school run websites that are supposed to help students connect and stay up to date with events around campus.
- **Parking:** On occasion, she parked in a "BG" parking spot and risked the 50 dollar ticket in order to get to class on time, which she was still late for just because of the congestion in getting into the parking garage. She had to resort to this option for several weeks until the influx in cars slowed down.
- **Dining:** The participant did not like that the majority of the dining options were in the campus center, while almost all her classes were somewhere in either SL or IT. If she does go somewhere, she found it easier to hop into her car at Blackford and drive to off campus dining options.
- **Classes:** Sophomores, although one of the newer students to campus, are able to pick up and/or find classes fairly easy after those first initial weeks. She's only been at IUPUI for a year and she's began to learn how the campus is laid out or the resources she could use to locate buildings and classes.

## Interview 5 (16 Sep 2016 14:00 )

**Background Information:**

The second participant was also a friend of mine who I do service leadership with once or twice a week, and who is in a group chat with me for school events. He is 24 years, and a junior in MAS with a concentration in 3D modeling. He currently parks off campus and walks into school every day because parking is too expensive and too crowded. He brings his lunch today because the cost of campus food is too expensive. Since he is skilled in how his classes are laid, and because all of his classes are in one building, he doesn't need as much help navigating the campus. This study was conducted on the 4th floor of the IT building and lasted for around 20 minutes.

**Key Findings:**

- **Events:** This participant is the president of a club on campus, and notice that promoting his club is difficult. He uses the school run site to post events, but he feels that no one seems to look. He also uses social media, but not everyone may

have the social media accounts that he does. If he needs to go to event and can't find the room, he gives up looking.

- **Parking:** He actually did not buy a parking pass this semester because of how crowded and expensive the parking is at IUPUI. In order to get to classes on time, he must arrive at school potentially an hour in advance, park off campus, and walk in. He did not seem to have any technical solutions to this issue other than building garages where parking lots are at.
- **Dining:** The participant chose to skip this section because it did not apply to him. He brings his lunch everyday and does not use dining services or vending machines on campuses. This, I believe, was the only participant out of all our interviews that chose to skip a section.
- **Classes:** All of his classes are in the same building because he is an upper classman, and finding classes on the first weeks of school was "too easy". He proposed designing a 3d model of the entire campus, creating a virtual world for capturing the different buildings on campus. He also proposed kiosks later in the interview during the wrap up.

## Chaolan Lin

Interview 6: (12 Sep 2016 14:40-15:20 )

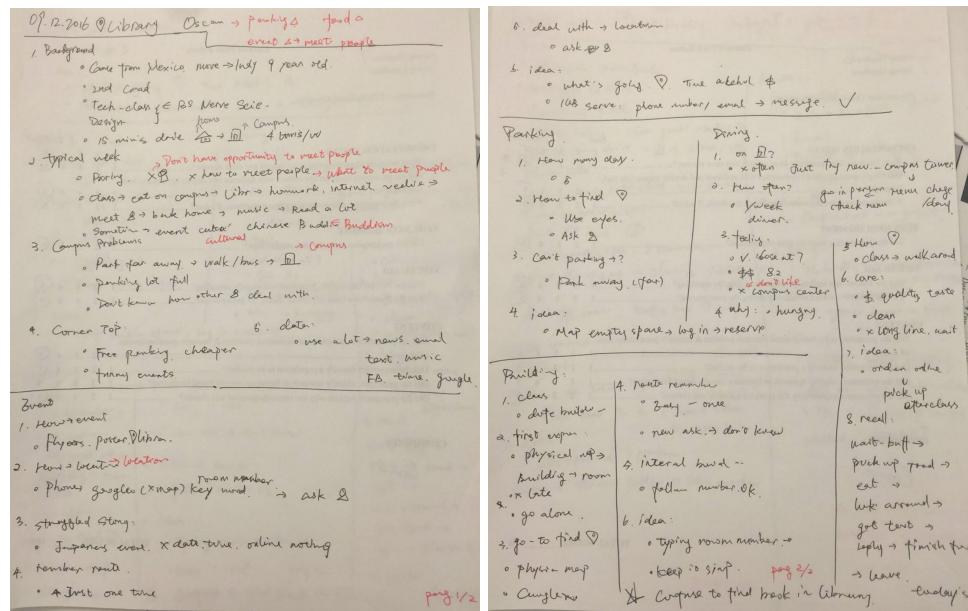


Image 23 and 24 - Interview Notes On campus Dining

**Background information:**

This interviewee is an acquaintance of my who I met with in the basement of library for riding out hurricane a month ago. He is around 22 years old. As a second year graduate students from IUPUI, he is quite familiar with this campus. Spending 4 days a week on campus, he knows the campus well and has a lot of story to talk. The duration of the interview is around 40 mins (length of audio recording is 33'43"). Main topic covers all of our 4 focus, namely finding event, parking, dining, and locating.

**Key findings:**

- **Students living off campus want to enjoy social life on campus**, for example meeting new people, attending cultural events and so on, **but can not get access to detailed information about campus activities**. However, there is limited approach to get information about ongoing or upcoming events except passing by posters on corridor inside building. Online information also reveals incomplete information which leaving students confused about date, schedule, location of a specific event.
- **Information sharing is limited among students**. In this interviewee's case, parking on campus struggles him much. He has to park far away of the campus and then walks for a while or even takes a bus to get to a determination on the compus. For him he hopes to learn how do other students deal with this plight but he cannot go anywhere to exchange ideas of figuring out parking problems.
- **Ask people for help is the No. 1 solution in mind for students to get information**, including asking location, timing, price, etc. Elements causing this situation could be: limited efficient information is available for students and information from friends or people nearby is more reliable.
- **Locating a building is somehow still a challenge even for senior students**. This interviewee has been studying on the campus but still relays on google to get to a new building. What's more, when asked by new comer about how to get to a specific building or place, the interview cannot help them since he don't know where is the building or mapping directions.

Interview 7: ( 14 Sep 2016 11:15-11:55)

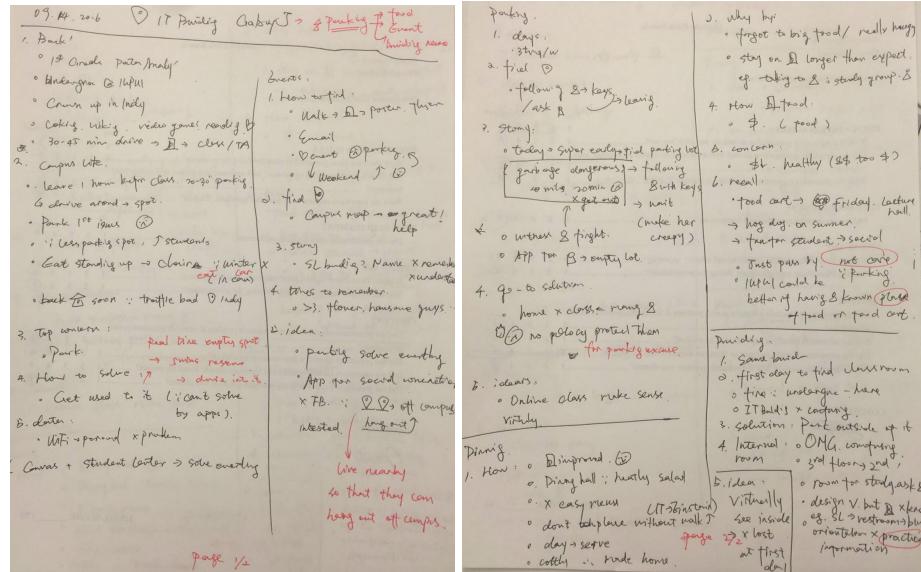


Image 25 and 26 - Interview Notes On campus Dining

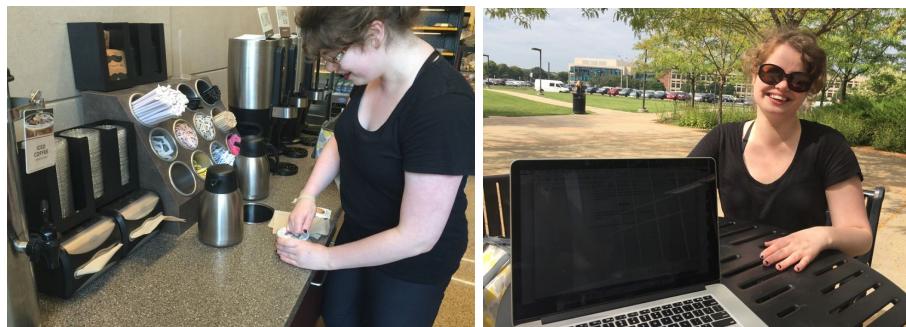


Image 27 and 28 - Interview and observation on campus dining

#### Background information:

This interviewee is a co-worker of mine. We got to know each other 1 month ago and meet each other in person twice a week for teaching assistant stuff. She is around 21 years old. After finishing her undergraduate studying on IUPUI, she is doing her 1st year graduate study in Data Analysis. Besides grown up in Indy, she has spent 4 years on IUPUI for college study. She is a typical local student who knows well things on and off campus. The duration of the interview is around 40 mins (length of audio recording is 34'33"). Main topics cover all of our 4 focus, namely finding event, parking, dining, and locating.

#### Key findings:

- Issues on campus interrelate with and influence each other, or sometimes there is one core struggling that has influence on many other things . For instance, parking

issues undermines every connection between students and IUPUI. Nice and easy going as this interviewee, she always complains and gets mad for parking struggling. Not only she has to leave for school 1 hours earlier and spend 20-30 minutes to find a parking spot which is really time consuming, but also limited her social extension on campus. For example, the main reason that she doesn't always show up on campus events is that she is afraid that she is not able to find parking spot.

- Students could individually develop valuable practical experience though they have limited opportunity to share. In finding parking spot, for instance, this interviewee finds out that beside asking people, she can just pay attention to someone who is walking ahead to a parking lot with his car key at hand and then follows him, wait for he leaving. She concludes from her experience and observation for more than 4 years on campus that this people are the ones who are leaving and thus a empty car spot will be available for she. Her experience on finding a car spot is quite practical but she seldom has an approach to share with people who needs this information.
- Students' attitude to that on campus problems could be solved is negative. Most of the problems on campus are considered as unsolvable. When taking to the fact that parking lots on campus are always full, the interviewee says the only way to deal with it is "get used to it" since she thinks that it is the enlarged new students that making parking lot and garage always full, and this is no way to be solved (8,000 parking spot but 12,000 student, makes the parking issues, cited from the interviewee).
- Communication between campus and students is limited. From the interviewee, we know that IUPUI is doing well in building design. She mentions that the wall of the restroom on SL building is deliberately painted in blue in order to help people locate the restroom. However, students have to realize this design by themselves and this kind of information will be never be collected by individuals. The University could do better if they inform this useful information to students. Similarly, IUPUI offers awesome food carts on campus without informing students that where and when they will be.
- Specific single things would ruin a whole piece of experience. From the interviews we conduct, we know that most student use Google Map to help them locate buildings they are going to. Even though Google Map is convenient and reliable, students might feel quite confusing and upset after they enter the right building but fail to find a specific room. The interviewee is satisfied with using campus map to locate a building but when it goes to internal locating, she blurt out "Oh My God!, it is confusing", showing that her experience of going to her destination is broken in the last few minutes.

### Interview 8: ( 15 Sep 2016 17:15-17:55)

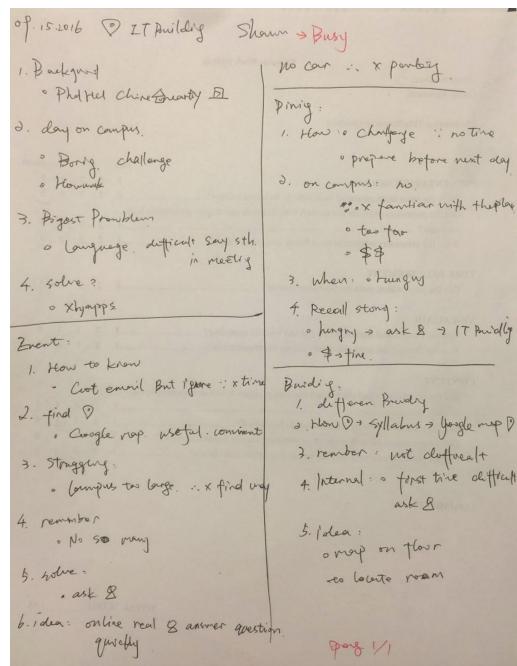


Image 29 - Interview Notes: On campus Dining

#### Background information:

This interviewee is one of my classmates. He is a 25 years old new PhD in HCI students from China, representing a certain group of international students. Coming from a Asian country, international students like he are not familiar with everything about IUPUI. For example, they are not familiar with locations of buildings, way of ordering food, and so on. Studying this user group and come out with solutions will help them to enjoy a high quality and happy campus life. The duration of the interview is around 20 mins (length of audio recording is 11'53"). Since the interviewee doesn't have a car, the main topics in the interviews covers all of our 3 focus, namely finding event, dining, and locating.

#### Key findings:

- Campus life on IUPUI for some students is monotonous and busy. The interviewee states that boring and challenge due to a large amount of assignments, hasn't get used to the language, and adapted himself into the new environment. This fact makes him has no interesting in exploring the campus.
- Information like food venues on IUPUI could be more easy to be accessed by students. From these interviews we found that the most common and frequently for find information like location is asking other people. This way of getting information can't provide students with objective and completed clues, making

the students' end need not guaranteed. For instance, in this interview, when the interviewee wanted to find food shop near his office and asked the people round him, the only options provided by questioned was "Somewhere in IT Building", let alone to the type, taste and price of the food.

- Traditional way in life like asking people could be facilitated by technology. From this interview, we found that asking people nearby to get information, as a first preferred, is limited by certain context in real life. For example, when students get lost on campus and it happens that no people nearby, he has no opportunity to ask people. Instead, if there is a tool providing him with functionality that enables him to ask people online and get real time feedback, it could be more helpful and timely.

