OBA Research & Development

by

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Intro
For the last year I have been working with Prof. Alan Borning along with the team developing OneBusAway for iPhone (primarily meeting with grad student Caitlin Bonnar), helping them add features, fix bugs, and test changes. It has been interesting work and has taught me quite a bit about iOS development, accessibility, and human interface design. I also put together and ran a user study to finish up my project and get more information to help the team in the future.

Development
During my time working on the project I helped add a couple of relatively substantial features to the app.

Bookmark Groups:
For quite a few years now, users of OneBusAway have had access to a stop bookmarking feature, allowing them to save stops they frequently visit to access again quickly. I decided to add the ability to group those saved bookmarks to keep them organized. So, for example, if the user had a couple of bookmarks for stops near their work they could create a ‘Work’ group, or the same for their home or any other place that they frequently access stops at.

The primary difficulty implementing this feature was the complex table view logic that was required. By default, iOS table views have sections which are collapsible, but they don’t allow items to exist outside of a section, and in general the interaction with sections wasn’t quite what I wanted
for this feature. Because of those limitations I went ahead and coded in custom behavior to allow the group rows to be selected to collapse the applicable bookmark rows. After some trial and error I was able to get this working well.

Apart from the table view implementation, most of the work was in revamping the data stored for bookmarks, making sure that nothing broke for existing users, but also making it easy for groups to be created and for bookmarks to be added to those groups. Due to the simplicity of the data this wasn’t too difficult, but I did learn quite a bit about how OneBusAway stores it’s data that I had no clue about before starting this feature.

The feature made it into the released app and there have been no serious bug reports or issues with it, and the feedback from those we have talked to about it has been positive.

**StopInfo:**
While I was working on the team a new StopInfo program was started for OBA. The idea was to create way for people to enter information about a stop to help blind and low vision riders. Since I didn’t have experience with this field, I went to the meetings about StopInfo but didn’t participate much in the research side of things apart from throwing out the occasional idea. Even still, this was certainly a learning experience, hearing more about some peoples’ transit requirements, the ways different users use OneBusAway, and also the type of information about a stop that
didn’t initially even occur to me as being useful but might be extremely important for some riders.

I didn’t help much with the research, but what I did help with was incorporating StopInfo into the app through a web view. One of the members of the research team for StopInfo was creating a mobile site for it so that it could be more easily tracked with analytics, didn’t require building a full native interface, and was easy to integrate into the apps on other platforms. Once this site was built it needed to be presented from inside the app, and this was where I came in.

We debated whether or not to simply switch the user to an external browser on their device, but instead decided to integrate it directly into the app for a more cohesive experience. Luckily Apple has support for web views, but there were still issues we had to figure out for ourselves such as how to handle back button behavior to allow the user to navigate the StopInfo site without unintentionally jumping back into the rest of the app, while still allowing them to get back to their original task without difficulty. The first couple of passes at getting this right were rather clunky, but after some trial and error as well as feedback from testers and the other developers a good solution was reached. The ultimate solution involved using a web view library, stripping out the included navigation controls, and then using the back button already present in our navigation bar with URL checking to handle returning directly to the app after submitting data.

**User Study**

Most recently, at the end of my work on OneBusAway (for credit, still hope to contribute to the open source project in the future), I decided to run a user study on a couple of potential new features as well as some existing functionality to learn more about how people use and would like to use the app. A group has been working on a redesign for the Android app, and Caitlin and I figured doing this research would be beneficial for their work as well as our own.
I designed and put up half a dozen flyers around campus to get volunteers for the user study the week before we were going to hold the sessions. We only got about eight responses, and of those we only ended up arranging sessions with three, and of those three only one actually showed up. We were able to grab a couple of grad students from the CS department to run a few more sessions on, but the next time I run a user study like this I will put up more flyers, put them up sooner, and make a few more time slots available to give our volunteers more options to fit us into their schedule. It was clear that the primary issue was lack of awareness and difficulty of scheduling.

