University of Washington
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HCDE 313

Field Study Report:

Improving the experience of waiting for the bus on campus

Goals and Context

The goal of the research was to attain a greater understanding of how current students, faculty, and staff at the University of Washington interact with the current system for waiting for the bus, and to answer the question: How can we improve the experience of waiting for the bus on campus for students and faculty at the University of Washington?

Public transportation is the second most popular method of commuting and for 397,000 people in King County, the Metro bus system is a significant part of their daily lives. (Seattle Curbed). With public transportations growth in Seattle, more and more people are joining the ranks of commuters who wait on average 40 minutes a day for the bus (Moovit Insights). Improving the experience at Bus Stops and waiting for the bus could significantly impact thousands of people's lives and hundreds of hours of time. Streamlining the experience would ideally increase numerous people's quality of lives.

The purpose of this Research was to discover the ways commuters at the University currently interact with the Bus system and pinpoint places that could see improvement. The field study attempted to find solutions through answering the following broad, key questions with structured observations:

- How do commuters interact with the varying built environments at stops while waiting for the bus?
- What actions do commuters take as they wait for the bus?
- When do bus schedules meet the time table expectations and how do commuters react to them being late or early?

The questions attempt to address the two most important factors of the waiting experience: How long they have to wait and what they can do while they wait. The final purpose of the research is to develop solutions, recommendations, and results that could potentially be applied to improve hundreds of commuters' experience.

Method

The overall approach was comprised mostly of directly observing two separate bus stops on campus at multiple different times. The first bus stop, which I will henceforth refer to as "Bus Stop 1", was fairly quiet (E Stevens Way NE & Jefferson RD NE). Despite being in the heart of campus/next to the hub, it saw fewer people. Only routes 45, 372, and 67 went through this stop. The second bus stop, which I will refer to as "Bus Stop 2", was much busier (15th Ave NE & NE Campus Pkwy). Routes 20, 43, 44, 48, 49, 70, 167, 271, 372, 542, 556, and 586 run through this stop. The people taking the bus were obviously commuters but most seemed to be around student age. Many of the people observed carried their belongings in a backpack. Bus Stop 2

seemed to have more people who did not appear to be students (older or younger). Perhaps this is due to it being on the very edge of the campus.

In order to not disturb the participants and to make sure my observation was not influencing the field study, I attempted to observe from places far and out of the way from the stops. For Bus Stop 1, I observed from a bench across the street. For Bus Stop 2, I observed from a nearby hill from much further away.

Something I specifically observed, made note of, and photographed was the built environment that is part the bus stops. The built environment is an important part of the bus waiting experience because it is closely related to one of the two previously mentioned factors that dictate the experience: what participants do while they wait. The facilities available at each stop greatly influence the participant's experience.

To address the other important factor – how long they have to wait – I specifically observed and made note of when buses arrived. A large part of waiting for the bus is in the name, *waiting*. Gathering data about how long participants waited and cross referencing the expected times for buses and actual times provided key insight into the waiting experience. Using a digital note-taking application, I timestamped every time someone arrived at the stop and every time a bus arrived at the stop.

The actual recording process involved collecting data into a blank document. I periodically timestamped or during key events in order to have accurate measurements about timing and a timeline. Going into each field study session I paid closer attention to differing areas of focus, including but not limited to: Built Environment, Possessions, Technology, Traffic, and Information. At Bus Stop 1, I carefully observed each individual and for the busier Bus Stop 2 I paid closer attention to group trends rather than individuals. Following the observations, I consolidated the notes and sorted them by categories. I conducted affinity analysis using a diagram in Miro and categorized my notes into trends (Appendix 4). I used these to inform my results below

Results

Through the field studies and analysis focused on the existing facilities at stops, the reality of wait times, and the way participants used the stop, the research has unearthed specific issues with matching the built environment to the volume of traffic, retaining and providing comfort and personal space, and giving informed expectations of waits for users.

Right Place, Right People: Contrasting Capacity of Stops

Through the observations it was discovered that the built environment's capacities did not match the actual volume of people. Between the two stops studied, neither seemed to

have the appropriate level of accommodations for the number of routes and people they serviced.

Bus Stop 1 (Figure 1):