## Swapnil Chandra

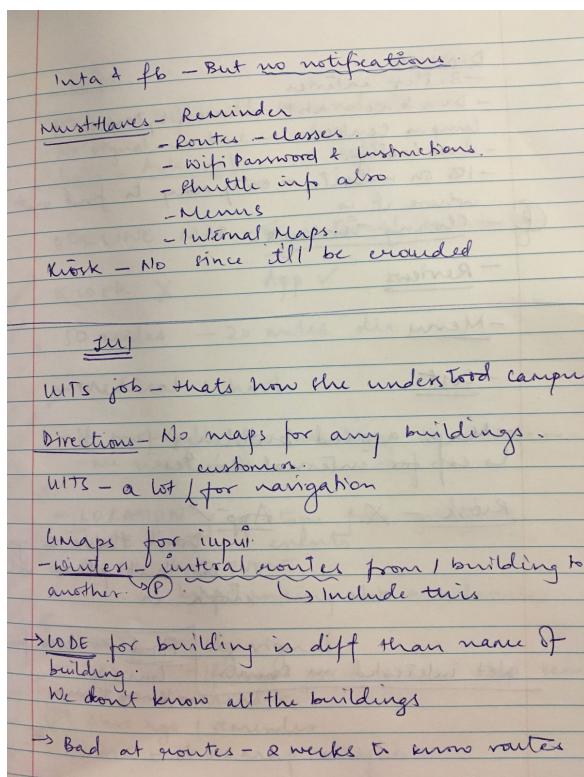
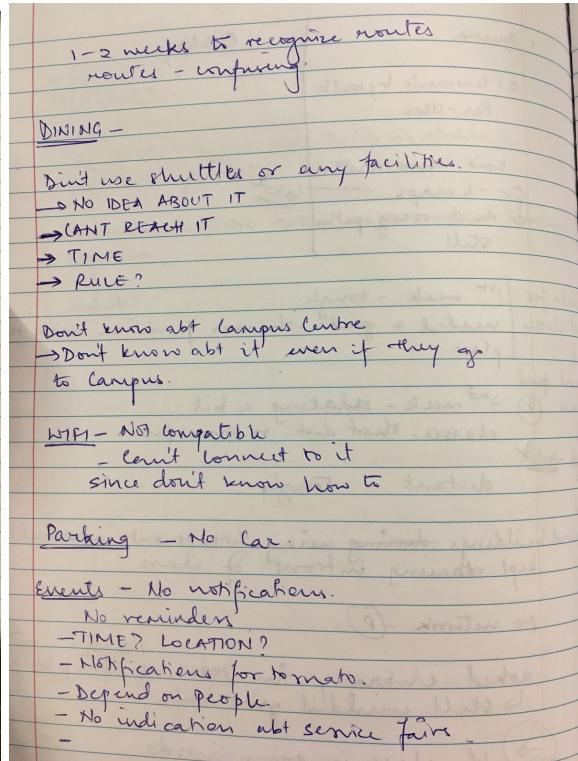
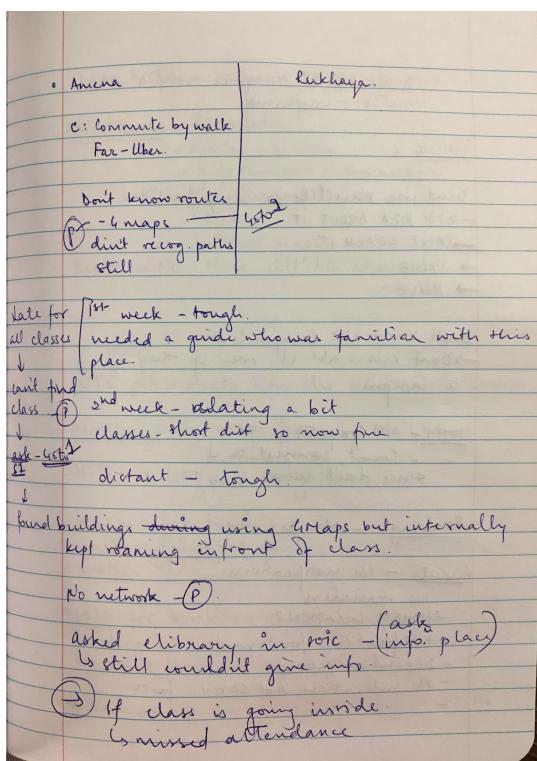


Image: Amena and Rukhaya Interview notes.

Image 30, 31 and 32- Interview Notes: Locating classes

## Interview 9: (17 Sep 2016 13:00 )

### Background Info:

For my first interview I chose a few of my fall 16 fellow graduate students. They are pursuing their masters in Health Informatics and due to the major shift from India to USA they are facing a cultural shock just like I am. That's why I thought they would be great candidates for this study since asking about their experiences in locating buildings classes and events around campus would prove to be informative since they are new to this area. It would give us a good idea on how helpful or unhelpful are the signs and directions around campus and inside the buildings.

### Key Findings:

- **Events:**

- “We missed all of them”
- *Problem:* They said they were unaware of the events happening around campus. They particularly mentioned that they are fun-loving and party people but due to the information gap can't enjoy any campus events. They are unaware of the time, location and the details about the event.
- They said that if they knew about the event, and didn't know the location, they would still atleast try to locate the event. However, missing the events is very frustrating and disappointing for them.
- *Problem:* They particularly mentioned the problem of “notifications”. They said that even if they did come across the event on fb or Instagram, they had to remember the event, and due to their forgetful nature it was tough for them to. This caused them to miss the events.
- *Suggestions:* They said that if we developed the app, to include notifications for the events and service fairs. Also they requested to include the shuttle information as well.

- **Parking:**

- “We commute by walk since we don't own a car”

- **Classes/Buildings:**

- “We were late for all our classes in the first week”

- *Problem:* They specifically stressed on the confusing routes and building maps around campus. Since they are new, it was difficult for them to find their way around campus. Rukhaya mentioned that she was 30 min late for the class on the first day.
- *Problem:* Rukhaya mentions that the day she was late she went to the information desk at UITS who was unable to provide accurate information since neither of them knew the exact classroom number, and the one they thought was right, had no class going on inside. Had they known that it was vacant, they would have rechecked the right classroom number. This brought up her problem that there should be an indication of the classes which are having an ongoing class, and which do not.
- *Go-To solution:* Asking people for direction is the most common go-to solution that they chose. The second one they mentioned was GMAPS.
- *Suggestions:* Indication of ongoing classes. Also they mentioned that the app should contain internal maps so that a student doesn't feel lost. When asked whether a kiosk is better for the external routes or an app, they both unanimously stated that an app is more accessible. Another reason being that Amena pointed out that a kiosk can be crowded, delaying the person from getting the information.

- **Dining and WIFI:**

- “Is that a cafeteria on the left on first floor of campus center?”
- “Since we don’t talk to many people, we still don’t know how to connect to IUSecure.”
- *Problem:* They can’t access the wifi, which causes them to use data.
- *Problem:* No indication of any dining area on campus. They are new, and are struggling to locate anything on campus. Hence, they end up missing almost everything.
- *Suggestions:* Menus and locations of the dining areas in and around campus.

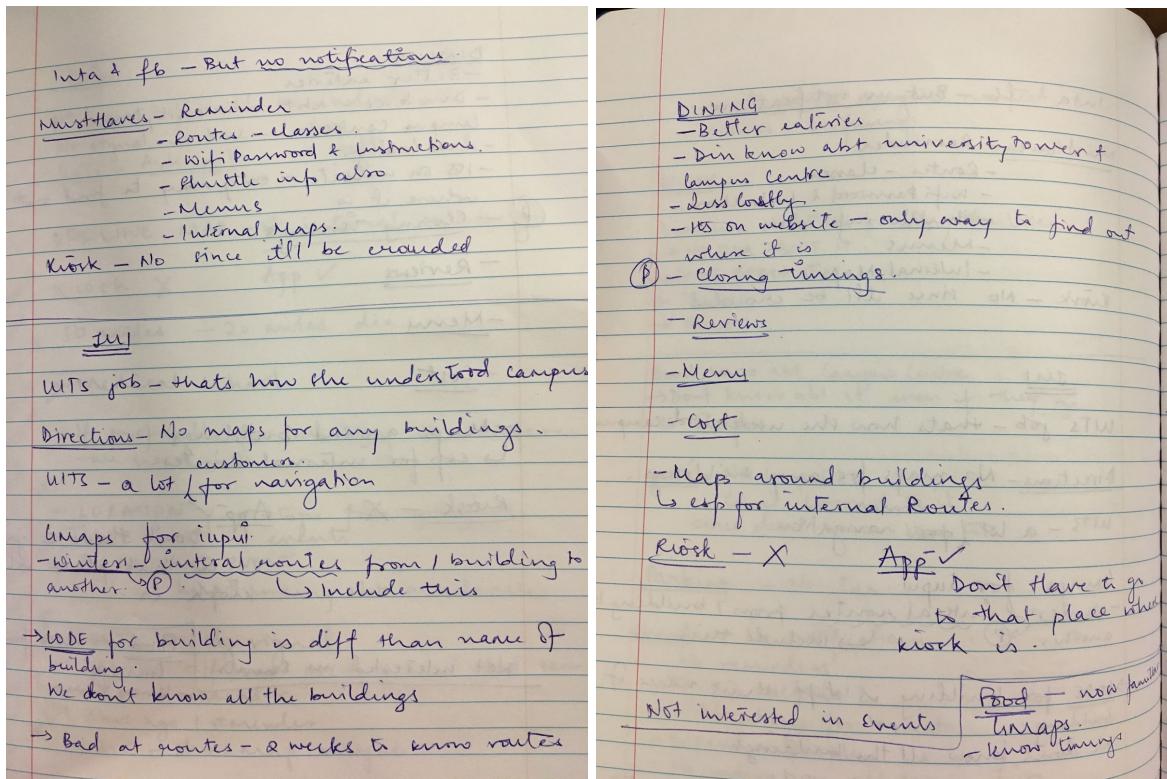


Image 33 and 34: Jui Interview Notes Locating Classes/buildings

Interview 10: (17 Sep 2016 13:00 )

#### Background Info:

For the next interview I chose a second year Masters student. Jui is doing her masters in mechanical engineering and works at UITS. She has lived around and studied in IUPUI, hence recording her experiences would be very informative. (Interview audio length: 12.12 minutes)

#### Key Findings:

- **Events:**
  - "It's a very personal thing, I am not very interested in events"
- **Parking:**
  - "Don't have a car"
- **Classes/Buildings:**

- “I work at UITS: that’s how I understood the campus!”
  - *Problem:* No maps for any buildings! She mentions that while working part-time at UITS, instead of solving technical problems she helped people navigate more often. She mentions that the campus is confusing to understand, and locating things around campus is a big task especially for her since she has a tendency to forget locations and has a hard time remembering buildings and routes.
  - *Problem:* The code of the buildings. She shared with me a story of her first year when she was late for her classes since couldn’t locate the building because its code didn’t make sense to her. She mentions that none of us know all the buildings so locating them without a map is very tough.
  - *Problem:* Internal routes of the buildings. She mentions that there are internal routes connecting each building to the other internally, however, where they are, and how they are connected. This makes it difficult for us to understand them and use them. She also mentions that they are very important during winters.
  - *Suggestions:* Need an app for the problems above. Especially for the internal connections between the buildings.
  - *Kiosk:* When I mentioned a kiosk she said that an app is a better alternative, since she will have to remember the location of the kiosk and go there, and she hates remembering.
- 
- **Dining:**
    - “I came back from work, and had no idea which coffee shop would be open at that time and felt so lost, ultimately came home and slept.”
    - *Problem:* Timings! Because of the incident that happened with her earlier that evening, she mentions that an app with the timings of each eateries is very important for the campus
    - *Suggestion:* An app that shows the menu, price, reviews, comments and timings of eateries in and around campus would be great.

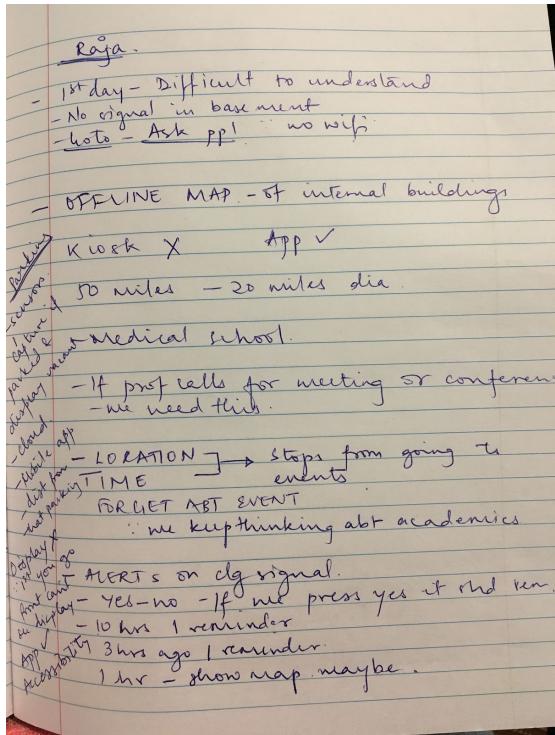


Image 35 - Raja Interview Notes Locating Classes/buildings

Interview 11: (19 Sep 2016 13:00 )

### **Interviewee:Raja**

#### **Background Info:**

Background Information: Raja is a Computer Science Majors student. This is his final semester. He has a technical outlook to life which made me want to take his interview and get any technical suggestions that he might like to share. (Interview audio length: 17.25 minutes)

#### **Key Findings:**

- **Events:** “Being busy with academic work, it is difficult to remember the events on campus”
  - *Problem:* There is no notifications for events. This causes most students to forget about them in the busy life of academics. He stressed upon the notifications bit of the solution.
  - *Problem:* The location and time is something that not a student will remember for each events, he states. This is one of the reasons he drops the plan to go to events.

- *Suggestions:* Provide notifications for the events- maybe 12 hrs ago, then 3 hrs ago. Once the event is in the app, ask the user whether he wants to attend. If yes, then provide notifications. Also, provide an option for the map.
  
- **Parking:** “No..I don’t have a car, so no parking troubles.”
  - *Suggestions:* Add sensors for parking lots so we know how much of the lot is full and where the parking spots are empty.  
The data could be stored on a cloud and accessed through an app. Also he said an app is more accessible than a display since a display can’t be seen from everywhere.
  
- **Classrooms/Buildings:** “1st day was the toughest”  
*Problem:* He started talking about his 1st semester and how tough it was for him to go about. However now it’s easier.  
*Suggestion:* Due to wifi troubles, create an Offline map.  
*Kiosk:* He opted for an app over a kiosk too. He said, campus a 20 mile diameter area, so putting up kiosks would be costly and less accessible than an app.
  
- **Dining:** “Now I am familiar with everything. If required, I use GMAPS.”

## INTERVIEW REFLECTION:

### Reflection 1:

Interviews are quite insightful, is it said that what people say and what people do is quite different, although observations astonishingly gave similar results about what people say that they would do in that particular scenario. Mostly if you’re looking for buildings, our first intuitions are to check google maps, look for landmarks, check the street names and then ask people. Key learning was, the people who don’t use cars have no reason to remember the street names and/or sometimes the general landmarks that car owners know. Google maps doesn’t give you results if you use the abbreviated form of the building, you won’t get anything if you don’t the full form of the building. Building names are quite similar so it can be confusing for users to remember them or their abbreviations. When people ask other people about the address it can get confusing and you’re not sure if you’re going in the right direction or not, unsurety adds up in the

frustration. Next time while doing interview, I will try to stick to the written script as much as possible, so that I can ask same questions to every interviewee and can analyse different responses for the same question. A semi structured interview will give much more quality data than informal discussion. Bothering unknown people was bit challenging, but once you start asking people without being ashamed then you get comfortable in it, sticking to the script was another challenging task. Out of three interviews, I'd say first and third interviewee were quite elaborative and thorough about their ideas and problems, second interviewee was know all, and faced little to no problem in any task or maybe she didn't know this was the problem and she's spending unnecessary amount of time doing the few things. At the end of the interview, I asked each interview for references who'd be interested in giving me discussing the same struggle they had, and everyone said to target freshman, international or whoever is new to the campus.

## Reflection 2:

Interviewing is very new to me, and something I will have to do in the near future for actual research projects. I am glad that I videotaped myself during my first round of interviews, because I was able to critique my interviewing style. There were several times where I would provide a lot of positive feedback or start pushing participants to answer in a specific way, which was on the verge of creating a bias. Other moments, I was starting to ramble/talk more than the participant was to keep the flow of the interview going. Many people, especially my participants, didn't find some of the interview questions to apply to them, because they didn't struggle to find classes or didn't buy food on campus. Looking back now, it would have been incredibly helpful to potentially have two different interviews: one for new people on campus, like freshman or 1st year graduates, and another for people who have experience navigating IUPUI. Even with our one interview script, this feedback of how some struggles only applied to certain people or situations, but not to others, helped in the creation of our personas. We were able to pull out that the primary persona would be a freshman, while the second person would a graduate student. Demographics are still an area that our group struggled with as a whole in terms of which demographics would be the most useful to collect. I personally asked for age, grade, major, ethnicity, and current job (if they have one other than a student). This slightly helped in creating the more 'technical' details of the persona to create a more 'life like' persona, but I seemed to be the only one that gathered those details.