Interestingly, when I gathered up the flyers when we were finished it turns out quite a few people were interested enough to take a tab, and of the 6 flyers only one had any tabs left. I don’t know if that means some people took more than one tab, or if there were many people who were interested but not enough to actually follow up, or (most likely) many of them just forgot. Whatever the case, more than fifty tabs were taken with only 8 emails, so clearly more flyers are needed simply to reach enough people to get a decent turnout.

**User Study Sessions**

For the sessions themselves I prepped a script with information about the project, a few pointers about the user study process (think out loud, don’t expect immediate
answers to questions, etc...), a request for permission to record the conversation for our own use, a few simple tasks for them to complete, and finally a small questionnaire about them, how they use OBA, and what, if anything, they would want changed in the app. The script was fairly basic and was heavily derived from Steve Krug’s Usability Script, and the primary differences were those required due to the nature of an app vs a website, as well as the specific questions and tasks related to OBA. I delivered the information from the script and guided the volunteers through the session (played as the phone) while Caitlin took notes and helped me answer questions during and after the interviews.

During the user sessions we tested a couple of new feature ideas, a potential Android interface, and the existing StopInfo web view. To do this a few things were done. First of all, for the new features I prepared paper prototypes of many of the OBA screens, some of them photoshopped with the changes being tested, as well as a roughly phone sized piece of cardboard that was used as their ‘test phone’. And secondly, for the Android interface we were able to borrow a Nexus tablet from another grad student to let the volunteers use, and simply handed them my own phone for the StopInfo web view.

What follows are all of the user tasks/features that we had the volunteers test. For each I will try and include what was told to the volunteer (the ‘task’), an overview of what I was hoping to discover/my motivation for trying out a certain feature, how the volunteers responded to the task, and what I learned from the feedback. When relevant I will also include the mockups I showed for that feature.
Feature 1: Walking Distance/Directions

Task for this feature: "You have to walk to the stop at 42nd and 11th when you leave, and you want to use One Bus Away to help you get the walking distance and directions."

For this first feature I was curious to find out whether or not people would find walking distance & directions useful inside the app. Personally, I know that the lack of walking directions is one of the major reasons I use Google Maps nearly every time I ride a bus, I want to know which bus to take, but I also need to know how to get to the stop if I haven’t been there before.

For the mockup I added a bit of text to the stop popover with a walking time estimate, and a row to the stop details view with the same information that when
‘tapped’ would take the user to Google Maps with the directions from the current location to the stop already loaded up (which was also one of the mockup screens). For the phrasing of the task I considered two options, the first would have been phrased “You have to walk to this stop when you leave”, emphasizing that the target destination is already on screen. I decided to go with the second option (shown above), and instead said the specific stop, assuming they would notice that the screen was already showing that spot on the map. This proved to be a mistake, and the volunteers initial response was to look for that stop, which was not the intent of the task, and I had to set them on the right track because I didn’t have enough screens prepared to allow them to search for the stop. Before the second round of interviews was going to take place I updated the task on the script, and also printed out about a dozen additional screens to try and cover more of what the volunteers might try, but I was unable to test these changes since those volunteers didn’t show up.

The volunteers felt that it was a good way to show the walking time information, but for the most part they didn’t think it would really fit into their existing workflow with the app, since so many people already start in Google Maps for their trip planning, and therefore have the distance and time loaded up already. I think that showing some indicator of walking distance could be useful, but it wasn’t immediately clear to the volunteers why they would need it, and overall the response to it was relatively neutral.
Feature 2: Stop Schedule

Task for this feature: "You know that you are going to need to catch a bus at this stop on Sunday, and to plan ahead you want to find the weekend schedule for the stop”

The idea behind this feature was to provide the information available on the bus stop schedule signs within the OBA app to help users plan trips from nearby stops. Right now it can be difficult to tell from within the app which routes will arrive at which times at a certain stop. For example, on a weekday it is currently impossible within the iPhone app to tell which/when routes will be visiting a stop on the weekend to allow for planning ahead of time. To ‘fix’ this, I added a stop schedule button to the stop view, which led to the stop schedule view shown to the right. The data was summarized to try to keep it relatively clear what happened without listing out every arrival time for every day.