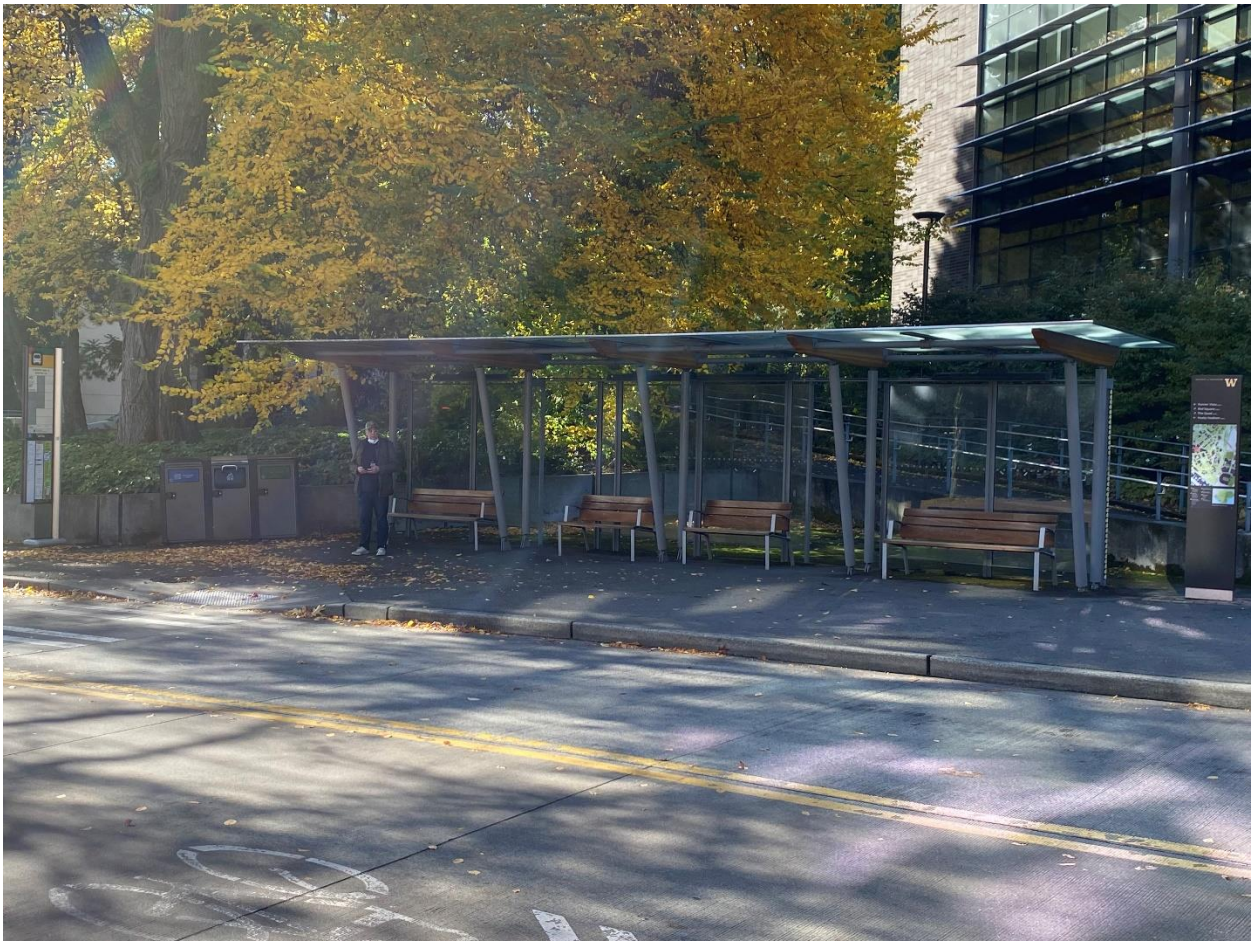

Figure 1 Bus Stop 1

“The built environment includes a large covering that is over 4 benches, two larger and two smaller.”

“6 people are waiting at the bus stop. Two are sitting on benches while the rest stand.”

“Three buses travel to this stop: 67, 45, 372”

At the peak volume seem at Bus Stop 1, there were almost enough benches for everyone. Throughout both observations at Bus Stop 1, all 4 benches were never in use at the same time. There appears to be too many benches and too large a covering for the volume. Bus Stop 1 is located centrally in the campus but only 3 routes run along the stop.

Bus Stop 2 (Figure 2):

Figure 2 Bus Stop 2

“The built environment includes a sign with all of the bus information as well as a single trash can instead of an array. There is a single covering and bench”

“There are almost 20 people at the stop now. Only one is sitting on the sole bench.”

“Routes 20, 43, 44, 48, 49, 70, 167, 271, 372, 542, 556, and 586 run through this stop”

The capacity of Bus Stop 2 appears to be too small compared to the actual number of people. At the peak, the total amount of people could not fit under the single covering if they wanted to. Bus Stop 2 is located on the edge of campus but 12 routes run through the stop.

Take a Seat: Use of Benches

Both Bus Stops include benches as options as places to sit. They varied in length but were wide enough often to seat at least 3 people. Bus Stop 2 was near a concrete railing (See Photo) that people would often sit on as well.

Figure 3 Concrete Railing

Figure 4 Bench at Bus Stop 2

“There are almost 20 people at the stop now. Only one is sitting on the sole bench. There is more room.”

“Person gets off bench to board bus and someone nearby takes their seat”

“Two [Friends] arrive and sit next to each other on the concrete railing”

At Bus Stop 2 despite there being around 20 people, only one person was sitting on the bench that had the capacity to seat more (Figure 4).

Benches are treated by individuals as single seats that are not to be shared. The only time a seat was shared was when two people arriving. As noted by the person taking the spot on the bench after the other left, individuals may have a desire to sit but would rather not share a bench or be that close to their personal space. Based on the findings, the current bench system does not seem to accommodate all the user’s needs or desires to sit.

Waiting, Waiting: Expectations of Arrival

Both Bus Stops included signs that displayed time tables of some of the routes that ran through the stops. Through observation it appears that the actual versus expected times can differ.

Figure 5 Different Angles of Signage

"3:32 PM Bus 67 drives straight past the stop, man makes no motion to move (3:29 expected time)"

"…stands near the curb and checks his phone and looks up the road and around [Wondering where his bus is?]"

"Man in black sweater comes and walks up to the signage indicating the bus routes and time tables. He stands near the sign and uses his phone."