### Reflection 3:

From the interview, we understand better on how important empathy is in understand users' need. When our group members firstly sit down to explore what topic we were going to deal with, one of our team member pointed out that we could work on parking issue on campus since it was really suffering students. 3 out of 4 in our team are new coming international students and have no cars. This made us very difficult to understand what the parking problem was, let alone imagined the solution. A little sceptical as we are, we pulled answers from the interviewees, felt their feelings, and linked the causal relationship between parking issues and other issues on campus. Surprisingly, not only we understood the parking problems on campus, but also got super excited in designing innovate solutions for the users. This experience help us to understand and enjoy the process of design research.

### Reflection 4:

We was looking forward to interview the students about the troubles they faced around campus because we know we have faced my share of them. We wanted to know how many people faced the same difficulties as we did. As we conducted the interviews, we realised that mostly everyone had a lot to say about locating classrooms and buildings. Parking was an issue for the ones who had a car, however locating things on campus was an issue for everyone. The issue we thought wouldn't be a big problem since it's the 4 week of classes was pretty serious. The interviews spoke about their problems and about their experiences. We particularly enjoyed the experiences everyone faced. Though the interesting part was their inputs regarding suggestions. A few of them suggested sensors for parking, or a lighting system, such that the parking spot that is vacant is visible and a student doesn't need to search for it manually. An offline map was another great idea. The interviews had similar points to say but the reasons for the issues varied, making it fun to understand the different ways people think. Interviews gave us a good idea about what people face on campus and brought light to many issues we didn't think were a big problem. If we had more time we would have conducted more interviews gathering more inputs so that our design is more accurate.

# PROBLEM SYNTHESIS

## Key user requirements:

### 1. On Campus Events

- User must be able to view all the events details in one location (i.e. date, time, GPS location, details of what's happening, target audience)
- User must be able to receive notifications of reminders or event changes/cancellations using channels other than social media and email (i.e. phone app notification, calendar, etc.)
- User will have the choice to filter event types based on their interests
- User should be able to see all the events that are happening on campus today
- User should be able to see all the events that are happening in a specific building (i.e. student is waiting for a class or meeting and needs to pass the time)

### 2. On Campus Parking

Parking is getting moved to its own usability study because the problem is so severe. The needs, requirements and solutions do not pair up with the needs of events, dining, and classes/buildings. We will complete user requirements for parking in the final project.

### 3. On Campus Dining

- User must be able to view maps offline electronically
- User will have the choice to pre-order food prior to arriving at the location to avoid long times
- Dining halls/food carts must have hours of operations online in one central location
- User will have the choice to filter the type of food they are interested in and have a map populate with the dining options within a 5 mile radius. (i.e fast food, italian, mexican)

### 4. Locating Classrooms/Buildings

- User must be able to view maps offline electronically.

- User should be able to see which classrooms are occupied during a given day (i.e. the student needs to study or hold a group meeting, but the room will have a class in it in an hour)
- Physical signs showing ranges of room numbers and the directions they are in should be displayed for (i.e. 1-10 is to the left, while 11-20 is to the right)
- User should be able to see a floorplan at all staircases/elevators and at every entrance of the building.

## Affinity diagram



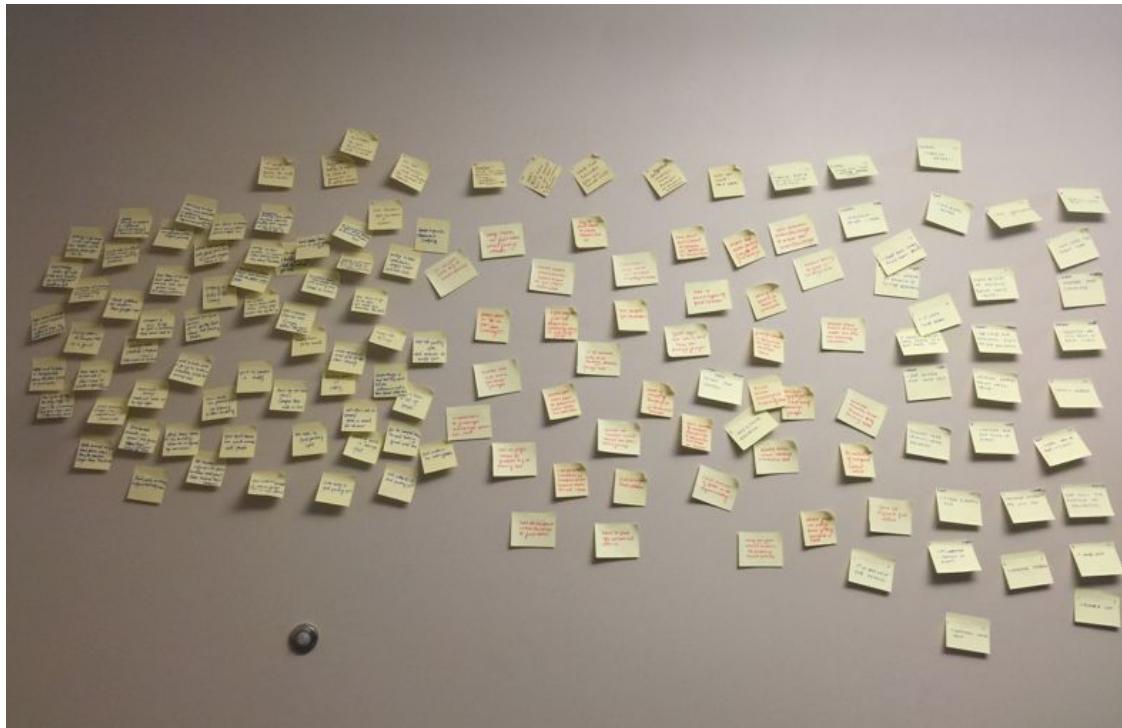
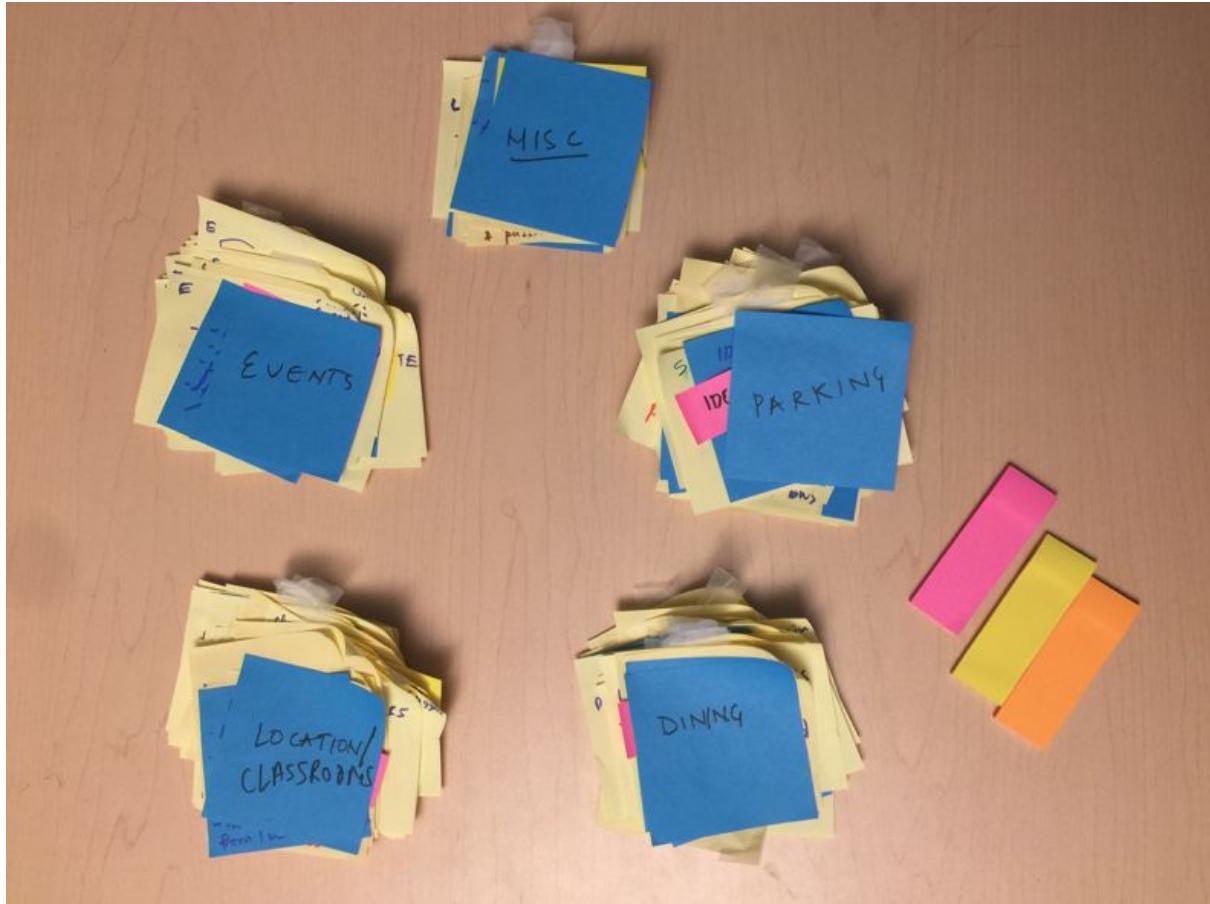
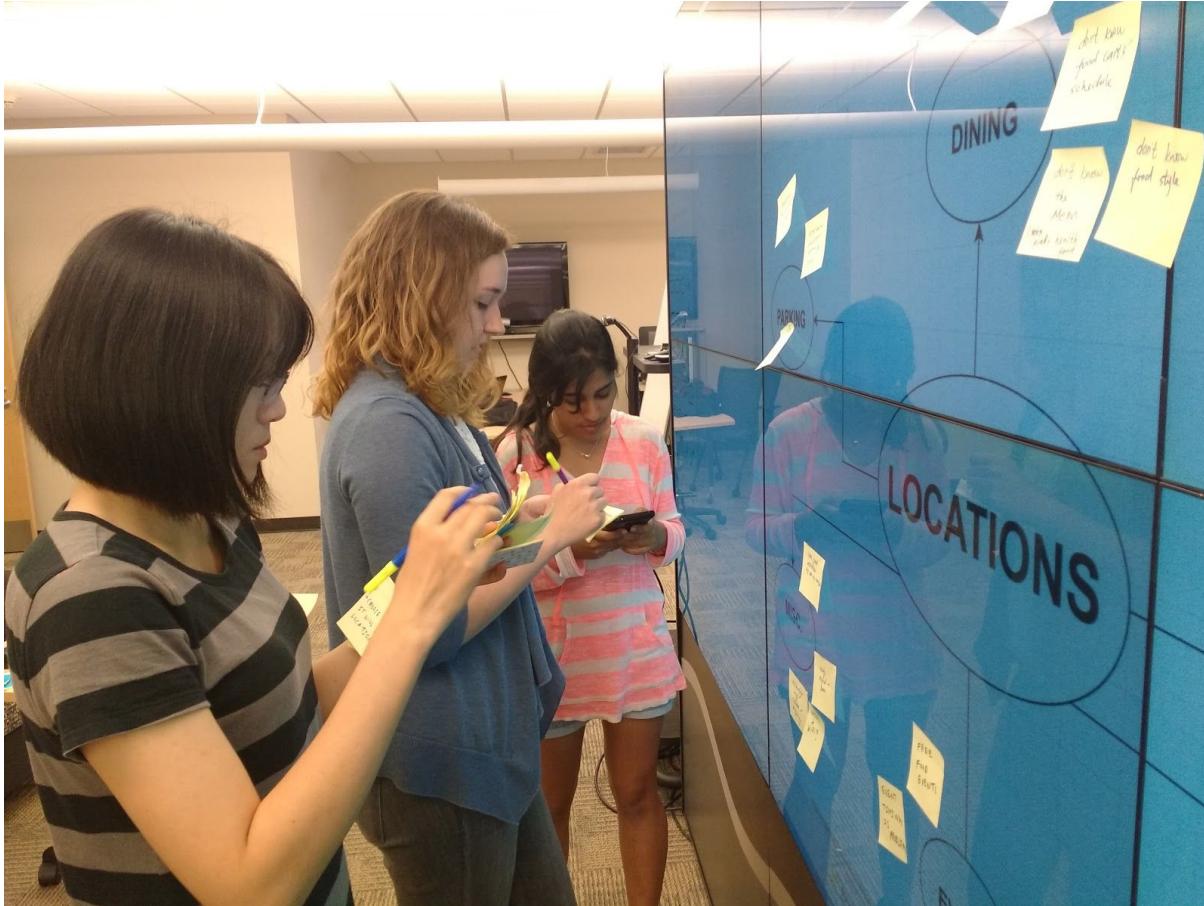


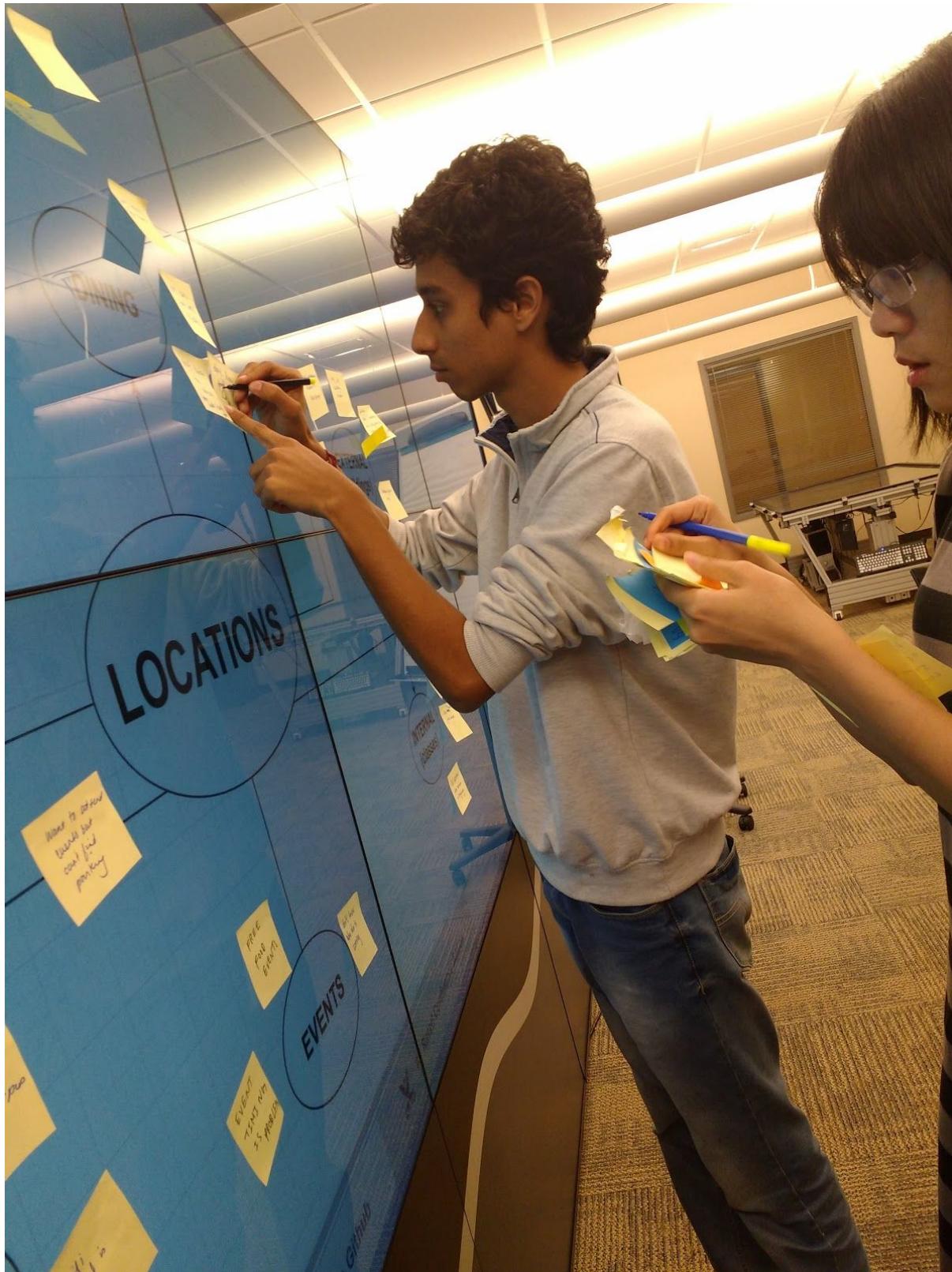
Image 38 and 39 - Affinity Diagram

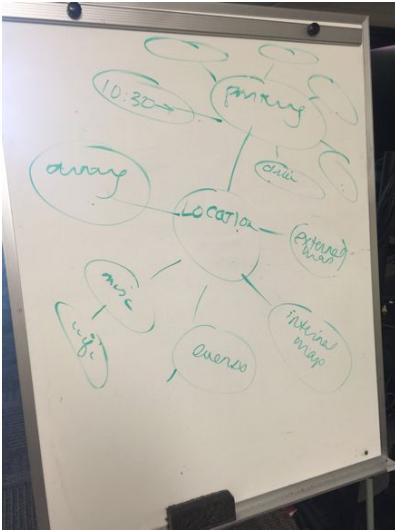


In-Campus Locator: Midterm Final Report-Team Bravo

# Concept mapping







While choosing our second diagram, we were initially stuck between ‘experience mapping’ and ‘concept mapping’; however, we only had time to complete one for this report. After sitting with a 2nd year HCI master’s student, he led us in the direction of the ‘concept map’ because it could help us find the root cause behind some of the struggles/pain points. Finding a reliable example of a HCI driven concept map online was difficult, but we were able to start brainstorming and seeing how pain points were causing even more pain points and how all of these struggles were linked to 1 or 2 causes. Chaolan, Swapnil, Pushkar, and Mikaylah all participated in this activity, and we noticed how this diagramming technique helped us link together why certain struggles were happening and coming up with specific solutions to combat the root cause. Affinity diagram provided the struggles for our concept mapping by separating comments and

ideas from observations and interviews into “problems”, “go-to solutions” and “ideal solutions”.

