OneBusAway Usability Analysis

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Mar 12, 2012

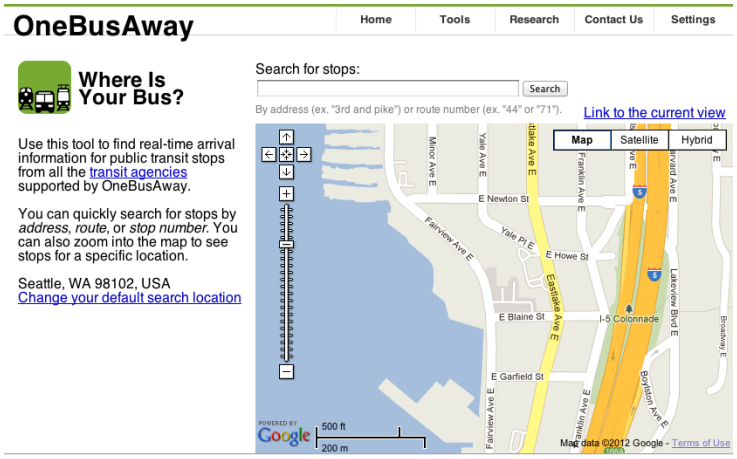
Abstract

OneBusAway (OBA) is a service that provides free real-time arrival information via a website and various mobile applications. Our group designed a study to test the usability of the web interface of OBA. Our assumption was that users of this tool would experience minor difficulty using its basic features, and have great difficulty using the advanced features. Through three pilot sessions of our usability test, we discovered that users in fact had much more difficulty using the basic features of OBA. Using the feedback from our pilot study, and input from our peers, we created a list of suggestions for those wishing to conduct future iterations of a usability test for OneBusAway.

Product Description

OneBusAway is a free service that provides real-time bus arrival information for multiple transit agencies via a number of tools including a web interface, a telephone service, and various mobile applications.

In this usability study, we have chosen to focus on the web interface tool for OneBusAway (seen in Figure 1), because while it is used by over 15,000 people every week, the usability of it has not been studied to the degree that other tools (such as the iPhone and Android applications) have been studied.



Screenshot of the OneBusAway web interface

Audience Description

Our target audience for the OneBusAway web interface consisted of users who satisfied the following criteria:

Criteria	**Reasoning**
No previous experience with the OneBusAway web interface.	Such that we can gain a fresh perspective on a new user's interaction with OneBusAway.
Do not use the OneBusAway service in any form (web, SMS, voice, or mobile application) four or more times a week.	Such that we do not test users who are experts on OneBusAway on other platforms.
Use the Internet for at least five hours a day.	Such that we can focus on users who are comfortable using computers and the Internet, and we can focus on their usage of the web interface, not on their facility with web pages in general.
No academic background in computer science, computer engineering, psychology, or design.	Such that users will focus on the task at hand, and not on the design of the study or the particulars of the website.
Not located outside of King County, WA.	Such that we can work with actual potential customers of OneBusAway.

In practice, it proved difficult to find any users who were completely new users of the OneBusAway web interface. As such, we relaxed criteria one in our usability test, and took this into account in our results.

Participant Profile

	P00 (Pilot)	P01	P02	P03
Gender	Female	Female	Female	Female
Age	Age 21~30	Age 21~30	Age 21~30	Age 21~30
Commute by Bus	+ 4 times/week	+ 4 times/week	+ 4 times/week	1~2 times/week
Transit websites				
- OneBusAway	Daily use (iphone, android,web)	Daily use (iphone)	Daily use (,web)	A few times/week (,web)
- King County	A few times/week	Less often	A few times/week	Less often
- Google	--	Less often	Less often	A few times/week
Mapping websites				
- Google	Daily use	Less often	Once a week	A few times/week
- Bigns	--		Less often	--
- Mapquest	--	Less often	--	--
Internet experience				
- Frequency	Daily	Daily	Daily	Daily
- self-evaluate	Extremely easy	Extremely easy	Very easy	Very easy
Note (bus routes used in tasks design)	65 (a few times/week) 68 (Daily) 72 (a few times/week) 75 (a few times/week) 79 (Less often)	75 (a few times/week)	72 (a few times/week)	65 (Less often) 68 (Less often) 75 (Less often)

Issues

An early cognitive walkthrough of the OneBusAway web interface uncovered many usability concerns. We structured these concerns into four major issues, and designed a usability test to investigate each issue. What follows is a description of each issue, and the related method used to investigate the issue. For complete details on our methods, please refer to the test kit for this usability test.