While it might be assumed that some people use technology to find time tables, not all commuters appear to and rely on the physical time tables. These do not always appear to be accurate and have varied times of 5-10 minutes. The timing between each bus being around 15 minutes according to the tables. Based on this it appears that the time-tables that the stops have little effective use. Additionally, a user's route may not even appear on the physical time table.

Recommendations

From the results formulated above, three recommendations to alleviate these issues have been made:

1. Allocate the facilities based on volume and number of buses, not location.

   As seen from the data, both Bus Stop 1 and 2 appeared to almost have opposite facilities to what they should have. Bus Stop 2 was clearly busier and could have benefited from a larger covering, more space, and more places to sit. Bus Stop 1 had far fewer people and the number of benches and large covering were never fully utilized. Build larger facilities for stops that run more routes, this appears to be tied to volume

2. Replace benches with an alternative seating solution such as individual seats, leaning bars, or even longer benches

   Based on the findings, people appear to be apprehensive to sitting next to each other. Creating distinct, demarcated places to sit may permit people to sit without feeling like they are infringing or being infringed upon their space. People also often stand even if there is available seating. Leaning bars give the ability to relax without the commitment of fully sitting down.

3. Create a digital system or screen that displays routes and accurate up to date information about the arrival of buses

   Users who use the physical time tables have likely found that the actual versus expected times of arrival are not congruent. Using a digital system that keeps track of buses could provide accurate up to date information to people at the stop. Create a dynamic display rather than the physical, static time tables. Apps already exist that do this but as evidenced by the use of the time tables in the first place, not everyone has access to those.

Discussion and Reflection

It is important to understand the nature of the bus system and some interesting probability. Firstly, it is difficult to accurately predict when a bus will come for the whole day. Bus routes frequently have dozens of stops and lateness or delays tend to compound. Secondly, commuters will on average experience the average time between buses as the time they wait. This can be explained by something called the inspection paradox. If the average time buses if 15 min you will on average have to wait 15 min for your bus (Ross).

A major limitation of the results is the sample size. Just walking through campus, one can view the varied and numerous designs for stops utilized. With the structures in place being

a large part of the experience, the data and results may be incomplete without doing an observation for more data points. The results are also limited by location. All data was collected on the University of Washington campus meaning it might not be applicable everywhere. Maybe the buses are always on time in Freemont.

Using structured observation enabled an understanding of the finer details that people may not self-report. It was possible to view how people interact with their environment, and while you cannot know their intentions, it's possible to gain an unfiltered lens into how people behave. Isolating changes in either location or time of day of observations permitted the ability to draw powerful comparisons without the possibility of one of those factors confounding the results.

One major setback was incorrectly timestamping my notes for the first two observations. All of the specific times were updated to be the time last edited by *Word*. This meant I did not have access to when buses arrived for the first two points. Going forward I would try to verify the technology I plan to use better beforehand.

It was fun and interesting to see how people do things they might not be conscious of. As a bus commuter myself I realize that I probably do many of the things I observed and would not even think about. It provided very interesting insight into something I interact with daily.

Next Steps

Based on the results and recommendations I want to gain greater insight into the intentions behind actions such as why people do not want to sit next to each other. I also want to learn about the technologies commuters use. I know there are apps that track buses but I could not observe that without violating people's privacy. Most of all with the field study I have the actions but not the reasons and I would like to find out more about that.

Appendix 1: References

Lloyd, Sarah Anne. “Commuting in Seattle: How Many People Bus, Drive, and Bike?” *Curbed Seattle*, 21 Sept. 2017, seattle.curbed.com/2017/9/21/16346824/seattle-commute-data-bus-drive.

“Public Transit Facts & Statistics for Seattle - Tacoma, WA.” *Moovit Public Transit Index*, 2021, moovitapp.com/insights/en/Moovit_Insights_Public_Transit_Index_United_States_Seattle_Tacoma_Bellevue_WA-522.

Ross, Sheldon M. “THE INSPECTION PARADOX.” *Department of Industrial Engineering and Operations Research*. University of California, 2003, http://ben-israel.rutgers.edu/711/Ross-Inspection.pdf

Appendix 2: Planning Materials

Research Questions:

a. How long do most people seem to wait for the bus?
b. In what ways do people's behavior change the longer they wait for the bus?
c. Where do people wait at the stop (On benches, standing, wandering)?
d. What facilities already exist at bus stops?
e. What technologies or applications are people using while waiting for the bus?
f. When the bus is late, how do people tend to react?
g. Who are the demographics or occupations who seem to be using the bus?
h. Does the average rider tend to be solo, paired, or in a group?
i. Why do some stops have much more facilities than others?

Areas of Focus:

Family & Kids	- Do people riding the bus tend to have children with them?
Built Environment	- What structures exist at different bus stops to facilitate waiting? - Does every stop have similar structures or benches?
Possessions	- Do people waiting for the bus tend to have a lot of possessions (ex. Backpack, purse, headphones)? - What do people do with their personal possessions while waiting for the bus?
Media Consumption	- How often do people use their phones while waiting for the bus? - Do people actively look at the screen or listen to music or call someone?
Tools and Technology	- What apps do people use to judge when the next bus is coming? - How frequently do people use or check these if at all?
Demographics	- What age groups seem most prevalent in waiting for the bus? - Do people arrive at stops with groups of people or do they tend to wait alone or with others?