## Personas

### PRIMARY PERSONA:

The primary persona represents the college freshman that is attending IUPUI, and college itself, for the first time. These students have little knowledge of the true ‘college experience’ and are not as familiar with having to navigate in between physical buildings. They are in charge of their own schedule, like classes, food, extracurriculars, for the very first time.

# Emma Williams



*"Do you have an app for that?"*

Age: 18  
Work: Freshman Student  
Family: Single  
Location: Indianapolis, Indiana  
Character: Type

**Personality**

Introvert	Extrovert
Analytical	Creative
Passive	Active

Confused   Explorer   Improviser

**Bio**

Emma is a freshman BS student. She is talkative and enjoys time doing various activities. She recently completed her high school and starting her college life. She moved from a small town in Ohio to Indianapolis and which is relatively large city for her. University life is big change in her life and she's still trying to keep up with class schedules. She is very excited about college life and wants to participate in different activities but at the same time she is struggling to find them on campus location.

**Frustrations**

- She struggles remembering names, places and street names.
- She's frustrated because dining at university is too costly.
- She is missing out on events happening in campus because she's simply not aware of them.
- She wants to participate in different activities but not able to squeeze them into her weekly schedule

**Technology**

Computer & Internet
Online & Social Media
Social Activities

**Goals**

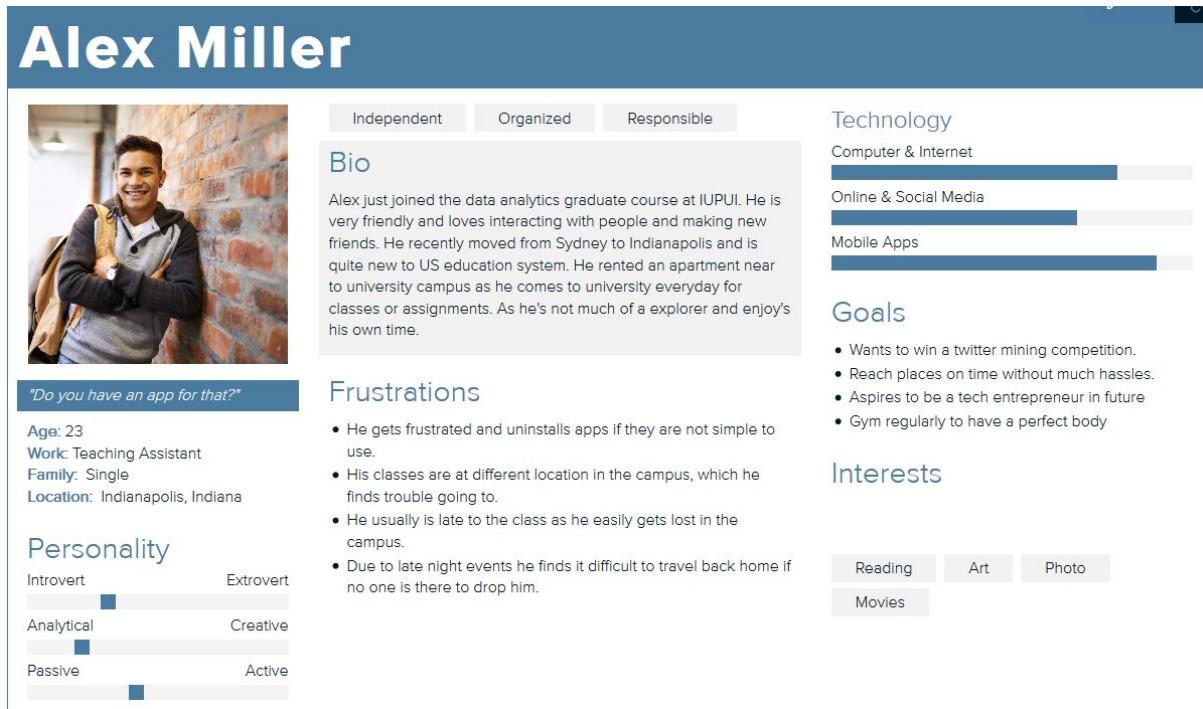
- Wants to learn Free Martial Arts
- Explore various locations.
- Aspires to be an Interior Decorator
- Go on morning run.

**Interests**

Arts   Canoe   Dance

### SECONDARY PERSONA:

The secondary persona represents the first year graduate student that is attending IUPUI for the first time. These students have experience in a college environment, whether that be in the states or internationally; however, their level of knowledge of the campus layout is similar to the primary persona, college freshman.



## Appendix B: Design Exploration

### 1. Executive Summary

We have chosen to concentrate our research on providing solutions to navigational difficulties around the IUPUI campus. Many attendees, both novices and experts explained and showed us how they struggle to locate different buildings, classrooms, and even people around campus. In most cases, people had to find alternative solutions to navigating around campus, while others gave up entirely. Using our research methodology, including brainstorming and storyboarding, we were able to generate a large amount of viable solutions that could solve this problem. As a team, we have chosen a combination of a phone application with a physical kiosk as our final solution.

The phone application will provide the following functionality:

- Search for an external location via a keyword or physical address
- Share/receive GPS locations with other users
- Ability to pull calendar events from the phone to access directions
- Customization of routes to destinations using shortcuts or aural navigation
- Ability to pair additional hardware, such as a smart watch, for hands free navigation

In addition, the kiosk will provide the following functionality:

- Search for an internal location via a keyword or physical address
- Search for an external location via a keyword or physical address
- Display floor plans of individual buildings
- Ability to send the route to the phone application

Our solution of a phone application and kiosk is designed in such a way that it will provide users a way to navigate that is accessible, clear, efficient, and pleasurable. The application provides the convenience of accessibility, because it can be easily downloaded onto a user's smartphone. The kiosk provides the element of excitement, since kiosks are not currently present on campus. Both elements in conjunction will display clear, accurate, user friendly directions that will help the user reach their end destination quickly. We believe this system will help resolve navigational problems on campus immensely.

## 2. Brainstorming

### 2.1 Results of Brainstorming Activities

#### **2.1.1 Round 1**

These ideas were written down during the first brainstorming session with all four team members present.

- 1) Add notification features (reminders, event changes)
- 2) QR code for building (identify the building)
- 3) Synchronize calendar with events
- 4) Mini kiosk outside (electronic) for people who don't use the app; maybe at major intersections and/or every building entrance
- 5) Map on the application
  - a) Offline map
- 6) Kiosk inside the building
  - a) Show events for the day inside that building
- 7) Interactive floorplans
- 8) Map to show interconnectivity of buildings via underground tunnels / gerbil tunnels
- 9) Display wall inside of the elevator to show floorplan
- 10) Smart lens to help navigate without having phone or map out
- 11) Pre-order food/drinks prior to arriving
- 12) Virtual Campus Assistant (SIRI 2.0)
- 13) Phone application
- 14) Web application

- 15) Reviews for dining
- 16) Visualization of 'busy' hours of dining halls
- 17) Show shortcuts of how to get around campus
- 18) Shorter milestones (i.e. have multiple smaller routes that make up one big route so they don't have to try and remember the entire route)
- 19) Networking system for events to get people connected prior to attending
- 20) Dynamic event management system
- 21) Screen/sign outside of classrooms to show their availability for the day
- 22) "Welcome to IUPUI" feature just for first 2 or so weeks of each semester
- 23) 3d model of the campus, physical and virtual (lego model)
- 24) Pings signal and buildings respond (accessibility)
- 25) Audio of maps for blind
- 26) International languages on maps or applications
- 27) Virtual orientation
- 28) Virtual tour
- 29) Club management system
- 30) Weather map: it shows the routes depending on the weather
- 31) RVSP system for events
- 32) Displaying parking garages and lots around campus
- 33) Food delivery via robot
- 34) Self driving segway with map to get to buildings
- 35) Self driving cars to park for you

### **2.1.2 Round 2**

These ideas were generated with the help of several individuals outside of the class. We explained the problem space and our objective and left it open for any additional solutions.

- 1) Live map
- 2) Parking spot renting
- 3) Parking tips sharing
- 4) I draw you follow
- 5) Location reminder
- 6) Food matching
- 7) Identifying location via analyzing environment sound
- 8) Event seller
- 9) Find your friend feature
- 10) Location translator basing on picture analysis
- 11) Live event on map
- 12) Show landmarks while guiding the user

- 13) "Yellow brick", routes on the ground in different colors, symbols/name
- 14) Weekly newsletter as an email (has to be blog style), filter specific with your major or also include campus wide events (i.e. career fair, jagnation)
- 15) 3D printed map
- 16) Cha-Cha

### **2.1.3 Round 3**

These ideas stemmed from our first session of brainstorming as a team. With inspiration from our discussions with external individuals, we were able to develop more solutions using wider ranges of technologies and user needs/goals.

- 1) Wheelchair map
- 2) Vibrational navigation
- 3) Send customized digital map from the kiosk to the phone
- 4) AR, hold phone over physical map, map now becomes 3D
- 5) Checkpoints
- 6) Navigating games (i.e get rewards for going to different places)
- 7) PS4 game with map of campus
- 8) Plug in schedule, and it automatically creates route to locate classes for the semester
- 9) Send check in locations to friends, which can be linkedin to a map so they know where to meet you
- 10) Use data from most visited/traveled to areas to host events or post flyers
- 11) Directions that project from either a device on your body or your shoe, able to look at directions hands free from a phone
- 12) At intersections, have arrows that point towards direction of building
- 13) Wifi hubs all over campus so that people can use offline and online maps when walking between buildings without using data
- 14) Monster of building
- 15) IUPUI Compass
- 16) DIY your own UI for your map
- 17) Hysterical navigation
- 18) Shortcut finder!
- 19) Map with timing functionality
- 20) Street light application for navigation: an app on the street lights to help guide
- 21) Number of feet to the next turning or routes: for the blind.: eg, walk 10 feet then turn right.,
- 22) A number we can call when we need guidance to navigate.
- 23) An internal map on the mobile/kiosk that speaks (for the blind)

- 24) Display inside the building outside classrooms to guide from one class to another internally.
- 25) Find a buddy
- 26) Call center service
- 27) AR Spirit
- 28) AR pathways
- 29) Whenever you'll see through your mobile camera, it will show you X-Ray vision.
  - Only the building you want go to will be shown in solid, and the distance to that building will be displayed.
- 30) Navigating shoes or sandals: If building is at left side, left shoe will vibrate.
- 31) Smart wristbands: Vibrate according to the direction.
- 32) Smart headphones, which will tell you when to turn right or left, just headphones, which are directly connected to satellite.
- 33) Organically illuminating trees: trees will start blinking to show the path in night.
- 34) Smart watch with screen
- 35) Robot will help you navigate the campus.

#### **2.1.4 Round 4**

These ideas were narrowed down from our initial 80+ ideas. These ideas led to the final three alternatives (bolded below) that were chosen for the remainder of the project.

- 1) QR code for building
- 2) Mini kiosk outside (electronic) for people who don't use the app; maybe at major intersections and/or every building entrance
- 3) Map on the application
  - a) Offline map
- 4) Kiosk inside the building**
  - a) Show events for the day inside that building
- 5) Interactive floorplans
- 6) Map to show interconnectivity of buildings via underground tunnels / gerbil tunnels
- 7) Virtual Campus Assistant (SIRI 2.0)
- 8) Phone application**
- 9) Web application
- 10) Show shortcuts of how to get around campus
- 11) Shorter milestones (i.e. have multiple smaller routes that make up one big route so they don't have to try and remember the entire route)
- 12) Audio of maps for blind
- 13) International languages on maps or applications
- 14) I draw you follow
- 15) Location reminder

- 16) Find your friend
  - 17) Cha-Cha
  - 18) Send customized digital map from the kiosk to the phone
  - 19) AR, hold phone over physical map, map now becomes 3D
  - 20) Landmarks
  - 21) Plug in schedule, and it automatically creates route to locate classes for the semester
  - 22) Send check in locations to friends, which can be linked to a map so they know where to meet you
  - 23) Use data from most visited/traveled to areas to host events or post flyers
  - 24) Monster of building
  - 25) Hysterical navigation
  - 26) Shortcut finder!
  - 27) Number of feet to the next turning or routes: for the blind.: eg, walk 10 feet then turn right.,.
  - 28) An internal map on the mobile/kiosk that speaks (for the blind)
  - 29) Display inside the building outside classrooms to guide from one class to another internally.
  - 30) AR Spirit
- 31) AR pathways**
- 32) Navigating shoes or sandals: If building is at left side, left shoe will vibrate.
  - 33) Smart wristbands: Vibrate according to the direction,
  - 34) Smart headphones, which will tell you when to turn right or left, just headphones, which are directly connected to satellite.
  - 35) Smart watch with screen
  - 36) Map creates routes depending on the weather

## 2.2 Brainstorming Reflection

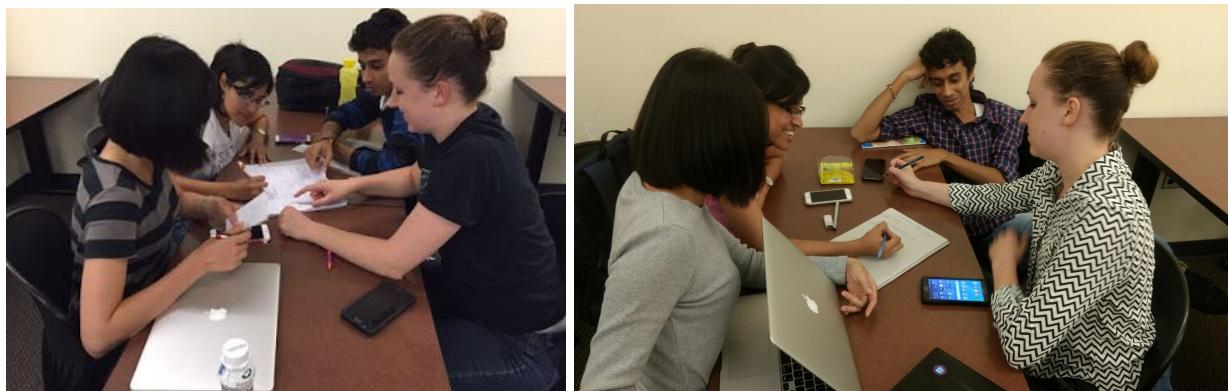


Figure 1 & 2: Pictures of the team brainstorming initial ideas

Brainstorming, especially during our first round, was incredibly difficult for us. Throughout the duration of the project, we had already (mentally) decided the one solution, a phone application. It became hard to venture beyond this specific idea. However, having the open brainstorming session and setting a minimum number of ideas pushed us to delve deeper into what the user may want or need in our product. The three solutions that we chose came from our first and third brainstorming sessions, where we were all together and conceiving solutions in person. This option was much more valuable for us because we were able to listen to each other's ideas and suggest feedback, which led to even more solutions. Brainstorming with people outside of our project did provide us with more ideas; however, explaining the problem space and assuming the person understand correctly became a challenge at times. All three brainstorming sessions provided a vast variety of solutions, though, and we were able to utilize several ideas as added features to the final three ideas we chose to storyboard. For future brainstorming activities, having each team member brainstorm individually and bringing the ideas back together again may be another way to develop solutions. Post-It notes have proven to be very successful for our group in previous activities and could also be used as a strategy for future projects.