Issue 1: Frustration for First-Time Users

Through the cognitive walkthrough, we inferred that the web interface would be difficult to use for first-time users because of several factors related to clarity and discoverability. Inadequate and incomplete information often leads the user to wrong results. Many features are buried in menus and settings pages. And finally, when presented with information on OneBusAway, users may not know how to interpret it. For example, it is not explained anywhere in the interface that the flags on bus stops are indicate directionality.

To test first-time usage, we focused on basic tasks related to retrieving real-time arrival information, and having actual first-time users conduct these tasks. We constructed a scenario that involved a goal of going from Point A to Point B, and using OneBusAway to find an appropriate bus stop, choose a bus, and know what time to arrive at the bus stop.

Issue 2: Lack of Step-By-Step Instructions for Real-Time Arrival Information

One significant factor that we found which could demotivate or frustrate users is the lack of a proper sequence of information to lead the users to find real-time bus arrival information. In other words, there is no concept of a “wizard” or set of steps to guide users.

To investigate this issue, we presented the user with a broad scenario of investigating what possible bus routes they could use to get to a specific destination within a specific time frame. This method would allow our participants to construct their own sequence of steps, which we could evaluate for speed, efficiency, and consistency.

Issue 3: Advanced Functions of Interface are Difficult to Find

Although the web interface of OneBusAway has a number of useful advanced features, we were concerned that users would have difficulty finding and using these features. Specifically, we identified the “remind me before my bus arrives” feature and the “save my preferences” feature as useful features that would not be easy to use.

To investigate this issue, we presented the user with broad actions related to these advanced features. Without mentioning the features precisely by name, or confirming their existence, we asked users to set a reminder to head to the bus stop at the right time, or save their favorite bus stops for easy retrieval, while working in a scenario related to real-time arrival information.

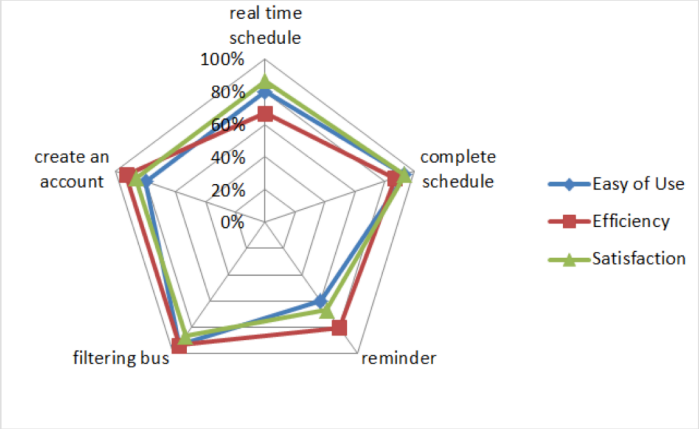
Quantitative Data Analysis

- The following table is the summary of task success rates and time to complete for each participant.

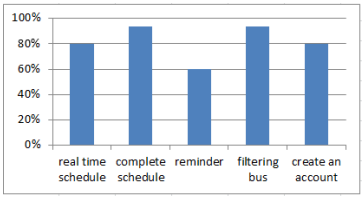
	Ave. Success rates	P01	P02	P03	Average	Standard Deviation
Scenario 1 Finding real-time information	100%	4:14	4:13	1:10	3:12	1:46
Scenario 2a Finding complete time schedule	100%	4:16	2:01	1:42	2:40	1:24
Scenario 2b Set up a 15 minutes reminder	100%	0:45	2:37	1:10	1:31	0:59
Scenario 3a Filtering bus routes	100%	1:16	1:11	1:07	1:11	0:05
Scenario 3b Create an account	100%	0:21	0:56	0:40	0:39	0:24
Total		10:52	10:58	5:49	9:13	5:38
Average per scenario		2:10	2:12	1:10	1:51	0:53

Maximum Minimum

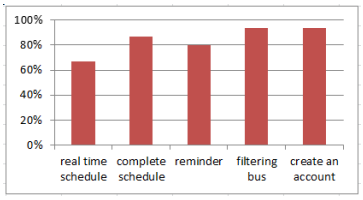
Figure 1 Rating from participants' self-evaluation (average score)