Traffic	- How do people react to delayed buses or having to wait a very long time? - Do people take routes that mean they have to walk more but wait less time at the stop? - Do people sit on benches as first priority or prefer to stand if it is busy?
Information & Communication	- What existing facilities at stops are there to help users know when the next bus is coming?

Planning mostly involved deciding on a few areas of focus to aim to try to answer questions for. I also would decide before hand whether I wanted to try examine people more closely individually or the group dynamics more.

Appendix 3: Collected Photos

Figure 6 Different Benches at Bus Stop 1

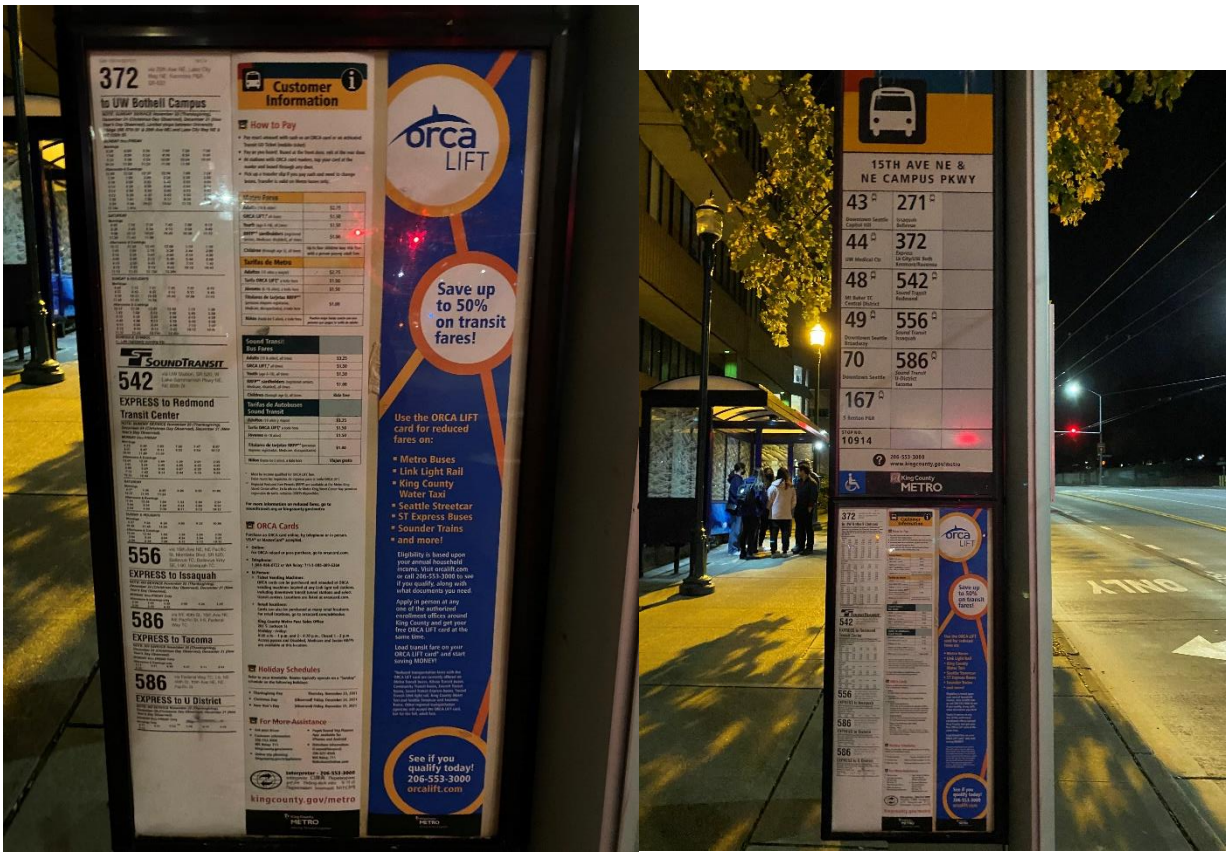

Figure 7 Assorted Signage at Bus Stop 2

Appendix 4: Affinity Diagram

Appendix 5: Field Notes

Observation 1:
E Stevens Way NE & Jefferson RD NE
Thurs 12:36 PM Commence:

- Bus 67 arrived at 12:36
- The built environment includes a large covering that is over 4 benches, two larger and two smaller. There is a sign that includes all of the bus routes and the supposed times. Three buses travel to this stop: 67, 45, 372
- There is an array of bins nearby and a map of the campus. In front of the bus stop is a cross walk. 12:38:50 PM
- Woman in black coat arrived at stop. She threw something away and then she stood in front of bench. There are already three people there. One other standing in front of bench, other two sitting.
- Bus 45 arrived. All people waiting at the stop boarded. The stop is now empty.
- One more person arrived and is standing in front of bench. Using her phone with headphones on. She sat down and is using her phone. She is still wearing her bag
- Woman in purple coat walks up to stop and pulls out her phone She has a single blue backpack which she takes off and sits on the bench. She gets out her laptop and begins using it.
- Man in white sweater arrives at stop and sits at one of the smaller benches. He takes his bag halfway off and gets out his phone, and pulls headphones and water bottle out of bag
- Man in red hoodie arrives and stands waiting where the door of the bus usually is. He has headphones on and is checking his phone. He is standing wide and is carrying a backpack
- Bus 67 arrived at and pulls up to the stop. Its door ends up being in front of where most people are sitting. Everyone at the stop stands and boards. The stop is now completely empty.
- Further observations about the built environment. This stop is directly positioned outside of the hub. There is a staircase directly leading into it.
- Woman in puffer arrives at stop and stands far from benches and closer to the curb. She has no backpack but is holding purse under arm and is on the phone with someone. Later she paced back along the stop to the far end. Continues using her phone
- Bus 372 arrived. 4 people disembarked. No one boarded
- Man in khakis arrives and gets out headphones. Pulls some stuff out from his bag then sits on the bench to the far left. Using his cellphone
- The service of the internet at the bus stop is two bars