## 2.3 Project Revisions

Based off the feedback that we received from our last report, we narrowed down our problem space to just navigating around campus. Our main objective since the beginning of this project has been to improve navigation, and our last report began to deviate from this problem space. Also, as we were narrowing down our solutions and creating user requirements, we noticed that our primary and second persona were different in characteristics and lifestyles, but ultimately navigating in the same fashion. Both personas were new to the IUPUI campus itself, so even though the secondary person may have had more experience navigating a college campus, they both would be starting fresh here at IUPUI. We revised the personas by having the primary persona be a freshman, someone who is new to campus. The secondary persona is a second-year graduate student with experience of the IUPUI campus layout. Below are our revised personas:

### 2.3.1 Primary Persona

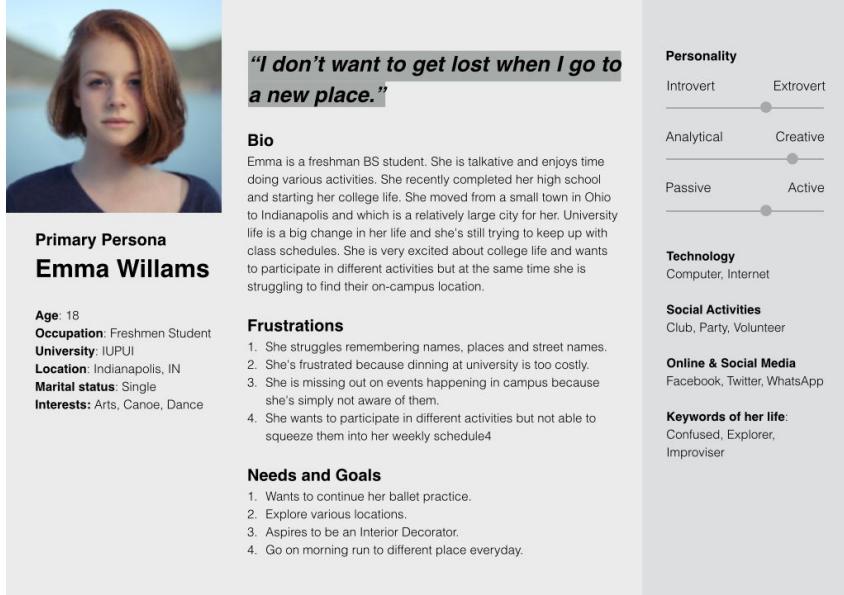


Figure 3: Updated primary persona, Emma

### 2.3.2 Secondary Persona

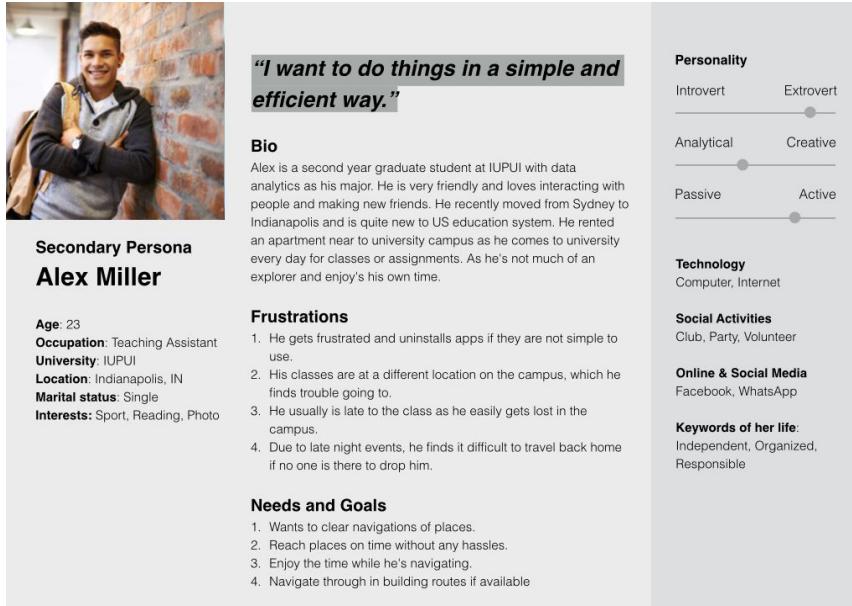


Figure 4: Updated secondary persona, Alex

## 2.4 User needs/requirements

The process of creating user requirements came immediately after our fourth brainstorming session, prior to selecting the final three ideas. Collectively, we agreed upon requirements that we believed would make a great experience and ones that would fit our personas' needs and goals. We noted the struggles and frustrations from our observations and interviews and wanted to create a solution that would allow navigation to be easier, clearer, and more enjoyable. Below are our user requirements:

#### **2.4.1 Accessibility**

The user will be able to easily access the product, whether that is on them physically or within reach/range.

#### **2.4.2 Clarity**

The directions and route will be clearly defined and easy to understand, without causing cognitive strain or requiring users to remember or articulate large amounts of information.

#### **2.4.3 Efficiency**

The user will be able to find a route to a desired location in a timely manner in as few steps as possible.

#### **2.4.4 Pleasure**

The solution will be fun and exciting to use. Users have the choice to use other applications or avenues, but will see the new solution as a modern, appealing way of navigating around campus.

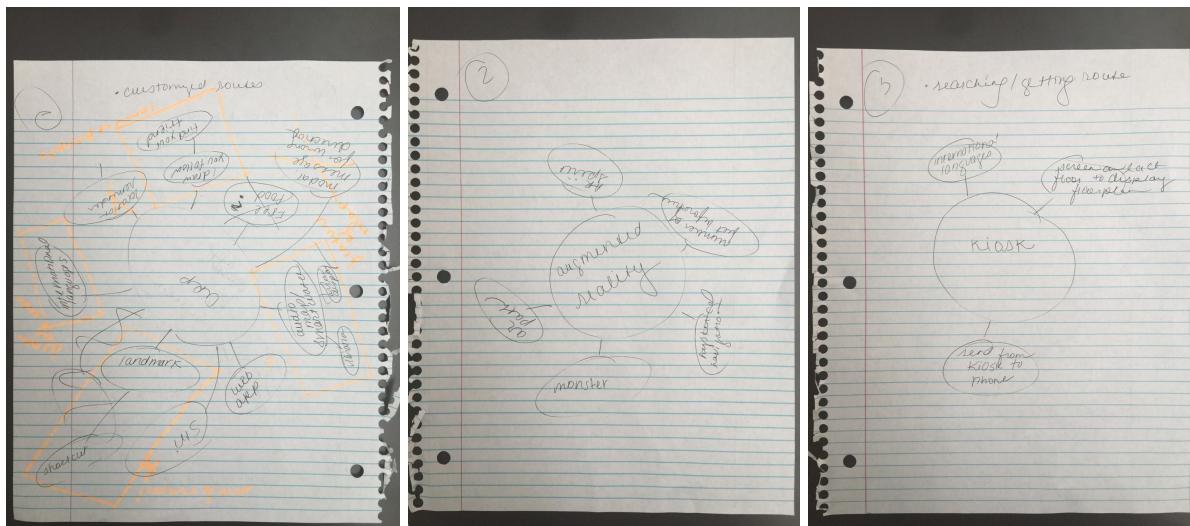
### **2.5 Three Design alternatives**

We chose our final three ideas by meeting in person and ruling out ideas that were either not practical or did not meet all the user requirements. This strategy, however, still left us with a large amount of potential ideas. It was at this point that we began to group the remaining ideas into areas that were similar to one another and separated the ideas that could supplement as features to larger solutions. After much discussion and collaboration, our three final ideas began to emerge as central points to each area: phone app, kiosk, and augmented reality.

**Round 1**

- 1) Add notification features (reminders, event changes)
- 2) QR code for building (identify the building)
- 3) Synchronize calendar with events
- 4) Mini-block outside (electronic) for people who don't use the app, maybe at major intersections and/or every building entrance
- 5) Map on the application
  - a) Offline map
- 6) Kiosk inside the building
  - a) Show events for the day inside that building
- 7) Interactive floorplans
- 8) Map to show interconnectivity of buildings via underground tunnels / gerbil tunnels
- 9) Display wall inside of the elevator to show floorplan
- 10) Smart lens to help navigate without having phone or map out
- 11) Pre-order food/drinks prior to arriving
- 12) Virtual Campus Assistant (SIRI 2.0)
- 13) Phone application
- 14) Web application
- 15) Reviews for dining
- 16) Visualization of 'busy' hours of dining halls
- 17) Show shortest of how to get around campus
- 18) Shorter milestones (i.e. have multiple smaller routes that make up one big route so they don't have to try and remember the entire route)
- 19) Networking system for events to get people connected prior to attending
- 20) Dynamic event management system
- 21) Screen sign outside of classrooms to show their availability for the day
- 22) 'Welcome to IUPUI' feature just for first 2 or so weeks of each semester
- 23) 3d model of the campus, physical and virtual (lego model)
- 24) Pins signal and buildings respond (accessibility)
- 25) Audio of maps for blind
- 26) International languages on maps or applications
- 27) Virtual orientation
- 28) Virtual tour
- 29) Club management system
- 30) WHERE BE THE FREE FOOD TELL ME
- 31) RSVP system for events
- 32) Displaying parking garages and lots around campus
- 33) Food delivery via robot
- 34) Self driving seaway with map to get to buildings
- 35) Self driving cars to park for you

*Figure 5: Screenshot of ideas being ruled out during the fourth brainstorming session*



*Figure 7, 8, 9: Pictures of our grouping strategy to determine our final three ideas*

### 2.5.1 Design Solution 1: Phone Application

The first solution is a phone application, which allows for the user to search for a specific location using a variety of different avenues, such as entering a keyword or a physical address. The user can customize the application by adding aural navigation, pulling addresses from calendar events, or sharing locations between other users via GPS.

Currently, Google Maps is the market leader in navigation. However, Google Maps is not customized to individual campuses and their specific buildings. For example, a user is not able to currently search 'IT Building' and receive the directions. They must type in the physical address to this building, which the majority of users do not know or remember. This application will solve this problem by allowing the user to search for specific locations, such as an IUPUI building, or allowing for exploration, like finding dining options in the area. It will also drive students to stay connected with events and friends by allowing for external sources, like the phone calendar and GPS, to pull in addresses or locations to the application.

This application can be accessible via a smartphone, which most students nowadays carry with them. A visible route with assistance when they have difficulties navigating will keep students on the fast track towards their destination. With multiple avenues for students to search and locate destinations, this application will provide an 'all-in-one' solution for navigating the campus.

### 2.5.2 Design Solution 2: Augmented Reality

The second solution uses the power of augmented reality (AR) to allow users to navigate hands free. The user can either pull in calendar event details, or search a specific destination via an application paired with the glasses. This will illuminate one or more paths onto the AR glasses, giving the user the choice of which path they would like to take (similar to Google Maps). As the user navigates, it will give step by step directions, including how many feet are left or what direction to turn. Audio cues via headphones can correlate with the visual directions if needed, along with a virtual navigation assistant to guide them on their journey.

AR is new to the market and will let people navigate without having their device in hand, allowing them to focus more on the real world than their smartphone screen. Similar to the phone application, this technology can allow for multiple sources of information to gather information or directions to destinations. This system will also allow the user to pick, potentially, the shortest or fastest route to their end destination, giving the user more control of their trip.

Although not currently a common trend in today's society, this solution may work as a future idea when AR becomes more readily available and affordable. The illuminated path with visual and auditory directions will provide clear instructions that will direct users without them having to constantly look at their phone screen. Since AR is an up and coming trend, users may find this solution to be more exciting than simply searching on Google Maps or asking for directions.

### 2.5.3 Design Solution 3: Kiosk

The third and final solution is a kiosk system, planted on the main floor of each building to assist with both external and internal navigation. Each kiosk will illustrate the entire building's floor plan and navigation. The user will access the kiosk either by JagTag or by phone number (if the user is not an IUPUI member yet). The user can then search a specific room or keyword (i.e. dining), view the route via the kiosk display, and if needed, send the route to their phone. If the user needs to travel from one building to another, they can search via keyword or address the new building. The kiosk will also allow the user to send their current location to other users via their student number or phone number from the kiosk.

The kiosk system accomplishes two goals in one, by allowing users to navigate both internally and externally. The user has the choice to either view the route or have it sent to them for reference. The use of a JagTag or phone number will allow for collaborating and sharing of routes to be quick and simple.

Kiosks are not widely used on campus yet and will provide a modern technique to providing assistance to visitors, newcomers, and experienced students. This system will also provide people who do not have a smartphone access to navigational directions. The kiosk is a quick interface to allow people to search a specific location and get/send the directions within seconds.

### 3. Storyboarding Report

#### 3.1 Design Solution 1: Phone Application

##### 3.1.1 Emma - Primary Persona



Figure 10: Emma trying to find her way to ballet building using app

##### 3.1.2 Use Case

**Emma would like to find directions to the ballet club to attend the activities but she cannot find the directions. Then she turns to our solution to seek help.**

**Frame 1:** Emma receives a calendar invitation to join the ballet group at IUPUI, but cannot seem to find the location on the campus map.

**Frame 2:** Emma opens the InCampus Locator application, which populates calendar events from her phone. Emma selects her ballet event.

**Frame 3:** The InCampus Locator shows the address and distance from her current location based on the calendar event. Emma presses 'Go'.

**Frame 4:** The InCampus Locator directs Emma by showing the route on the phone. The phone vibrates whenever she makes a wrong turn.

**Frame 5:** Emma is so happy when she locates the building without getting lost.

### 3.1.3 Alex - Secondary Persona



Figure 11: Alex trying to find location of career fair using app

### 3.1.4 Use Case

**Alex doesn't know where the career fair is being held. He hopes that his friend Nick is there so that Nick can guide him. He then looks to our solution to complete this problem**

**Frame 1:** Alex checks his clock and sees that he overslept on the morning of the career fair. He does not remember where it is located.