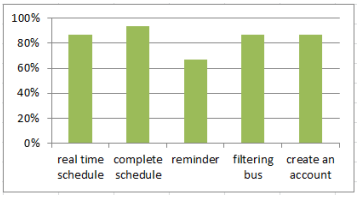
Overall, every participant successfully completed every scenario quicker than our expectations (we set up the maximized-time-to-complete goal for each scenario), but in some tasks, participants had to look over content of pages and look for several different pages in order to find the correct information. For example, in scenario 2b, we asked participants to set up a 15 minute reminder for a time schedule of a particular bus, but almost every participant had to examine every possible link because the design of OneBusAway displayed this function in a very indirect way. For almost all participants, scenario 1 & 2a took the most amount of time to complete. However, scenario 1, "finding the real-time information" is the chief and frequent feature of OneBusAway, took at least 4 steps to get in the real-time schedule page (same as "finding complete time schedule"). Generally speaking, participants were confused when they saw the screen showed an unfamiliar map area with many bus stops. They had to spend a long time to move around every bus stop in order to collect information which could help them to make the decision.



Ease of use



Efficiency



Satisfaction

If we compare the performance data to the self-reported data of our participants, we can see that scenario 3a and 3b are the most efficient tasks to them and these two tasks indeed took less time to complete. Two of the most challenging tasks to users were setting up a reminder and finding real-time arrival information. Furthermore, these tasks also yielded the most negative experience for our participants. (Please see Appendix 1 for more self-report data analysis.)

Findings and Recommendations

Key Findings

The following descriptions summarize our observations and key findings.

- **What worked well**

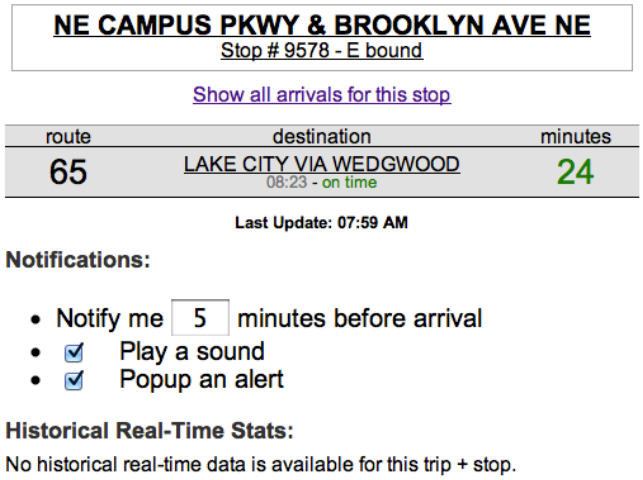
All participants could distinguish between immediate and future arrival information

In one of our usability tasks, the participants were asked to find bus arrival information a few hours from the current time. We found that every participant could comprehend the information given to them and were successful in providing the correct time intervals when they would be taking the buses few hours later as described in the scenario.

All participants were able to find and use the "Set a reminder" feature.

Participants were asked to set reminder for one of the bus arrival information. While they took some time to explore through the links to get to the 'set reminder' page, they were eventually successful in setting the reminder.

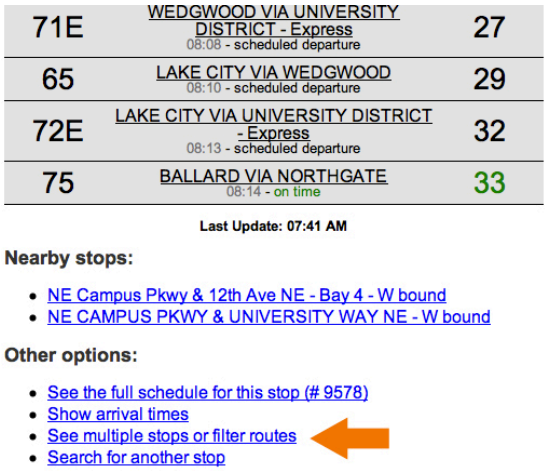
In contrast, we had anticipated that our participants would not be able to find the set reminder information as there was not clear information in the website that once could set reminder for the bus real time information. But all the participants were successful in completing this task.