- Woman in puffer gets into car that pulls up at stop
- Boy in purple sweater and separate black hoodie girl arrive at stop at the same time. Purple hoodie sits on the second bench from left. The girl in the black hoodie stands in between two benches. They are all using their phone. Purple hoodie stands sand leaves bus stop entering the hub
- Khakis stands and black hoodie shuffle towards front
- Bus 45 arrives and both boards.
- Man arrives and sits on far-right bench with food in a box [from the hub]. He gets out his phone and takes off his bag and eats while sitting.
- Tall guy in blue raincoat walks up and recycles something then leaves
- Girl in green jacket arrives and stands between the far most left benches.
- She has a backpack and a single handheld bag. She has earbuds in and is looking towards where the bus would come from. She takes a seat on the bench second from the left
- Bus 67 arrives. The girl boards
- Girl in pink puffer arrives and stands looking at phone. She has a backpack and lunchbox
- Boy in black anorak looks at signage relating to the bus schedule. He looks around a bit and continues looking
- Man in black sweater comes from and sits on bench second from left. He gets out his phone. He stops looking at his phone and bounces his leg. He takes off his bag and retrieves his headphones
- Boy in black anorak stands next to the sign and uses his phone
- Food guy finishes eating and stands up. He puts on his bag and throws away his stuff at the bins. He puts his mask back on. He leaves the bus stop and crosses.
- All three waiting are using their phones
- Bus 372 arrived
- Everyone except girl in pink puffer boards

Observation 2:
15th Ave NE & NE Campus Pkwy
Fri 3:32 PM Commence:

- 3 people at stop. Grey hoodie on chair
- Bus 44 arrived
- 3 people at stop. Grey hoodie sits on a bench. Lady in coat leans up against wall of covering. Two men sit next to each other on the concrete railing nearby
- Bus 48 arrives and 3 people board
- Lady leaning and one man on concrete railing stay

- Several other people stand near the sign. One is reading a book and another is leaning up against a concrete wall
- Man in red jacket arrives and stands against a post
- Two [Friends] arrive and sit next to each other on the concrete railing. One uses his phone while the other looks around. He looks up from phone and they something to each other
- Bus 20 arrives
- Several more people arrive. There are now 13 people standing at the stop. 6 Stand around the sign where the bus stops. Many are congregated around the covering.
- Bus 70 arrives and stops next to the large group of people. Many people stand and queue to board the bus
- One particular person stands and checks his phone then looks up the road and looks around. [Using a bus tracking app and looking to see when his bus will arrive?]
- There are much more people at the stop now. A majority are standing
- Despite there being a bench only one person is sitting on it.
- Bus 372 stops at a light and several people at the stop stand and move to the front of the stop I preparation for its arrival
- Arrives at the stop and ~10 people board the bus
- The amount of people standing at the stop impedes the flow of pedestrian traffic. A [couple] walks through the group having to weave and several people waiting have to step aside.
- People are now standing all the way along the side walk. Some people are mostly on their phone looking down.
- Lady in blue jacket waits near the curb and [eagerly] looks up the road [for her bus]. She has been on the phone for ~5 minutes
- The bus stop now has 13 people waiting for the stop.
- Most people at the stop are wearing backpacks or carrying a handheld bag. All of them are wearing them and have not set them down on the ground.
- The weather is currently overcast
- Bus 70 arrives
- There is one covering that has a single bench. There is a sign with all the bus information as well as a single trash can. There are two street lights above the stop.
- Bus 49 arrives

Observation 3:

E Stevens Way NE & Jefferson RD NE

Wed 3:13 PM Commence:

- 6 people at the bus stop. Two are sitting on benches while the rest stand. One stands next to the curb looking uphill to see if the bus is coming.
- 3:16 PM BUS 45 arrives and clears out the bus stop.
- Almost no one waiting for the stop converses or interacts
- 12:27:42 PM3:18 PM Man in puffer arrives at stop and stands near the curb
- 3:21 PM Bus 67 arrives and picks up sole person
- 3:24 PM Bus 45 arrives and no one is at the stop
- Man arrives in green coat and stands near sign looking up the road
- Continues standing and waiting
- 3:32 PM Bus 67 drives straight past the stop, man makes no motion to move
- Man walks over nearer to a bench. He is still holding a backpack and a handheld bag
- Woman walks out of hub and comes up and sits on bench second from the left
- 3:39 PM Bus 45 arrives and both people at the stop board
- Bus stop is completely empty
- Man in black trench coat walks up and takes a look at the sign with the tables
- Girl in ski jacket walks up and stands next to sign as well
- Single girl in green walks up and stands next to bench.
- Pair arrives together
- 3:46 PM Bus 67 arrives and clears out the bus stop

University of Washington
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November 2021
HCDE 313

Interview Topline Report:

Improving the experience of waiting for the bus on campus

Goals and Context

The purpose of the interview portion of the research is to gain specific qualitative insight into the reasoning, intentions, and thoughts behind the behaviors observed during the previously conducted field study. The interviews in this study will build off of the field observations and fill the holes that were left unanswered.