**Frame 2:** As he leaves the house in a rush, he texts his friend, Nick, for directions.

**Frame 3:** Nick opens the InCampus Locator application and draws the route using his finger to send to Alex.

**Frame 4:** Alex opens the app to find Nick's route available for navigating.

**Frame 5:** Alex is so happy when he arrives at the career fair without getting lost

### 3.2 Design Solution 2: Augmented Reality

#### 3.2.1 Emma - Primary Persona

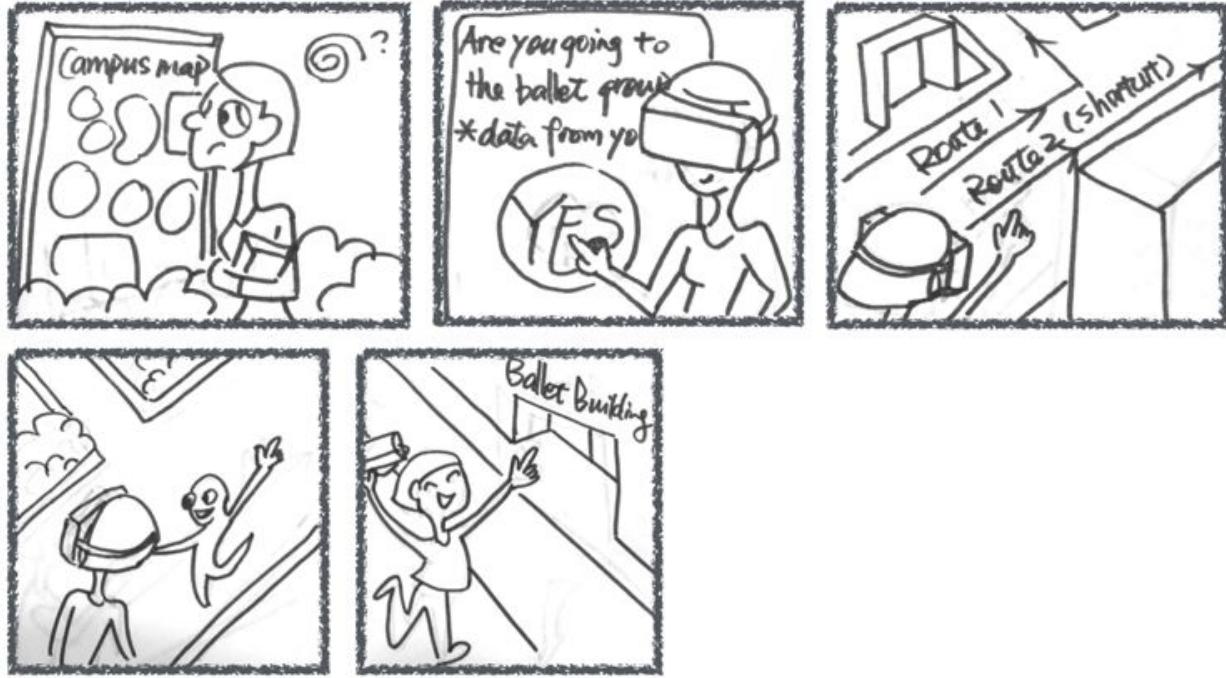


Figure 12: Emma is trying to find ballet building using AR goggles

#### 3.2.2 Use Case

**Emma would like to find directions to the ballet club to attend the activities but she cannot find the directions. Then she turns to our solution to seek help.**

**Frame 1:** Emma is wondering where her ballet group is located on campus.

**Frame 2:** Emma puts on her augmented reality glasses and sees the option to pull in data from her calendar events. Emma selects the event for her ballet group via a button on the side of her glasses.

**Frame 3:** The glasses illuminate multiple paths, giving her the option to choose which path works best for her.

**Frame 4:** Emma selects the second illuminated path, where a 'spirit' (virtual navigation assistant) helps her on her journey.

**Frame 5:** Emma is so happy when she locates the building without getting lost.

### 3.2.3 Alex - Secondary Persona



Figure 13: Alex trying to find Nick

### 3.2.4 Use Case:

**Alex receives a call for immediate help from his friend Nick through our solution. Our product help Alex to meet Nick quickly.**

**Frame 1:** Alex is wandering around campus.

**Frame 2:** He gets a call from his friend, Nick, who is having car trouble and need helps. Nick shares his GPS location with Alex via an application paired to his augmented reality glasses.

**Frame 3:** Alex puts on his augmented reality glasses and starts following the illuminated path.

**Frame 4:** As he is walking, a 'spirit' shows him a shortcut that could get to Nick faster.

**Frame 5:** Using this shortcut, Alex is able to finally locate Nick and his car.

### 3.3 Design Solution 3: Kiosk

#### 3.3.1 Emma - Primary Persona

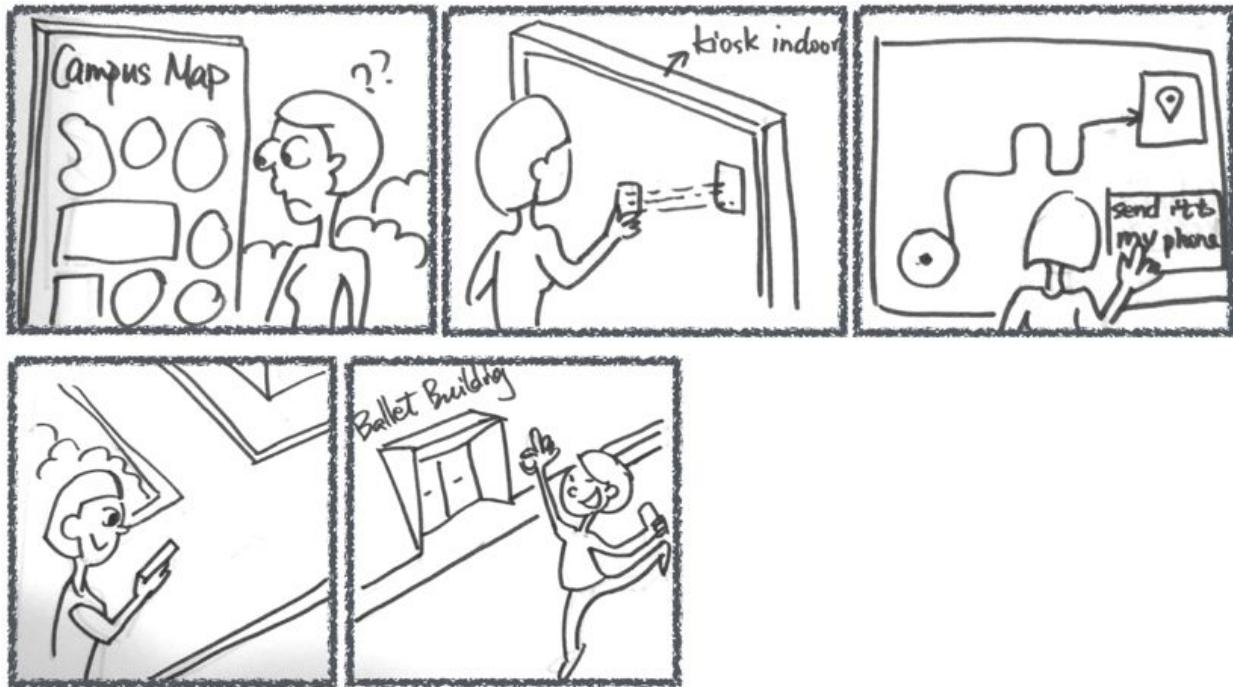


Figure 14: Emma trying to find ballet building using on campus kiosks

#### 3.3.2 Use Case

**Emma would like to find directions to the ballet club to attend the activities but she cannot find the directions. Then she turns to our solution to seek help.**

**Frame 1:** Emma is wondering where her ballet group is located on campus.

**Frame 2:** Emma goes to the main kiosk in the Herron School of Art building, and scans her JagTag.

**Frame 3:** Emma searches and locates the building where her ballet class is located. She sends the route to her phone.

**Frame 4:** Emma's phone receives the route via an application associated with the kiosk and starts walking towards the building.

**Frame 5:** Emma is so happy when she locates the building without getting lost.

### 3.3.3 Alex - Secondary Persona



Figure 15: Alex trying to find a specific room using kiosk

### 3.3.4 Use Case

**Alex is invited by Emma to go for movie together but he doesn't know where Emma is. He uses our solution to locate her accurately.**

**Frame 1:** After class lets out, Alex gets a text message from Emma, asking to see a movie with him.

**Frame 2:** Alex goes to the nearest kiosk, and inputs Emma's ID.

**Frame 3:** The kiosk asks permission for Emma to share her location via an application associated with the kiosk. Emma accepts.

**Frame 4:** The kiosk shows a route to Emma's location. He sends the route to his phone.

**Frame 5:** Alex is so happy to arrive at the classroom where Emma is located without getting lost.

## 3.4 Design Solution Choice

In conclusion, we chose to focus on a phone application, with additional functionality of physical kiosks located across . The application will allow users to search by keyword or address, and provide the ability to pull in external data via calendar events and GPS location sharing. Having a solution that can be easily accessible on a smartphone while on the go solidified the phone application as our main solution. However, the benefit of

the kiosk, with its bigger display and internal navigation, pushed us to also add it as a part of the overall system, as well. With the ability to send the route to the user's phone or another user's device, it only made sense to have the application and kiosk work with each other. Both these solutions in parallel will serve the user's needs in the following ways:

1. Accessibility:
  - a. Available anytime anywhere
  - b. Serves for external and internal navigation
2. Efficiency/Usability:
  - a. Clear direction, including faster or shorter routes
  - b. Ability to share locations
3. Pleasure:
  - a. Low cognitive load
  - b. Emotion evoking

Initially, we struggled to fully support the idea of an application only, because it is the 'typical' solution that most designers would think to do. Using technologies such as Kiosk or AR could have made the solution more appealing, something 'new' to the users. However, this 'pain point' brought about a design challenge: how do we make our product efficient, clear, and accessible using a common and wide used media? Would the kiosk or AR solution alone actually serve as better solutions?

For the kiosk by itself, it would provide a larger display, allowing the user to view the entire route in one complete screen. Kiosks are not widely used on our campus, and would be a new, modern way of navigating around campus. However, when we reviewed our data collected from interviews and observations, many users mentioned that the idea of a kiosk would be neat, but added: "Why would I want to navigate to the kiosk and then navigate to my building? It'll be an additional step. I'll just ask people around that's more convenient".

As for the AR technology by itself, AR has the ability to display the route continuously and hands free while the user travels. This method of convenience and efficiency, along with its modern appeal, made it a viable final solution. Similar to the difficulties with the kiosk alone though, AR technology is not fully accessible in today's society, and would require the user to own the glasses and have the technical knowledge to operate them.

## Appendix C: Heuristic Evaluation Report

We conducted a Heuristic evaluation for our product and came up with the following issues which can be targeted and worked up to make our application user-friendly and intuitive for the user.

### 1. Usability Aspect Report (UAR)

UAR number: UARHU1
Product Name: InCampus Locator
Date and Time of Study: 10/17/16 15:00
Experimenter's Name: Swapnil Chandra
Subject ID: HU01
Subject Details: Our app is about navigating around campus. We will conduct a heuristic test on the design.
<b>Heuristic List:</b> Heuristic List we referred to were: "10 Usability Heuristics for User Interface Design" by Jakob Nielson. According to his 10 heuristics, we found a few potential design changes we can incorporate as our future scope.

We focused on the following flaws:

1. Option to cancel the request sent to someone  
**Heuristic Rule:** 3 User control and freedom  
**Severity Rating:** 4 Usability catastrophe
  
2. Option to reject the request from someone  
**Heuristic Rule:** 3 User control and freedom  
**Severity Rating:** 4 Usability catastrophe
  
3. Option to give shortcuts through buildings instead of a roadmap  
**Heuristic Rule:** 3 User control and freedom  
**Severity Rating:** 4 Usability catastrophe
  
4. Turn GPS on permission modal isn't there  
**Heuristic Rule:** 3 User control and freedom  
5 Error prevention  
**Severity Rating:** 4 Usability catastrophe

5. There is no compass on the map  
**Heuristic Rule:** 1 Visibility of system status  
**Severity Rating:** 4 Usability catastrophe
6. Option to select the place on map instead of a keyboard input  
**Heuristic Rule:** 3 User control and freedom  
**Severity Rating:** 4 Usability catastrophe
7. Map doesn't have the names of the buildings and roads  
**Heuristic Rule:** 1 Visibility of system status  
**Severity Rating:** 4 Usability catastrophe
8. Sign telling you that the dot on the map is where you are  
**Heuristic Rule:** 1 Visibility of system status  
**Severity Rating:** 3 Major usability problem
9. Re-center to your location  
**Heuristic Rule:** 1 Visibility of system status  
**Severity Rating:** 3 Major usability problem
10. Zooming function is not available in the map  
**Heuristic Rule:** 1 Visibility of system status  
**Severity Rating:** 3 Major usability problem
11. No instructions  
**Heuristic Rule:** 10 Help and documentation  
**Severity Rating:** 3 Major usability problem
12. Option to show location to all or someone always/publicly, so that user doesn't have to accept requests if s/he doesn't want to  
**Heuristic Rule:** 3 User control and freedom  
**Severity Rating:** 2 Minor usability problem
13. No way to contact any assistance or the makers of the app.  
**Heuristic Rule:** 3 User control and freedom  
**Severity Rating:** 2 Minor usability problem
14. Map should tell the details of the roads (1 way 2 ways)  
**Heuristic Rule:** 1 Visibility of system status  
**Severity Rating:** 2 Minor usability problem

## 2. Detailed Usability Aspect Reports (UAR)

No. 1	Problem
<b>Name:</b> Option to cancel the “share location” request sent to someone	
<b>Evidence:</b> <b>Heuristic Rule:</b> 3 User control and freedom  Once request for someone to share their location is sent, there is no way to cancel that request from the sender's side.	
<b>Explanation:</b>  User can send a request to a contact in one click, however, if for any reason he wants to withdraw the request, the user has no button to do that. This can make conditions helpless for the user.	
<b>Severity or Benefit:</b>  <b>Rating:</b> 4 Usability catastrophe	
<b>Justification (Frequency, Impact, Persistence, Weights):</b>  Frequency: Any user wanting to undo the action of “send request” is likely to face this problem.  Impact: There is no way to overcome this problem. User will have to wait for the receiver to accept or reject the request.  Persistence: This problem will be persistent until the design is redone.  Weight the factors: This issue causes the user to feel helpless therefore I am rating this issue as a 4.	
<b>Possible solution and/or Trade-offs:</b>  Ideal solution to this problem is to create a cancel button for each request for “location share” that is sent.	

**Relationships:**

None.

**No. 2****Problem****Name:**

Option to reject the request from someone

**Evidence:**

**Heuristic Rule:** 3 User control and freedom

There is no option to reject a location share request received by a user.

**Explanation:**

There should be an option for the user to reject a pending “Share location” request so that the user is in control of whom he wants to share his location with.

**Severity or Benefit:**

**Rating:** 4 Usability catastrophe

**Justification (Frequency, Impact, Persistence, Weights):**

Frequency: Any user wanting to reject a pending “share location” request is likely to face this problem.

Impact: There is no way to overcome this problem. User can only accept the request to leave it in the list of pending requests.

Persistence: This problem will be persistent until the design is redone.

Weight the factors: This issue causes the user to feel helpless therefore I am rating this issue as a 4.

**Possible solution and/or Trade-offs:**

Ideal solution to this problem is to create a reject button for each request in the pending request section.

**Relationships:**

None.