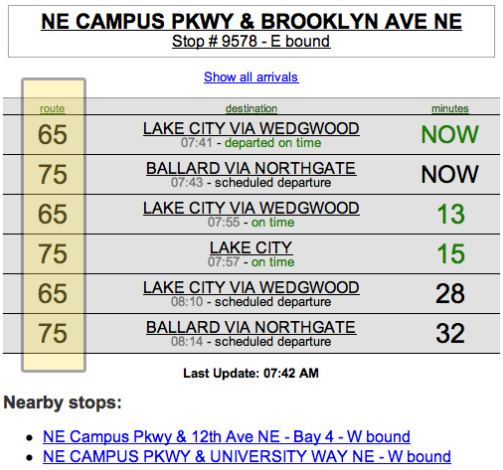


All participants were able to correctly apply bus route filtering.

In the OneBusAway website, bus route filtering is a feature that allows the users to filter out different buses they would not use to commute between places.

The bus route filter is designed to help people who regularly commute between two places and to prevent the hassle involved in re-entering their most-used bus routes for every trip. Users can save the bus routes they would take and remove out the bus information they do need.





In our testing, we thought to devise a task to evaluate our participants if they were able to understand and use this filtering option. We asked participants to imagine a scenario in which they were taking only two buses between specified locations, but the search they conducted would provide them with a great number of different buses unrelated to their route of interest.

All the participants were able to correctly apply the bus route filtering option on the buses we asked them as part of their tasks. We discovered that this was not a difficult task for them to complete, although two of the three participants took some time to arrive at their end goal.

All the participants were able to find the user accounts page

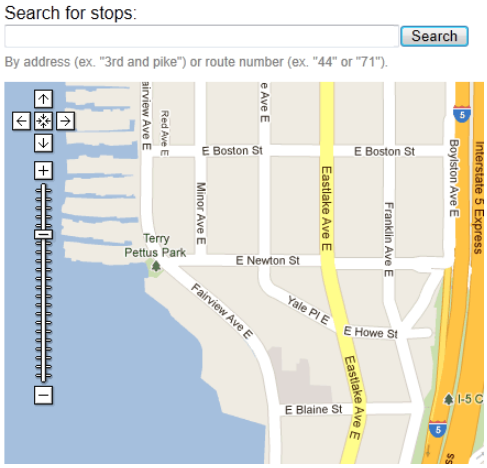
In order to save bus routes preferences for users who commute between two places regularly, the OneBusAway web interface has a feature where users can create their profile and save particular bus stop information. However, we surmised that this feature is not easy to find.

Of the three participants, two went to the Settings link to explore to be able to find some information on how to create user accounts. But one of the three participants looked around the home page to see anything that said to create a new account. She expected that the home page would have something related to creating a user account. But after when this user couldn't find any information from the homepage, they went to the Settings link to look for any information on how to create new user accounts.

What didn't work well

Participants did not find the search field clear

We observed that participants were confused by the limited examples provided below the search box. The search box told users they could search by address or by route number, but when they tried to input a bus stop number, that also worked.

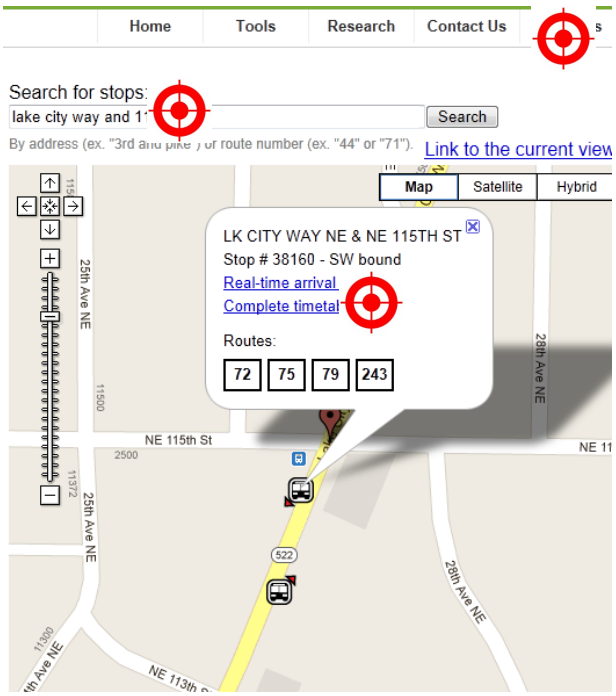


Search box help text only specifies address and route number

Participants often clicked at random around the interface

When we asked users to find the location on the interface to save their preferences, they reported no clear location to find this information. Instead, they clicked "randomly" around the interface until they found what they were looking for.