There were three one-on-one interviews conducted, each one interviewing a different student at the University of Washington. They all were students living off campus and regularly used the bus system to commute to and from campus, their daily usage of the system provided valuable data. Participants were selected after preliminary questioning about the frequency they used the bus system, participants with little experience using the bus were excluded. Interviews were done in a variety of locations on campus such as the Husky Union Building or the Center Table dining hall. The locations and times permitted a quiet environment that was still public and comfortable for participants.

The interviews were intended to answer several key high-level questions. The first is how technology use impacts the experience of waiting for the bus. During the field study, many students were observed using their phones or laptops while waiting. There are also several apps used for tracking buses such as Google Maps, OneBusAway, and Transit App. Another question to answer was to figure out what participants feel while waiting for the bus. This was a key hole in the field study research.

A large limitation of the study is the small sample size. Three students are hardly emblematic of the whole body of students who use the public transportation systems. Another limitation is that the participants selected ended up being fairly similar in the distance they lived from campus. Longer or more complex commutes were not accounted for. A strength is that the interview data is building off the previously reviewed field study. Data from the interview seems to corroborate the previously gathered evidence.

Results and Recommendations

From thematic analysis of the three interviews, three results and recommendations have been obtained:

Displays with Relevant Bus information

Result:

From the field studies it was apparent that people infrequently used the available signage such as route maps and time tables. After further being explored in the interview, it was revealed that participants infrequently used the signs because they were not always

accurate or were difficult to parse. As an alternative, participants in the interview seemed to mostly use third-party apps as their primary method of obtaining updated and relevant information about the routing of their bus. These included Google Maps, OneBusAway, and the Transit App. Making individuals rely on their own personal devices to track the buses is poor design. As evidenced by the presence of physical, static time tables in the first place, not everyone has access to these third-party applications all of the time or even at all. Participant 2 mentioned that, “Well, a couple times my phone was dead. And, I didn't have any charger. So, I just had to go anyway to the bus stop. Without knowing how far away the bus is.” The current signage and information provided by the actual bus stop itself is inadequate.

Recommendation:

The recommendation to solve the problem of inadequate and dated primary information is to create digital and dynamic displays at more bus stops. As seen in Figure 1, a display like this would provide commuters with up-to-date information about bus routes and their expected arrival.

Figure 1 Example of Bus Stop Display System

This would ensure that if their personal technology was not working or available for whatever reason they could use technology provided by the bus stop. When asked if the participants themselves could think of any improvements, 2 out of 3 suggested directly adding a system like this:

“I think also like I noticed one stop had some type of display telling you like when buses might arrive. I think that's actually pretty handy. Because it prevents you from like, you don't have to look at your phone for that information anymore” (Participant 1)

“I think the displays that show when the bus is coming would be a good improvement” (Participant 2)

Improving Protection from the Elements

Result:

Due to the limitations of the previous field study observation, there was a lack of data in regards to inclement or poor weather such as rain, cold, or snow. This became a key point to look into during the interviews. It was uncovered that there are times where the built environment proves inadequate, especially during poor weather. Throughout the interviews, it was revealed that participants often attempted to utilize the built environment for shelter, such as a covering, during poor weather.

"I usually stand by the side that like says the bus numbers. Unless it is raining and then I stand under the cover" (Participant 2)

"Most of the time outside of [the covering] unless it's raining and I try to get into it" (Participant 3)

However, according to participants at times the covering can fail to meet capacity or serve its intended purpose. When it rains, almost all of the people at the stop seem to move under the covering. Participant 3 mentioned that "it was raining pretty hard. So, most of the people were trying to get like under the shelter." Putting all the people waiting under the cover can make it crowded,

"I think when the bus stop is crowded, there might not always be enough cover especially when stuff like rain or wind is coming from like from the side." (Participant 1)

And occasionally it seems that the coverings are not in proper condition,

"Well, the [covering] near my house has a broken glass pane on it" (Participant 2)

Recommendation:

Despite being a pervasive issue, it poses to be a difficult one to solve without expending significant resources. The first step to the recommendation would be to redistribute the resources allocated to a given stop based upon popularity and capacity. This was a finding that was uncovered during the field study report but would be a valuable part of the solution here. Participants complained of crowding so making large shelters for stops that run more capacity would be a significant improvement.

The next step would be altering the design of the current shelters to be more protective of the elements and the weather experienced in the Seattle area. A participant mentioned that rain and wind tend to just come under the shelter anyways from the side. A number of bus stop shelters feature little side protection, looking like Figure 2.