It turns out that there were a couple of major problems with this idea. The biggest one was that the volunteers really weren’t sure why they would want to do this. They didn’t understand the task right away, and once they did it didn’t seem like something they would ever need to do. And I think the core of that is Google Maps and the like. At this time not many people use OneBusAway for trip planning, and so going into the app to try and find the schedule a few days out just isn’t something many people would do.
The other issue was presentation. The layout of the stop schedule view was somewhat unclear, so the volunteers weren’t exactly sure if the busses were supposed to show up exactly at 9:00 (for example) and every half-hour after that, or if it was actually scheduled for some other time like 9:15. For this feature to be useful at all it would need to have slightly more information about the stop. Basically the volunteers found it hard to trust this information since it wasn’t exact and real time, and so it had little value for them. Overall this feature wasn’t appreciated.

**Feature 3: Bookmark Star**

Task for this feature: "You know you will be at this stop frequently and you want to save it to access it quickly in the future."

This wasn’t an entirely new feature, more of a quality of life improvement and a test of a visual change. Currently there is only an Add to Bookmarks row in the stop detail view, but in the mockups I added a bookmark star, similar to what is currently in the Android app. I figured adding a star in a prominent position could bring attention to the ability to save a stop, and would provide a nice visual for important stops. In addition, one other goal with the bookmark star was to provide an even simpler process for adding a bookmark. Right now the bookmark button takes the user into a separate view where they are prompted to name and group the bookmark, and then pressing ok takes them to the bookmarks screen. But to me this seems like slightly too many steps, and too much of an immediate context switch. So for this mockup I also made it clear that saving a stop was a single tap on the bookmark star. Doing what they want it to, giving them visual feedback, and not taking them away from the stop they are on.

This went over very well. Most of the volunteers saw it right away, immediately recognized what it would do, and found it more intuitive and noticeable than the current row. One volunteer actually hadn’t looked at bookmarks before because he
never paid attention to the rows after the list of arrivals. Although, as far as I could
tell the volunteers hadn’t really used the bookmarks feature heavily, so they didn’t
have an opinion on the difference in workflow for saving the stop. Overall the
feedback was positive enough that (as I will describe later) I am currently working
on adding this enhancement to the app.

**StopInfo**

Tasks:
- “You are traveling at night and want to know if the stop has good lighting. Try
  and find that information.”
- "You arrived at the stop and found out that there is a trashcan and the page
  said there wasn’t, update the stop information accordingly."

At this point StopInfo had been in the app for close to a year, so we decided to go
ahead and get some feedback from users to see how they felt about it. We asked the
volunteers to find the StopInfo view and learn something about the stop from it, as
well as show how they would try and enter new data. These were very simple use
cases for StopInfo, because we wanted to see how the average user might approach
a simple task.

The volunteers were able to find the StopInfo view fairly easily, between the About
this Stop button and the (i) button at the top of the view it was relatively apparent
how to go about finding more information about the stop. But there was also a small
amount of confusion with the info button because it is the same as the info button in
the map popover which leads to the stop page. This wasn’t a serious point of
confusion, but it might be worth considering a different icon for the StopInfo button.
The big issue was that once StopInfo was open the process and the StopInfo view
were at times a bit unclear. First of all, the 'Verify' and 'Needs Verification' phrasing
confused the testers, and they weren’t sure exactly whether they were adding data
or verifying data, and what they should do if what was in there was wrong. There were other issues with some of the terms used, and it sounds like for some people having lighting be a scale from 1 to 5 would be preferred to labels like 'some lighting'.

Overall this view was usable, but it seemed like people would appreciate some clarification and a somewhat improved interface for data view and entry.