In addition, because there were no clear instructions, participants often returned to the home screen as a way to get re-oriented, even though it did not help in their workflow.



Participants clicked randomly around the interface.

Participants often got disoriented on map

We noticed that participants were noticeably flustered by the behavior of zooming in OneBusAway. When zooming out to get a larger view of a map area, bus stops would disappear from view, making it difficult to pinpoint an exact bus stop to search on.

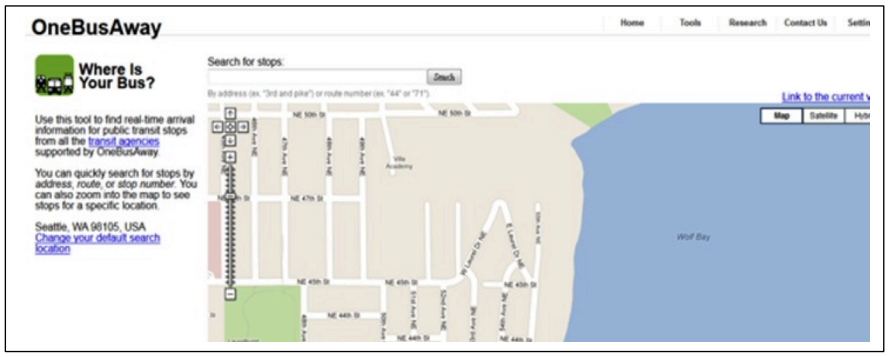
Participants had trouble deciding on a bus stop

As part of scenario one, we gave participants a particular bus number and intersection, and asked them to find a close bus stop that would take them to a particular destination. All participants reported as to what bus stop to pick, because OneBusAway did not make it clear to them what direction the different buses were headed.

General user behavior

All participants inputted a zip code, but it did not simplify their process of finding a bus stop

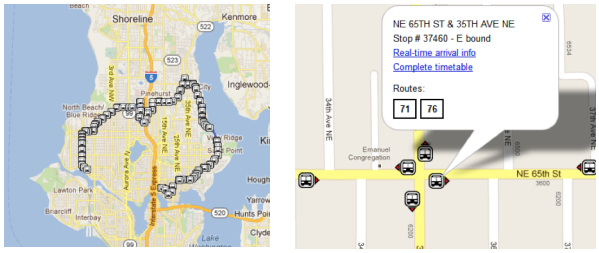
For first-time users of the OneBusAway web interface, a welcome window pops up and invites them to optionally input their ZIP code. The purpose of this design is to assist the system in establishing a default map area. And if users zoom in to at least 200ft, they will see bus stop/stops on the map. In this usability testing, there is no any participant choose to skip this step.



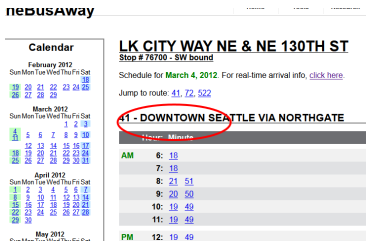
However, when our participants inputted the zip code and saw this screen (As the figure), no one chooses to navigate the map directly. All participants following choose to input the address which we provide to them in order to start their tasks. Based on our observation, even every participants input the "correct" zip code (based on our task design), they didn't gain any advantage. And because the system didn't provide any hint or following suggestion to users, participants usually have to stop and then input the address for search.

In fact, participants will get the same result once they input a complete address. And all our participants rely on search with key words rather than manipulate with map, therefore, the step of "input a zip code" didn't simplify our participants' efforts in following tasks.

Participants relied on text instructions more than visual cues



"complete bus route map mode" and "Bus stops mode"



distention information of a complete time table page

Since the UI of the OneBusAway web tool is very map-oriented-design, we are curious to learn the answer to the following question: "How many users (if any) begin and perform their search by using the map?" And we also design a situation that lead our participant to must interchange their search between two different modes: "complete bus route map mode" and "bus stops mode" (As the figure 3) in order to decide which bus line can take them to the distention.