No. 3	Problem
<b>Name:</b> Option to give shortcuts through buildings instead of a roadmap	
<b>Evidence:</b> <b>Heuristic Rule:</b> 3 User control and freedom  The route displayed for navigation is the roadmap from one point to another.	
<b>Explanation:</b>  If the user is a pedestrian, he can would prefer to use the shortcuts available in the buildings rather than use the longer road route. Therefore, there should be an option for the user to choose which route he would prefer.	
<b>Severity or Benefit:</b>  <b>Rating:</b> 4 Usability catastrophe	
<b>Justification (Frequency, Impact, Persistence, Weights):</b>  Frequency: The user will face this problem each time he looks for a route and finds the roadmap route but he would like the shortcut through buildings instead.  Impact: The problem is not easy to overcome and it defeats the purpose of the app.  Persistence: It will be a persistent problem until the option is added into the app.  Weight the factors: Since this issue defeats the main aim of the app, I think it needs immediate attention and hence rated it a 4.	
<b>Possible solution and/or Trade-offs:</b>  Ideal solution to this problem is to provide information of both the shortcut route and the road map route and let the user pick the route he would prefer.	
<b>Relationships:</b>  None.	

No. 4	Problem
<b>Name:</b> Turn GPS on permission modal isn't there	
<b>Evidence:</b>	<p><b>Heuristic Rule:</b> 3 User control and freedom, 5 Error prevention</p> <p>The application once launched displays the map and the user's location without checking if the GPS has been switched on.</p>
<b>Explanation:</b>	<p>The application locates the user's location without checking if the GPS is working. This can cause the application to either display the wrong information or switch on the GPS internally, taking away the freedom of the user.</p>
<b>Severity or Benefit:</b>	<p><b>Rating:</b> 4 Usability catastrophe</p> <p><b>Justification (Frequency, Impact, Persistence, Weights):</b></p> <p>Frequency: Each user will face this issue each time he launches the app.</p> <p>Impact: The problem can either cause the app to display wrong information or use the GPS without the user's permission.</p> <p>Persistence: It will be a persistent problem until the option is added into the app.</p> <p>Weight the factors: This issue is a major problem since it doesn't ask the user's permission for the GPS. Hence I gave it a 4.</p>
<b>Possible solution and/or Trade-offs:</b>	<p>Ideal solution to this problem is to provide a model for asking the user's permission for accessing the GPS.</p>
<b>Relationships:</b>	<p>None.</p>

No. 5	Problem
<b>Name:</b> There is no compass on the map	
<b>Evidence:</b>  <b>Heuristic Rule:</b> 1 Visibility of system status  There is no compass on the map displayed for navigation.	
<b>Explanation:</b>  Since there is no compass on the map, the user can't understand the directions properly. Due to this very fact, all maps contain a compass on the top.	
<b>Severity or Benefit:</b>  <b>Rating:</b> 4 Usability catastrophe	
<b>Justification (Frequency, Impact, Persistence, Weights):</b>  Frequency: Most users will get confused while they navigate  Impact: The users will not understand which direction they are navigating in. That will not be very informative for the user.  Persistence: It will be persistent problem until the compass is added into the app.  Weight the factors: This issue is a major problem since it doesn't give complete information to the user. Hence I gave it a 4.	
<b>Possible solution and/or Trade-offs:</b>  Ideal solution to this problem is to provide the compass on the map.	
<b>Relationships:</b>  None.	

No. 6	Problem
<b>Name:</b> Option to select the place on map instead of a keyboard input	
<b>Evidence:</b>  <b>Heuristic Rule:</b> 3 User control and freedom  The user can't tap on the map to select the location to navigate to.	
<b>Explanation:</b>  The user has only one option to select the place they need to navigate to, by typing it into the search box. This causes a hindrance to the user. The user should be given an option to select the location by tapping on it in the map in front of them.	
<b>Severity or Benefit:</b>  <b>Rating:</b> 4 Usability catastrophe  <b>Justification (Frequency, Impact, Persistence, Weights):</b>  Frequency: All users will face this problem.  Impact: The user will have to always go to the search bar and type the location to pull up the route to the location.  Persistence: It will be persistent problem until this feature is added into the app.  Weight the factors: The issue is a major problem since it doesn't let the user choose the location from the map, making the searching for a location very limited to the search bar. Hence I gave it a 4.	
<b>Possible solution and/or Trade-offs:</b>  Ideal solution to this problem is to provide the feature of selecting the location off the map.	
<b>Relationships:</b>  None.	

No. 7	Problem
<b>Name:</b> Map doesn't have the names of the buildings and roads	
<b>Evidence:</b>  <b>Heuristic Rule:</b> 1 Visibility of system status  The map has no labels for any building and roads displayed on it.	
<b>Explanation:</b>  The map will not provide enough information to the user who needs to navigate from one point to the other. This defeats the main purpose of a map.	
<b>Severity or Benefit:</b>  <b>Rating:</b> 4 Usability catastrophe  <b>Justification (Frequency, Impact, Persistence, Weights):</b>  Frequency: All users will face this problem, especially the users new to the area.  Impact: The users will need to remember the names of the buildings and the routes to understand the map better.  Persistence: It will be a persistent problem until the names of the buildings and routes are added into the app.  Weight the factors: This issue proves to be a problem for the user to decide by just looking at the map since the map doesn't provide sufficient information. Hence I gave it a 4.	
<b>Possible solution and/or Trade-offs:</b>  Ideal solution to this problem is to provide the names of all the buildings and routes on the map.	
<b>Relationships:</b>  None.	

No. 8	Problem
<b>Name:</b> Sign telling you that the dot on the map is where you are	
<b>Evidence:</b>  <b>Heuristic Rule:</b> 1 Visibility of system status  The map has a dot representing the user's location on the map, however it isn't marked.	
<b>Explanation:</b>  The map will not provide enough information to the user who needs to navigate from one point to the other. Though the dot on the screen is intuitive enough that it shows the user's location, we should mention this information on the screen.	
<b>Severity or Benefit:</b>  <b>Rating:</b> 3 Major usability problem	
<b>Justification (Frequency, Impact, Persistence, Weights):</b>  Frequency: All users will face this problem, especially the new users.  Impact: The users might get confused about what that dot is, or might ignore the dot all together unless its mentioned that the dot is their location on the map.  Persistence: It will be a persistent problem until the marker is added to the app.  Weight the factors: This issue posts a possibility that the user might get confused, though it is partly intuitive. Therefore, I am giving it a rating of 3.	
<b>Possible solution and/or Trade-offs:</b>  Ideal solution to this problem is to provide the marker on the map.	
<b>Relationships:</b>  None.	

No. 9	Problem
<b>Name:</b> Re-center to your location	
<b>Evidence:</b>  <b>Heuristic Rule:</b> 1 Visibility of system status	The map has no functionality to change or re-position the user's position.
<b>Explanation:</b>  If the user taps on another point in the map and that point is selected, it gives off the information that that is the user's location, however that is not the case. Hence this functionality is very important.	
<b>Severity or Benefit:</b>  <b>Rating:</b> 3 Major usability problem	
<b>Justification (Frequency, Impact, Persistence, Weights):</b>  Frequency: All users will face this problem when they try to read the map and tap on somewhere else on the map.  Impact: The users will get confused and not understand where they are exactly and might take wrong decisions based on the information displayed on the map.  Persistence: It will be a persistent problem until the functionality of re-centering is added to the app.  Weight the factors: This issue might provide wrong information of the map if the user taps on another part of the map. This can be confusing for the user leading him to make wrong decisions though currently the user can't tap anywhere on the map. Therefore, I am giving a rating of 3.	
<b>Possible solution and/or Trade-offs:</b>  Ideal solution to this problem is to provide a "re-center" button on the screen that re-locates the user using the GPS.	
<b>Relationships:</b>	

UAR number 5. If the solution of UAR 5 is implemented, this issue will be a major problem.

No. 10	Problem
<b>Name:</b>	Zooming function is not available in the map
<b>Evidence:</b>	<p><b>Heuristic Rule:</b> 1 Visibility of system status</p> <p>The map is a static map, with no way that the user can interact with it.</p>
<b>Explanation:</b>	The user can't interact with the map. This makes the map difficult to read and understand, especially for the new users. There should be a way to zoom in and out from the map so that it is easier for the user to understand.
<b>Severity or Benefit:</b>	<p><b>Rating:</b> 3 Major usability problem</p> <p><b>Justification (Frequency, Impact, Persistence, Weights):</b></p> <p>Frequency: All users will face this problem when they try to read the map.</p> <p>Impact: This problem will make it difficult for the user to understand the map making it difficult to use the map. This will discourage the user to use the app.</p> <p>Persistence: It will be a persistent problem until the map includes the functionality of zoom-in, zoom-out.</p> <p>Weight the factors: Though the user will not be able to read the map effectively, this will not hinder the main purpose of navigation. Therefore, I am giving this issue a rating of 3.</p>
<b>Possible solution and/or Trade-offs:</b>	Ideal solution to this problem is to provide the zooming functionality to the map.
<b>Relationships:</b>	

None.

No. 11	Problem
<b>Name:</b> No instructions	
<b>Evidence:</b> <b>Heuristic Rule:</b> 10 Help and documentation  When a user enters the application, the application offers no assistance about the functionality of the app.	
<b>Explanation:</b>  The user will need some instructions when he enters the app for the first time to understand the functionality of the app and the various buttons present in the app. Without the instructions, the user will need to depend solely on his instincts making it tough on the user.	
<b>Severity or Benefit:</b>  <b>Rating:</b> 3 Major usability problem	
<b>Justification (Frequency, Impact, Persistence, Weights):</b>  Frequency: Frequency of this problem of feeling lost will happen to every novice user. Once he adapts to the app he will not face the issue anymore.  Impact: The problem is not very easy to overcome unless the user becomes experienced.  Persistence: It is a one-time problem unless the user runs into a new functionality and has to understand it on his own again.  Weight the factors: Since the problem is not causing a big hindrance in the basic functionality of the app, I didn't rate it a 4. However, it does make the job of understanding and using the app tough for a first time user. Therefore, I rated it a 3.	
<b>Possible solution and/or Trade-offs:</b>	

<p>Trade-off to this problem will be that we would make the app difficult for the new users to use. This will affect the user-friendliness of the app. Ideal solution is to create a step by step guide for every new user with a “skip” option for user.</p>	
<p><b>Relationships:</b> None.</p>	
No. 12	Problem
<b>Name:</b> Option to show location to all or someone always/publicly, so that user doesn't have to accept requests if s/he doesn't want to	
<b>Evidence:</b>  <b>Heuristic Rule:</b> 3 User control and freedom  The user has to always accept the request when needed to share the location.	
<b>Explanation:</b>  The functionality of sharing your location requires the user to send and accept requests. However, if some user would like their location to be public all the time or always shared with a person (friend), they have no such option.	
<b>Severity or Benefit:</b>  <b>Rating:</b> 2 Minor usability problem	
<b>Justification (Frequency, Impact, Persistence, Weights):</b>  Frequency: All users requiring an option to share their location with a certain set of people without always accepting the request would face this issue.  Impact: The problem will make such users unnecessarily accept requests repeatedly.  Persistence: It will be a persistent problem until this feature is added to the app.  Weight the factors: Though this issue will cause some users to get annoyed, this can be thought of as future scope. This is because this issue doesn't interfere with the main functionalities of the app.	
<b>Possible solution and/or Trade-offs:</b>	

Ideal solution to this problem is to provide friend function or an option to publicly share your location to the user.

**Relationships:**

None.

No. 13	Problem
<b>Name:</b>	No way to contact any assistance or the makers of the app
<b>Evidence:</b>	<p><b>Heuristic Rule:</b> 3 User control and freedom</p> <p>There is no option to contact anyone in the app.</p>
<b>Explanation:</b>	The user can't contact anyone through the app in case the user loses his way or has a question about the app. This can cause inconvenience to the user.
<b>Severity or Benefit:</b>	<p><b>Rating:</b> 2 Minor usability problem</p> <p><b>Justification (Frequency, Impact, Persistence, Weights):</b></p> <p>Frequency: Any user who needs to contact someone through the app will face this issue.</p> <p>Impact: The problem will render the user helpless in such a situation when he wants to contact someone through the app.</p> <p>Persistence: It will be a persistent problem until this feature is added to the app.</p> <p>Weight the factors: Though this issue will cause some users some inconvenience, this can be thought of as future scope. This is because this issue doesn't interfere with the main functionalities of the app.</p>
<b>Possible solution and/or Trade-offs:</b>	

Ideal solution to this problem is to provide a “contact us” feature in the app.

**Relationships:**

None.

No. 14	Problem
<b>Name:</b> Map should tell the details of the roads (1 way 2 ways)	
<b>Evidence:</b>  <b>Heuristic Rule:</b> 1 Visibility of system status  There is no indication for any information for the roads in the map.	
<b>Explanation:</b>  If the user requires information about the routes in the map, especially if they are driving then this app gives them no information about it.	
<b>Severity or Benefit:</b>  <b>Rating:</b> 2 Minor usability problem  <b>Justification (Frequency, Impact, Persistence, Weights):</b>  Frequency: Users who travel by car or require information about the roads might get affected by this issue.  Impact: The issue is that the users get no information from the map regarding the roads. This will discourage such users from using this app.  Persistence: It will be a persistent problem until this feature is added to the app.  Weight the factors: Though this issue will cause some users some inconvenience, this can be thought of as future scope. This is because this issue doesn't interfere with the main functionalities of the app.	

**Possible solution and/or Trade-offs:**

Ideal solution to this problem is to add such information into the app.

**Relationships:**

None.

## Appendix D: Cognitive Walkthrough Report

### 1. Cognitive Walkthrough Report (CWR)

#### 1.1 Task 1: Share Location

**CWR Number:** ICL001

**Product Name:** InCampus Locator

**Task Name:** Share Location

**Date and Time of Study:** 17-10-2016 12:08 to 17-10-2016 12:30

**Experimenter's Name:** Pushkar Joshi

#### 1.1.1 Task Description

Another friend has requested my location using the InCampus Locator app. I want to accept his location request.

#### 1.1.2 Task Action Sequence

1. User: Open Application  
Application: Show home screen of app
2. User: Click Share Location icon  
Application: Load location requests screen.
3. User: See location requests loaded on the screen.  
Application: Do nothing.

4. User: Click on accept request icon.  
Application: Start sharing user's location with the requester. Change the accept icon to stop sharing icon.
5. User: Press back button.  
Application: Show previous screen (home page)

### 1.1.3 Interface Description

Phone is standard size smartphone with touch screen display. Phone has GPS feature in built.

### 1.1.4 Cognitive Walkthrough

#### Open Application:

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

#### Click Share Location icon:

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>	X	Although the notification badge over the button clearly tells that few requests are there. User might get confused about the text 'Share Location'. Text is not

		clear enough on the button.
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

See location requests loaded on the screen.

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		No delete location request button on the screen. Not taking an action is not equal to deleting location request.
<i>If the correct action is taken, will the user see that things are going ok?</i>		

Click on accept request icon

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the</i>		

<i>correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		No information regarding how much time the location will be shared with the requester, will user have to stop sharing with the requester after sometime?

Press back button.

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

## 1.2 Task 2: Find Friend

<b>CWR Number:</b> ICL002
<b>Product Name:</b> InCampus Locator
<b>Task Name:</b> Find Friend
<b>Date and Time of Study:</b> 17-10-2016 12:35 to 13:00
<b>Experimenter's Name:</b> Pushkar Joshi

### 1.2.1 Task Description

I want to find friend's location who is in the campus.

### 1.2.2 Task Action Sequence

1. User: Open Application  
Application: Show home screen of app
2. User: Click Find Friend icon  
Application: Show contact list
3. User: Click on arrow icon from one of the friend's contact.  
Application: Application will send location sharing request to the clicked friend's contact.
4. User: Click Back button  
Application: Show previous page (home screen) And if contacted person accepts the request, application will show message that user has accepted the request.
5. User: Click on the message  
Application: Show friend's location on the map, along with the route to reach to the friend.
6. User: User clicks on Let's Go button  
Application: Application shows first person view of the route.
7. User: User starts following the shown route.  
Application: Application shows the various screens according to the user's changed location.
8. User: User reaches the friend's location  
Application: Show location reached screen.
9. User: Clicks on back button  
Application: Show previous screen (home page)

### 1.2.3 Interface Description:

Phone is standard size smartphone with touch screen display. Phone has GPS feature built-in.

