OnTime

Don’t Be Late, Be OnTime!

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Executive Summary

Problem

The biggest problem we found for CMU graduate students is that people's timeliness to class is greatly affected by their awareness of time and choice of transportation. Students living off campus, especially the ones who have morning classes, tend to run late because of the lack of information about transportation options they have, as well as poor planning around the available methods. Moreover, the time it takes users to get to campus is unpredictable and can vary greatly based on factors such as weather, traffic, and ridership.

Methods

In order to investigate the current state of campus transportation and proposed solutions, we employed a variety of research methods. This included conducting contextual inquiries, text-based diary studies, think-alouds, speed dating, desirability testing, and 5-second tests.

Evidence

From the various generative & evaluative research methods that we conducted, we found that existing solutions of lyft and Transit do not allow for planning ahead of time and are not optimized for daily commute. We also found that users tend to have high stress levels when they are faced with high-cost transportation methods as well as unreliable transportation information.

Insights

Some of our key insights are regarding time, cost, and reliability. As for time, students often had difficulty planning out their commutes in advance. For cost, students expressed that affordability of transportation methods is important. For reliability, students want reliable transportation and accurate tracking information.

Solution

We solved this problem through OnTime, an app which will recommend users an optimal transportation method. Our solution includes 2 steps. First, in our customization step, users can import their academic schedule, input their morning routine times, and choose their preferred methods of transportation. Then, after calculating these personalized data, OnTime can deliver users the optimal transportation recommendation every morning. This fulfills our user's desire to access the information about reliable, efficient, and safe transportation in the shortest amount of time possible.

Problem

Previous to identifying the specific problem of lateness to morning classes, we performed numerous research methods on the student population, and the transportation methods that they had available to them.

In our background research that we did previous to working in our group, we were exposed to ridership data from an application called "Ride Systems," which is used for tracking CMU shuttles. From looking at this data, there was a section of when the app is most frequently used. We found that the highest density of users occurs on weekdays, from the hours of 8 to 11 AM. While there is a high density of users later in the day, the times are not consistent for each weekday (for example, on Monday it was 6 - 9 PM, while on Tuesdays it was 5 - 10 PM. Basically, the fact that there was a high density of users bounded by the hours of 8 and 11 AM every weekday morning piqued our interest, in that most students were commuting at that time. Obviously, shuttles were being used frequently in the mornings, and we wanted to know why and how they were being used.

In doing our first in-group contextual inquiries, we interviewed students using the shuttle and students who used the shuttle occasionally. We followed them to their destinations (whether it was morning or night), and asked questions specifically about their experience using the shuttle as well as other transportation experiences. One of the people we interviewed, who walked to class, described the feeling she has when going to school in the morning as the following: "The one emotion I constantly feel when getting to school in the morning is stressed, and tired, because I am usually late to class on top of having to turn in assignments and prepare for exams." This user was also constantly checking her phone during the interview to see if there was a bus coming, which added time to our commute, increasing her problem of being late. In addition to these findings, two other problems that most if not all of our users complained about was the unpredictability (time-wise) of the transportation method they had chosen (either CMU Shuttle or PAT Bus) and the lack of information they had surrounding the different transportation options they had. Additionally, a few of our contextual inquiries commented on the weather, and how it affected which transportation option they decided on that day.

Other than background research and preliminary contextual inquiries, we also performed a think-aloud protocol on the transportation application Tiramisu. In our script, we allowed users to use any application they wanted to if they got stuck on a task. In one task, we asked users to plan ahead to arrive somewhere later in the afternoon using Tiramisu. We saw users always struggle to complete this task, which signified that students either were not familiar with the task of planning ahead commute times, or that the Tiramisu app did not support planning ahead, or maybe some combination of both. We were interested in this particular subject because planning ahead in terms of transportation can help you to get to where you are going on time. So, in our further studies, we focused on the task of planning ahead, and how users think of planning ahead.