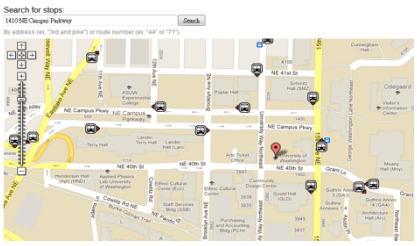
However, although every participant faced the problem to decide which bus line is correct, almost no participant chooses to click the number of bus# purposely, or hold a positive comment when they saw the "bus route map mode". Instead, all our participants rely on text description to confirm their decision. For example, the "distention" information on the real-time or complete time table page (shows as figure 4).

Participants relied on their use of Google maps to inform how they used OneBusAway.

In summary, all our participants' operational chunks1 of a digital map are limited. They manipulate the map only because they have to click "the bus stop symbol" for more information such as bus # and click the link to get in a real-time schedule or complete time table page. Moreover, they rarely zoom in or zoom out the map. Sometime they will try panning2 the map (shift the screen) but give up quickly. Compared to participants' pre-test questionnaire results, we assume that one of possible reasons might relate to their mapping website experience. For example, besides P03, the other two participants report their usage of Google map is "less often" or "once a week".

Furthermore, we observed that P02 usually click one of search results in the left-hand margin of the web page. At the debriefing session, she said that these links are suggests by system based on her search request (keyword). And her prior experience with Google map told her that these links are useful or related to her search goal.

Advanced users were able to use the tool quickly, but had concerns about their personal efficiency



In scenario 1, participants will see this screen after they input the address

We learned (or we can say "confirmed") an insight from this study is people generally use OneBusAway for a specific reason: find the real-time schedule of a specific bus. And they usually know the bus route they want to take (at least, they know the interception of the nearest bus stop), if they don't, they will use the other trip planning tools (e.g. Google transit, or King County website) to assist their search (we learned these information from our participants at their debriefing session).

Therefore, our participants usually struggle with complete their tasks when they been asked to find the time information of an unfamiliar bus route, or they have to find a specific bus stop among many bus stops (shows as figure 5).

On the other hand, participants gain advantage if they familiar with the bus route or the area which shows on the screen. For example, one of our participant (P03) have real experience likes scenario 1 design, therefore, she immediately found the closest and correct bus stop for bus #65 with her existing knowledge. Compared to the other two participants, P01 and P02 have to take a long time to look over every bus stop, and they are very confuse and frustrated because they don't have a guiding picture in their mind. However, although P03 complete this task in very short time period, she told us that the design of OneBusAway web tool is very inefficiency, because it involved too many steps to find the real time information she need.

1 When a user performs a map operation, the operation sequences are detected. Hirose, Hiramoto, & Subiya (2006, 2007) define these operation sequences as "operation chunks".

2 "panning" defined by Hirose, Hiramoto, & Subiya (2006, 2007), it represent that Users interest in the overall map

Changes to the study

We learned many valuable lessons from this study, and attempted to improve the study design after each participant's test. For example, after each test, we modified our scenario script and note taking form in order to make them clearer. Three of the most important changes we would like to adopt in future implementations of the study are as follows.

- **Noting that bus schedules are affected by day and time**

  Maintaining a stable test environment is significant to a usability testing. We conducted a testing section on Feb. 20th, which is a holiday, and this condition somewhat affected our study because the difference of bus schedule between what the Feb. 20th participant saw compared to the other two participants.

- **Making a more clear task description**

  Making your scenario script as clear as possible is important, especially when you request your testers complete tasks based on the information you've provided. In an unnatural setting, participants experience tension easily and can become unusually hasty to finish their assigned tasks. Therefore, they may overlook some information on the script. Based on our experiences, isolating crucial information from the test script and handing it to participants as they need it better calls their attention on it.

- **Accounting for a higher success rate among our convenience sample**

  Steve Krug (2000, 2006) suggests that "the importance of recruiting representative users is overrated". In our study, we could not recruit participants who completely met our criteria because of limitations of time and resource. We suspect that might be because of the plentiful usage of OneBusAway in our personal network, from which we sampled participants. If we are able to recruit participants who are not familiar with OneBusAway, we may acquire a different result by comparing the performance of participants, and gain greater confidence in our findings.