**Android**

We didn't do too much for the Android app, but we did show our testers the current development build with some of the changes from the recent Android redesign discussion, asking them questions about information clarity and usability. The current approach being tried by one of the designers is to have a list of all upcoming routes, and to show the departure time for the nearest along with an asterisk to pair the two. Most of the volunteers noticed the asterisk next to the upcoming stop in the list, but they weren't confident that they understood the meaning, and all of them found it to be too subtle. One of the testers also suggested that the Bus icon in the row was unnecessary because there would be context because that stop had been tapped, and that this space might be better used for other things. The bus icon is useful because both busses and trains can leave from the same station, although there may be a better way of handling this.
**Lessons Learned**

Due to the low volunteer turnout I didn’t learn as much as I would have liked about the app. Even still, I gleaned a couple of important insights, and I certainly learned a good deal about the process of running a user study.

First and foremost, the big lesson from that experience would have to be to get more volunteers. I would have liked to have at least five or six random students to interview, rather than a single person from the flyer and multiple grad students likely with more prior knowledge/bias. To accomplish this I should have put out at least another half dozen flyers, gotten them out there ~2 weeks in advance rather than the end of the week before the sessions were to be held, and then added another time slot or two to free up scheduling conflicts with more people. I also should have done slightly more forceful prodding and reminding the day leading up to the scheduled times to prevent people from unexpectedly reneging on their agreement. And finally, if this was a bigger and more mission critical study I would definitely try enticing people with free food or even money to complete an interview, because as it was we were relying completely on people signing up due to curiosity, free time, and a desire to help the app.

One other big lesson I learned during the interviews themselves was how unexpected of actions the volunteers would take. In my mind I had an idea of what seemed like ‘reasonable’ actions to take given the tasks I had put forward for them, and so I prepped my mockups appropriately, skipping certain screens that I felt the user wouldn’t likely end up at. But almost immediately every volunteer would try something that I hadn’t prepared for, either trying to enter a different section, or scrolling around the map when their target location was in front of them already. And what was interesting is that as soon as they did it, although it wasn’t the ‘correct’ action to take, it was understandable why they would try to do what they
did, and it was clear to me that my usability predictions were vastly off mark. I intended to stay as hands off as possible, but due to a lack of clarity and limitations of the paper mockup system I had to help guide the volunteer far more than I would have liked. After the first day I took this knowledge and prepared quite a few more mockups, and if the sessions on the second day had actually happened I suspect that I would have been much better prepared for whatever the volunteers tried.

For the app itself I did learn a couple of lessons. For one thing, until the app has a more complete trip planning feature it is unlikely that people will use or appreciate minor planning features such as the walking distance or the stop schedules that we tested. It is simply much easier at the moment to do all planning in Google Maps and then go into OneBusAway for the real time data immediately before making a trip. This is what I do, and this is what all of our volunteers did, and because of that they had trouble even figuring out where to start with a task that overlapped with the feature set of Google Maps that they were so used to.

But what the volunteers definitely do want is more clarity and simplicity in the app. They liked the bookmark star, and found it to be a more straightforward and immediately clear way to save a stop to bookmarks than the current solution. They also found parts of the StopInfo view to be confusing, and the Android route asterisk to be too unclear. I think our focus, for the iPhone app at least, will be to stick to the core of what people know how to use and try to polish the rough edges that we find. Overall we have a good experience in our app, but certain parts of it are certainly showing their age, and those should be our emphasis

**Conclusion**

The next step for me is to incorporate the bookmark star button into the app. I have a basic implementation complete and up on the project github repo, but there are a few modifications, fixes, and edge cases that need to be taken care of before it will be ready for release. So far a few things have already changed from the mockups.
The primary difference is that we decided to place it in the nav bar, and replace the existing refresh button with a refresh controller on the view itself, allowing for pull to refresh. Once it was moved up there it also made more sense to use the existing green tint color rather than the gold from the mockup. Mockups are a great way to get an idea of the value of a problem, but once the actual construction of the feature begins many initial thoughts and plans go out the window.

Overall this experience has been an enlightening one, and has taught me quite a bit about accessibility, human interface design processes, and the design and development of apps. I have enjoyed working with Prof. Borning and Caitlin over the last few quarters, and I look forward to continuing work on the project in the future.