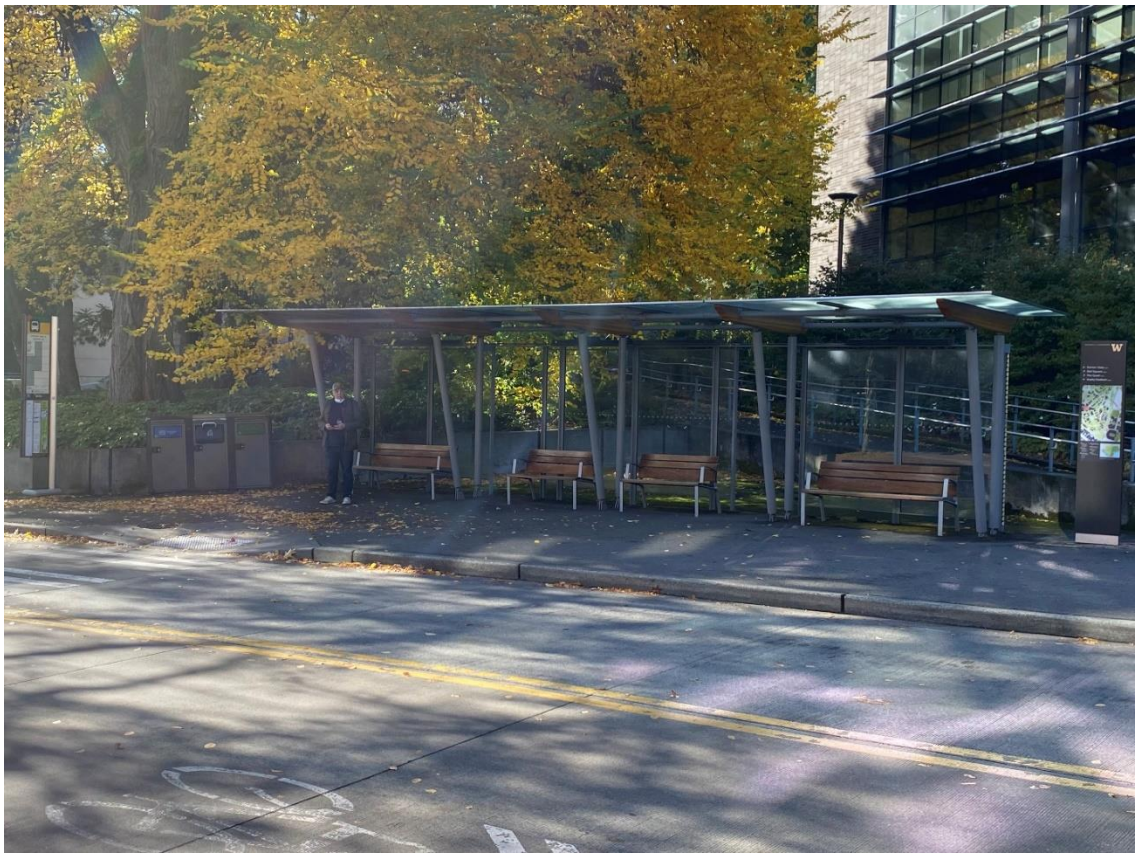


Figure 2 Bus Stop: No frontal or side protection from the elements

I would recommend creating shelters that have side, back, and partial frontal covering so as to better protect commuters from the elements.

Providing and Posting Official Information

Result:

Participants often had a difficult time adjusting to route changes. For two separate participants they found out about the route change after they had been waiting in the wrong place for a bit:

"I was waiting for the bus on time and it just did not come but I think it's because the routes changed" (Participant 2)

Participants exclusively used third-party apps such as Google Maps, OneBusAway, or the Transit app. It appears that finding relevant information was difficult preemptively.

Recommendation:

The recommendation is for King County to develop an official public transportation app that manages all of the information about the modes of transport in one place. Users should

have the ability to select the routes they ride regularly and receive notifications about route changes before they happen and be able to quickly see bookmarked routes. This would make the apparent barrier of communication less obfuscated.

Prioritization

The recommendations should be prioritized in the order mentioned above:

1. Displays with Relevant Bus information
2. Improving Protection from the Elements
3. Providing and Posting Official Information

The most pertinent recommendation is creating these displays. Bus stop information and signage is very limited and updating this system to be more modern should be a top priority. The next priority should be improving the protection because while the current coverings could be improved it appears that they are adequate enough based on the participants reactions. The last recommendation would simply streamline the waiting experience and allow commuters to get the information they need, be it route information, changes, or time schedules in a single more accessible place.

Next Steps

Based on this data, the next steps would be to uncover more about the current satisfaction and pain points commuters currently experience. A survey could reveal more information about what issues commuters find most unsatisfactory. It would be a great way to find an accurate representation of commuter statistics, such as how long or far they have to commute. The biggest missing piece in the data garnered from both the field study and these interviews, is a set of quantitative data.

Reflection

In my next study I would like to interview students from a more varied background and geographic location. I feel that the data lacks information on students taking longer commutes, so the recommendations are not necessarily tailored to them. Going forward, I would also try to work with the audio a bit better to see if I could get a more accurate computerized transcription so it would be less work later on. I feel more experienced interviewing but even just reading the interviews over again has prompted me to consider more follow-up questions I wished I would have asked about.

Appendix 1: References

Lloyd, Sarah Anne. “Commuting in Seattle: How Many People Bus, Drive, and Bike?” *Curbed Seattle*, 21 Sept. 2017, seattle.curbed.com/2017/9/21/16346824/seattle-commute-data-bus-drive.

Appendix 2: Questions and Protocol

1. Are you comfortable providing some basic information about yourself and how you commute?
    a. How long have you been a student here at the University of Washington?
    b. About how far would you estimate you live from campus?

    This question simply attempts to provide more context as to the way the participant engages with public transportation at the University. It tells us where participants are coming from and how far.