Appendix 1 Post-questionnaire analysis

- The following tables are rating from each participant. (by scenario)

Scenario 1 finding real-time information

	P01	P02	P03	Average	Standard Deviation
Overall I am satisfied with the ease of completing the tasks	100%	40%	100%	80%	35%
Overall I am satisfied with the amount of time it took to complete the tasks	80%	40%	80%	67%	23%
Overall I am satisfied with the support information when completing the tasks	100%	60%	100%	87%	23%
Average	93%	47%	93%	78%	

Scenario 2a finding complete time schedule

	P01	P02	P03	Average	Standard Deviation
Overall I am satisfied with the ease of completing the tasks	100%	80%	100%	93%	12%
Overall I am satisfied with the amount of time it took to complete the tasks	80%	80%	100%	87%	12%
Overall I am satisfied with the support information when completing the tasks	100%	80%	100%	93%	12%
Average	93%	80%	100%	91%	

Scenario 2b set up a 15 minutes reminder

	P01	P02	P03	Average	Standard Deviation
Overall I am satisfied with the ease of completing the tasks	100%	20%	60%	60%	40%
Overall I am satisfied with the amount of time it took to complete the tasks	100%	40%	100%	80%	35%
Overall I am satisfied with the support information when completing the tasks	80%	60%	60%	67%	12%
Average	93%	40%	73%	69%	

Scenario 3a filtering bus routes

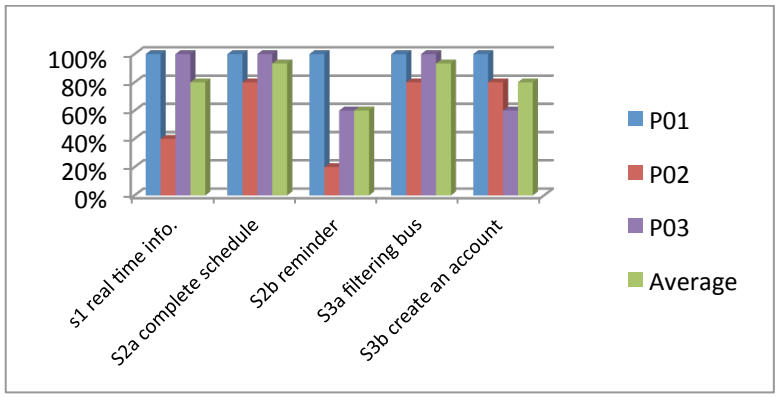
	P01	P02	P03	Average	Standard Deviation
Overall I am satisfied with the ease of completing the tasks	100%	80%	100%	93%	12%
Overall I am satisfied with the amount of time it took to complete the tasks	100%	80%	100%	93%	12%
Overall I am satisfied with the support information when completing the tasks	80%	80%	100%	87%	12%
Average	93%	80%	100%	91%	

Scenario 3b create an account

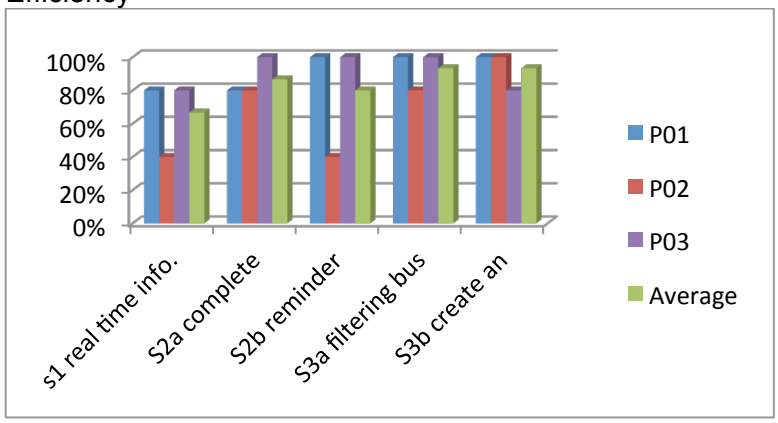
	P01	P02	P03	Average	Standard Deviation
Overall I am satisfied with the ease of completing the tasks	100%	80%	60%	80%	20%
Overall I am satisfied with the amount of time it took to complete the tasks	100%	100%	80%	93%	12%
Overall I am satisfied with the support information when completing the tasks	80%	80%	100%	87%	12%
Average	93%	87%	80%	87%	

- The following figures are rating from each participant. (by assessment dimension)