### 1.2.4 Cognitive Walkthrough

#### **Open Application:**

CW Questions	Issues	Notes
<i>Will the user be trying to achieve</i>		

<i>the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

Click Find Friend icon:

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		No search bar option to find the friends.
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

Click on arrow icon from one of the friend's contact.:

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		

<i>If the correct action is taken, will the user see that things are going ok?</i>		
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Click Back button:

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

Click on the message

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		Message is not intuitive enough to click. It is displayed as toast message, and may project that it is just an informative message.
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

User clicks on Let's Go button

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

User: User starts following the shown route.

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

User: User reaches the friend's location

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		Grammatically incorrect message: "You Find"

		Isabella!!!”
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

User: Clicks on back button

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

### 1.3 Find location

<b>CWR Number:</b> ICL003
<b>Product Name:</b> InCampus Locator
<b>Task Name:</b> Find location
<b>Date and Time of Study:</b> 17-10-2016 13:15 to 13:40

<b>Experimenter's Name:</b> Pushkar Joshi
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### 1.3.1 Task Description

I want to find a location of a building/classroom inside the campus.

### 1.3.2 Task Action Sequence

1. User: Open Application  
Application: Show home screen of app
2. User: Click Search Direction icon  
Application: Hide icons and show Keyboard
3. User: Type location name using keyboard  
Application: Application will take the inputs.
6. User: Click search button  
Application: Application will show the route if searched query is located.
7. User: Click “Let’s go” icon  
Application: Application shows first person view of the route.
8. User: Starts following the route  
Application: Application shows the various screens according to the user’s changed location.
9. User: User reaches the desired location.  
Application: Show location reached screen.
10. User: Clicks on back button  
Application: Show previous screen (home page)

### 1.3.3 Interface Description

Phone is standard size smartphone with touch screen display. Phone has GPS feature built-in.

### 1.3.4 Cognitive Walkthrough

Open Application

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		

<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

Click Search Direction icon

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

Type location name using keyboard

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		Spacebar button has some chinese symbol on the keyboard  No search suggestions, user will not know till the end if he/she is entering correct until application gives some message.
<i>Will the user know that the correct action is available?</i>		

<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

Click search button

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		No way to know how far or how many mins walk is the location.
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

Click “Let’s go” icon

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		User might get confused how application didn't ask for permission about locating user's own location.
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going</i>		

ok?		
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Starts following the route

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

User reaches the desired location.

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

Clicks on back button

CW Questions	Issues	Notes
<i>Will the user be trying to achieve the right effect?</i>		
<i>Will the user know that the correct action is available?</i>		
<i>Will the user know that the correct action will achieve the desired effect</i>		
<i>If the correct action is taken, will the user see that things are going ok?</i>		

## Appendix E: User tests

### 1. User Test 1

UAR number: UARCL01
Product Name: InCampus Locator
Date and Time of Study: 17-10-2016 20:30 to 17-10-2016 21:05
Subject ID: CL01
Subject Details: Subject is female, 26 years old and a visiting scholar in school of medicine.
Venue of user test: Subject's Apartment.
<p>Script:</p> <ul style="list-style-type: none"> <li>● I'd like to show you the APP for IUPUI InCampus Locator.</li> <li>● I'll let you click around and look at the APP.</li> <li>● What tasks do you think you can do with the APP?</li> <li>● Now, I'm going to ask you to try out a few tasks using the APP.</li> <li>● Can you show me how you would navigate through the APP for the following tasks?</li> </ul>

**A. Find a given location****B. Find a friend****C. Share location to your friend**

- What is your overall impression of the APP?
- Tell me more about that.
- Is there anything else you would recommend?
- Script for wrapping up the session

Looks like that's what I needed, thank you! Would you like us to share a copy of our report with you when we are done? [If yes, get email address, if no] Do you have any questions for me? [IF yes answer, otherwise go on] Thank you so much for your time and for your feedback on the website! Have a great day!

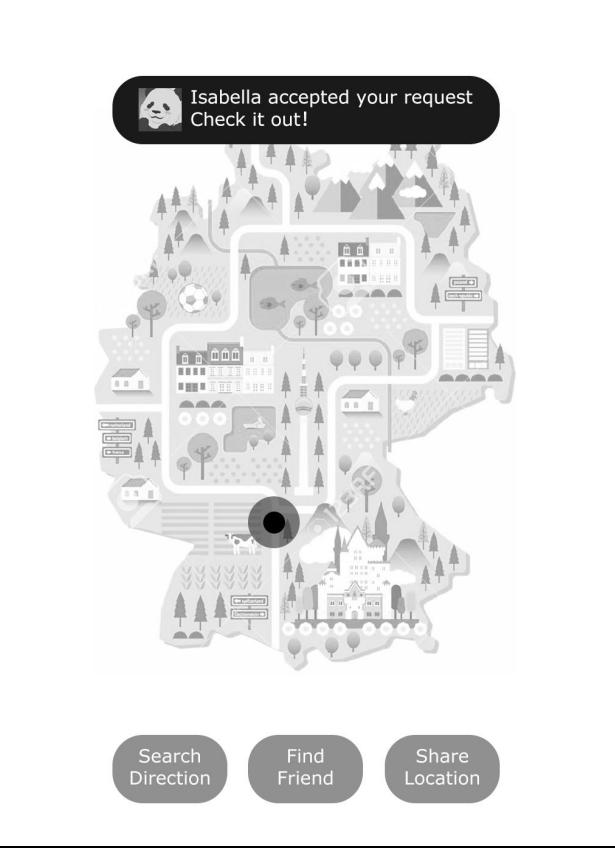
**Summary of the think-aloud user test:**

Overall, the user have positive attitude to our design solution. She had few trouble in understanding what the APP served and how to use it. She also provided a lot of valuable expanded functionalities for us to improve the APP. Detailed description is shown below. Here is the comment from the real user:

<https://drive.google.com/file/d/0BwKj1nJBzYYN2dnOXVXckhDeG8/view?usp=sharing>

Interface	Quote from User
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	<ol style="list-style-type: none"> <li>1. I want to see the streetscape wherever I point out on the map even though I don't want to go there.</li> <li>2. I want to see the open hour of the building.</li> <li>3. I want to know whether there are many people or not on the road, so that when it is midnight I can choose the route which there are more people there, not the shortcut.</li> <li>4. I want to know the landmark of on IUPUI campus, like library, campus center, etc.</li> </ol>
	<ol style="list-style-type: none"> <li>1. I want the real time streetscape be controlled to see 360° environment.</li> <li>2. I also hope the real time streetscape showing real weather condition.</li> <li>3. When the route in real world is unavailable, how to choose another route?</li> </ol>

	<ol style="list-style-type: none"> <li>1. I didn't noticing how to find friend's location when receive the notification of acceptance from friend on the top bar of the APP</li> <li>2. I want to know my friend's location with detailed address (E.g. 12 Blake Str.)</li> <li>3. I want to know my friend's location after I accepted his request of getting my location.</li> <li>4. I want to set a meeting place for allowing several friends to meet up.</li> </ol>
	<p>When arrived, want to send feedback to the developers of the APP</p>

## 2. User Test 2

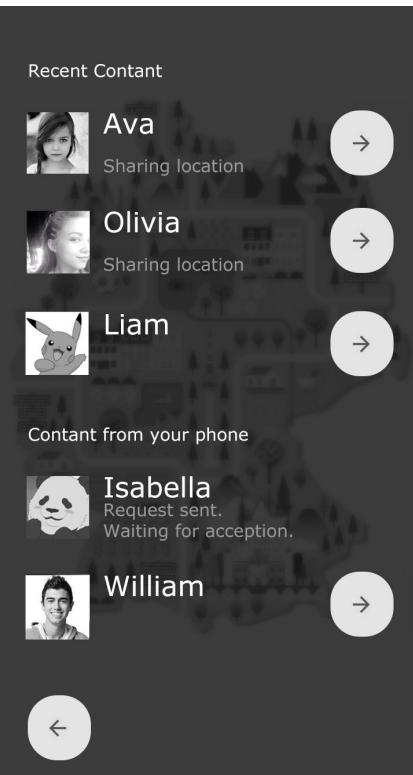
UAR number: UARCL02
Product Name: InCampus Locator
Date and Time of Study: 10/18/16 18:00
Experimenter's Name: Swapnil Chandra
Subject ID: CL02
Subject Details: The subject is a student of IUPUI, the school we are creating this app for. The user travels to the classes by foot and requires directions to buildings and directions inside the building while travelling to the classes. The is a 24-year-old graduate student.
Venue of user test: Campus Center
<p>Script:</p> <ul style="list-style-type: none"><li>● We have created an app design for navigating around campus.</li><li>● We would like you to interact with the app and talk aloud about what you think about the app.</li><li>● Now, I'm going to ask you to try out a few tasks using the APP.</li><li>● Can you show me how you would navigate through the APP for the following tasks?<ul style="list-style-type: none"><li><b>A. Find a given location</b></li><li><b>B. Find a friend</b></li><li><b>C. Share location to your friend</b></li></ul></li></ul> <p>● If you have any questions during the walkthrough, you may stop the process and ask us</p> <p>● You may leave the walkthrough anytime</p> <p>● What are your views about the app</p> <p>● What changes would you recommend</p> <p>● Script for wrapping up the session</p> <p>Looks like that's what I needed, thank you! Would you like us to share a copy of our report with you when we are done? [If yes, get email address, if no] Do you have any questions for me? [If yes answer, otherwise go on] Thank you so much for your time and for your feedback on the website! Have a great day!</p>

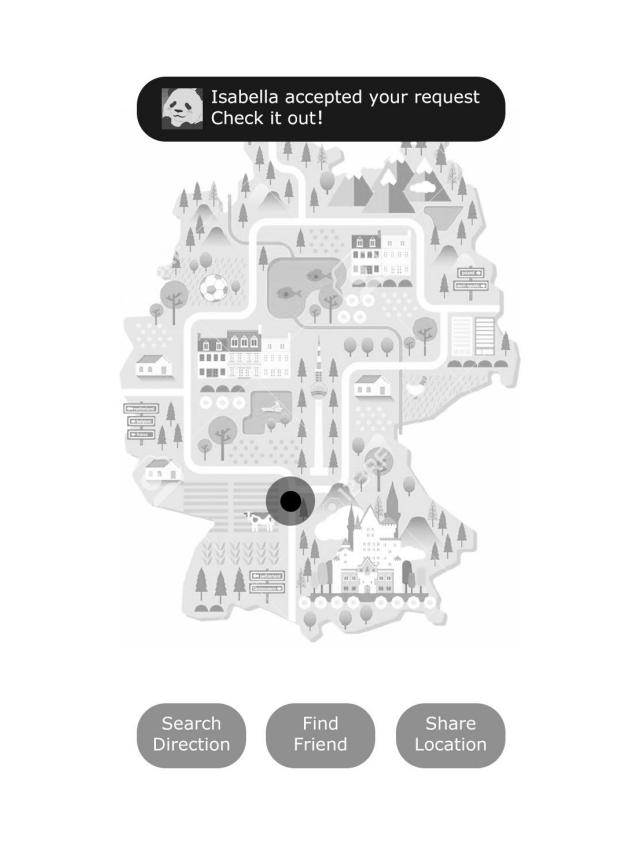
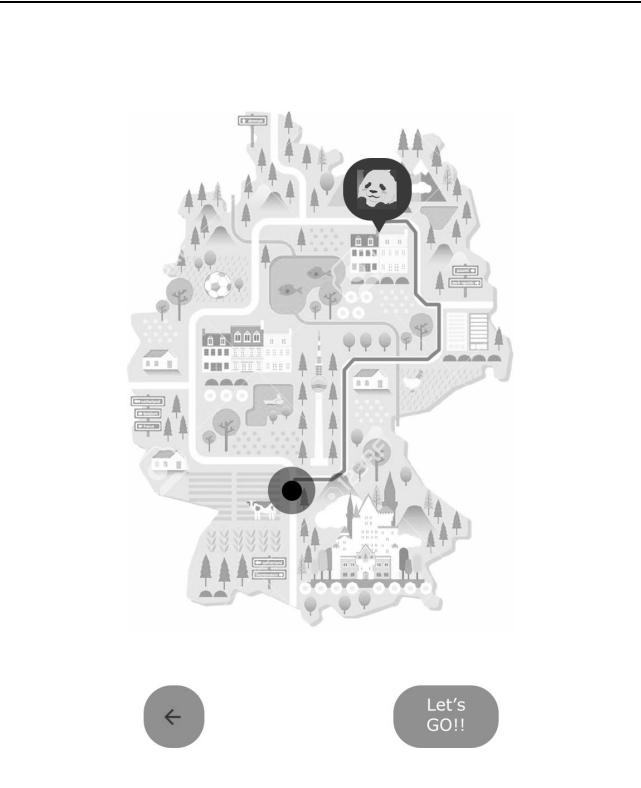
Summary: The user was very excited to use the application. He was interested in the whole concept of the application and thought the application was a good idea for this problem. While testing the application, the user came across a few parts where the app didn't fulfill his needs and pointed it out as the user tested the application.

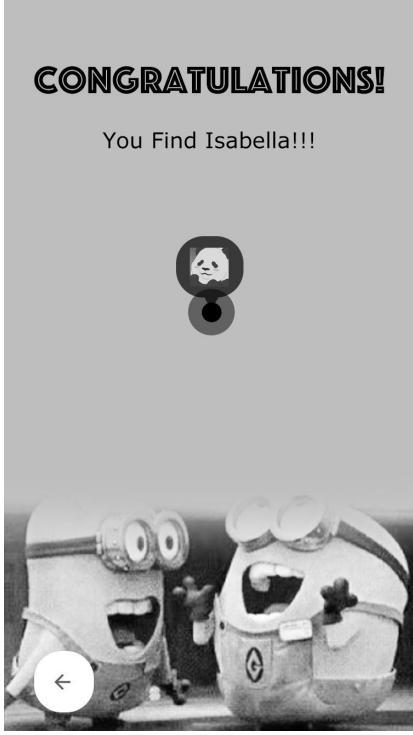
Interface	User Quotes
	<ol style="list-style-type: none"><li>1. This is the map of our campus, but I don't see any names</li><li>2. Where is the gps on the map</li><li>3. I like how the map is a little animated format. Being a gamer it gives me a game like feel to the app</li><li>4. Oh, clicking on the map doesn't select the location</li></ol>

1. The map gives the route well  
2. "Let's Go" button is well placed

1. The internal navigation looks good.  
It tells me where I am going with the images  
2. I would like the map to be there somewhere too on the screen since with just the internal map I am not able to understand where I am

	<ol style="list-style-type: none"><li>1. I would like the map to be on every screen, including this one.</li></ol>
	<ol style="list-style-type: none"><li>1. The interface seems simple to understand. I like that</li></ol>

	<ol style="list-style-type: none"><li>1. I didn't understand that we had to click the notification to get the route on the map.</li></ol>
	<ol style="list-style-type: none"><li>1. I didn't see the name of the contact. I won't be able to remember the name of each contact.</li><li>2. What if the contact changed location after sharing the location? Will the map change real time?</li></ol>

 A screenshot of a mobile application interface. At the top, the word "CONGRATULATIONS!" is displayed in large, bold, black capital letters. Below it, the text "You Find Isabella!!!". In the center, there is a small circular icon containing a white Minion face. At the bottom left, there is a white circular button with a black arrow pointing to the left.	<ol style="list-style-type: none"><li>1. The application doesn't consistently display the map.</li><li>2. The app focuses on navigation which is much needed for the school, especially with different named/ codes for the buildings and the internal navigation being difficult. Great idea for an app!</li></ol>
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