2. What is your primary method of transportation when it comes to commuting from where you live to campus and vice versa?
    a. How many times a day do you tend to ride the bus?
    b. Do you use the bus to travel *within* campus?
    c. Given the option, would you rather walk more in order to get somewhere earlier, or wait longer for a bus in order to walk less?

    This question will provide insight into what role public transportation plays in the participants daily life. It will tell us, as well, what situations prompt the participant to use the bus system.

3. Prior or during waiting for the bus, do you use any sort of technology to find when the bus will arrive?
    a. For instance, Google Maps, One Bus Away, or Metro's official time tables?
    b. Do you feel that these applications are accurate?
    c. What else do you use your phone for while waiting?

    This question will tell us about how the participants use technology in relation to waiting for the bus. We will find out if the current technology is satisfactory to participants.

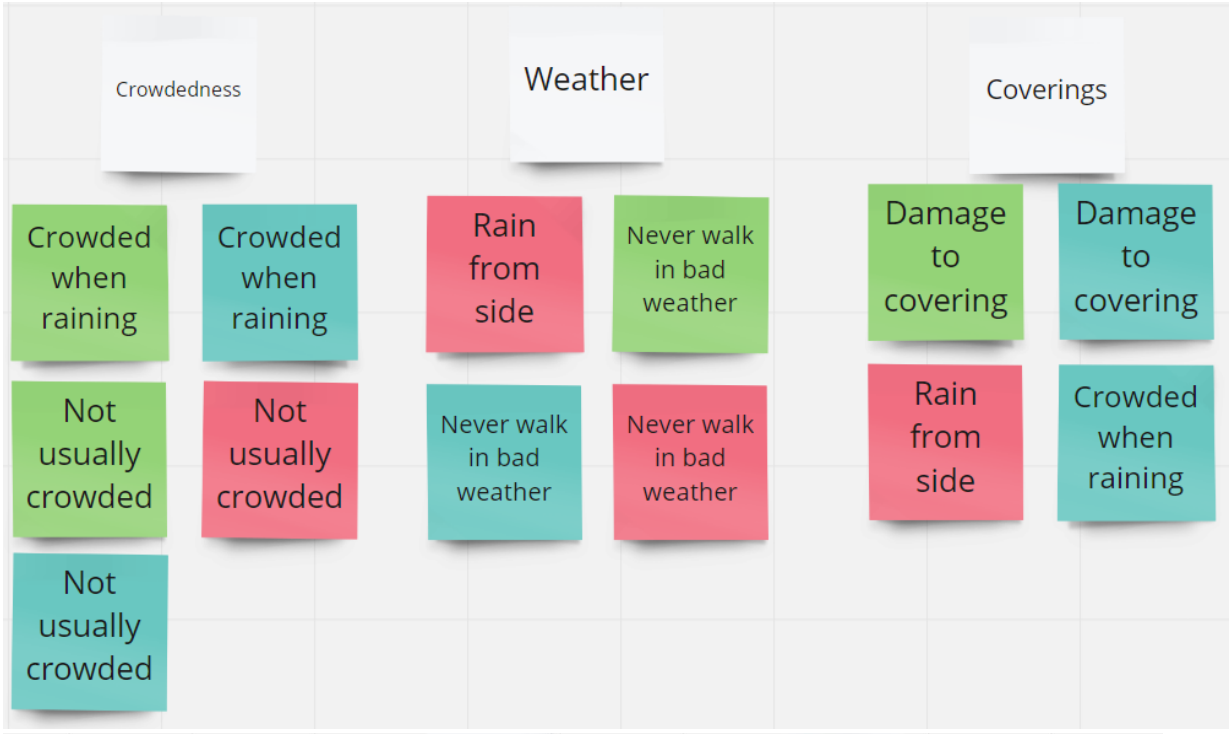
4. Could you tell me about what the last experience you had waiting for the bus was like?
    a. Would you describe this experience as typical?
    b. Did you sit at all or stand? Do you usually sit or stand?
    c. How long did you have to wait for the bus?
    d. How would you say you felt while waiting for the bus?

    This question will provide specific data about what the typical bus waiting experience for the participant may be like. It will also go further into how they engage with built environment and reveal their perceived wait times.

5. Aside from your most recent experience, are there any other experiences in the past waiting for the bus that stick out to you?
    a. What was the weather like?
    b. How many people were at the bus stop?
    c. How did you feel during this experience?
    d. Before ending the interview, are there any changes or suggestions you may already have in mind for improving the experience? It is ok to say no.

    The final question attempts to look into irregular experiences and understand what the participant felt or complained about. It opens the participant to discussing any sort of notable experiences that might not be happening all of the time but nonetheless affect the entire experience as a whole.

Appendix 3: Thematic Analysis




Displays
Route Changes
Bench Usage
Desire for display
Desire for display
Used other app
Very infrequently
Never sits
Just walked
Never sits
Application Usage (Timing)
Application Usage (Routing)
Walk vs Bus
Seldom checks timing of the bus and usually just goes to stop
Always checks the apps before going. Plans it out
Goes and then checks upon arriving at stop out of curiosity
Uses google maps to route somewhere new
Uses google maps to route somewhere new
Doesn't take bus somewhere new
Walks more than bus
Bus more than walks
Always buses
Inadequate Coverings
Publication of Information
Lack of up to date timing
Crowdedness
Weather
Application Usage (Timing)
Route Changes
Application Usage (Timing)
Displays
Coverings
Walk vs Bus
Application Usage (Routing)
Signage