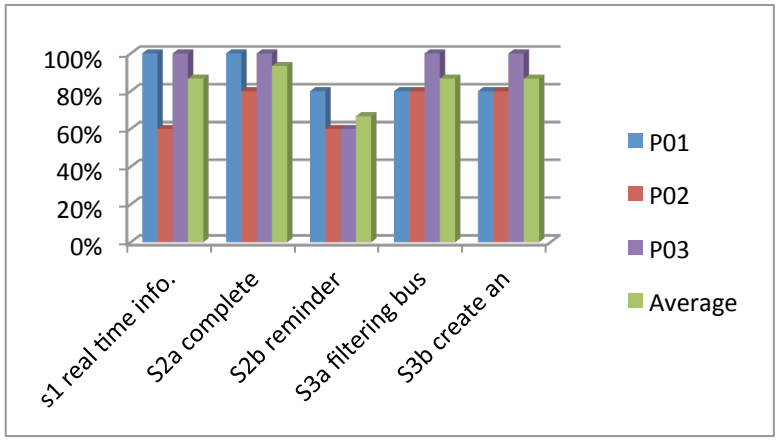
Ease of use



Efficiency



Satisfaction



- Overall user experience of OneBusAway

	P01	P02	P03	Average	Standard Deviation
I think that I would like to use OneBusAway web tool frequently	80%	100%	100%	93%	12%
I found OneBusAway web tool unnecessarily complex	60%	60%	20%	47%	23%
I thought OneBusAway web tool was easy to use	60%	80%	100%	80%	20%
I think I would need the support of a technical person to be able to use OneBusAway web tool	20%	20%	20%	20%	0%
I found the various functions in OneBusAway web tool were well inergrated	80%	40%	100%	73%	31%
I thought OneBusAway web tool was too inconsistent	40%	60%	20%	40%	20%
I would imagine the most people would learn to use OneBusAway web tool very quickly	100%	80%	100%	93%	12%
I found OneBusAway web tool very cumbersome to use	40%	40%	20%	33%	12%
I felt very confident using OneBusAway web tool	60%	80%	100%	80%	20%
I needed to learn a lot of things before I could get going with OneBusAway web tool	60%	20%	20%	33%	23%
Average	60%	58%	60%	59%	

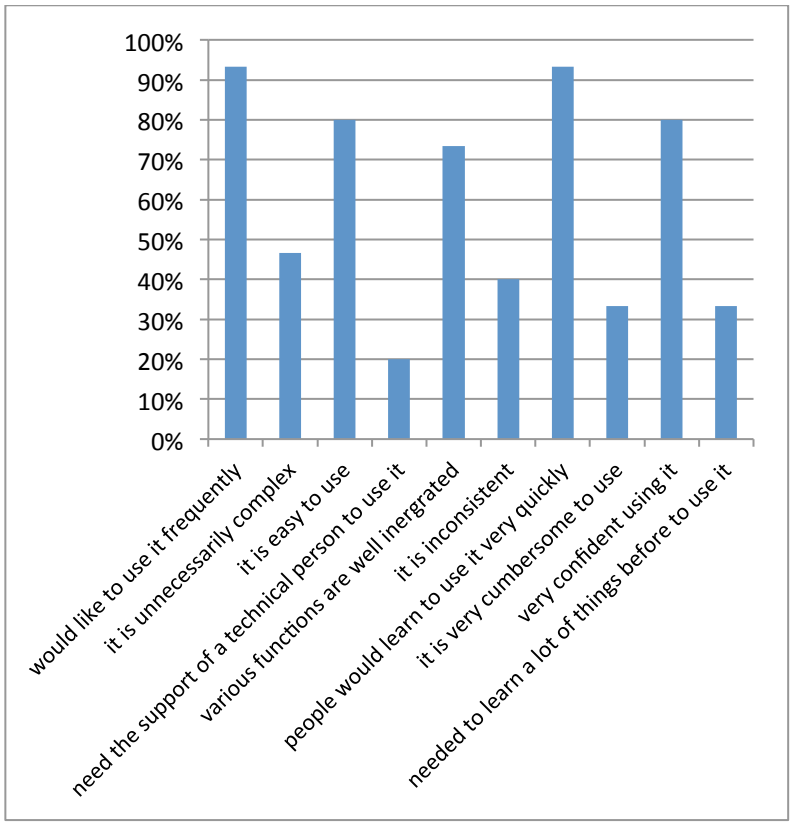


Figure 2 average rate of user experience