Methods

Overall Process/Timeline

In terms of an overall arc of research, we started with more generative research methods and moved into evaluative methods as our design artifact came closer to fruition. To start, we used a contextual inquiry and a text-based diary study in order to 1) understand a lot of what is going on in a user's head when performing the act of commuting and being late and 2) getting to know what problems users are faced with when commuting when late. After this grounding of knowledge, we moved on to a think-aloud to watch users accomplish tasks given existing solutions of transit, and see the current gaps of where users are un-aided in their commute. We then moved on to generating some sort of solution through speed dating with storyboards, which helped us narrow in to a solution. After this, we used a desirability study, a five-second test, and a final think-aloud protocol to iterate over our solution.

Contextual Inquiry

When

10/29/18, 10/30/18 @ 9:00 AM and 6:00 PM respectively

Where

One was going to class in the morning via the PAT bus, the other was going home via their bike. The experimenters followed the participants on their commute, and engaged in an interview in this setting.

How

We walked with users during their commute to and from campus and asked them questions about the decisions that they made on that day and how they typically make decisions about their commute.

Who

2 graduate students, one in Computational Biology and the other in ECE

Justification

We wanted to perform this method in order to get a grounding in our problem base: we didn't really know what users wanted when they were late, or what mindset users were in when they were late. We weren't sure of what tools existed that they use to help them in their endeavors. We thought this method would be best in exploring the problem area, which we didn't know a lot about.

Questions we wanted to answer

- Identify what factors users care about most when running late
- Understand users mindsets when running late(general behaviors)
- Find what tools users gravitate towards when rushed
- Identify user's current solutions to delays & unexpectedness while late
- Understand how weather affects a users decision in transportation type

Text-based Diary Study

When

10/27/18-10/29/18

Where

During/after commutes to and from campus

How

We had a general list of questions that we planned to ask users in the morning and afternoon, corresponding to the user's schedule of when they commute to and from school. We tried to ask questions about their commutes after they had commuted, then we also asked follow up questions about their entire day in the evening. We asked users to rate their commute on a scale from 1 to 7, 7 being the most positive, in order to get a quantitative understanding of how users' stress levels vary throughout the day.

Who

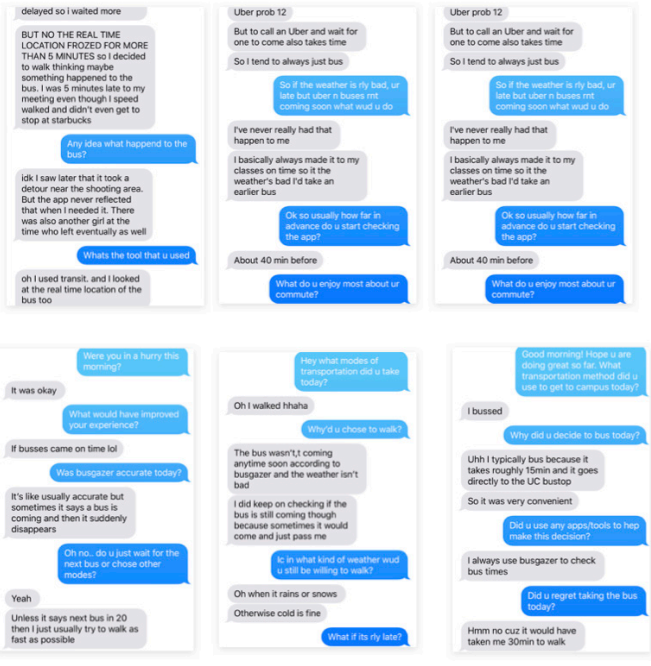
3 CMU students who live off campus

Justification

In order to gain a better understanding of users' stress levels during their commutes to and from campus within a tight timeframe, we decided to conduct a text message-based diary study. We messaged users three times per day asking them about their commute to and from campus, as well as a couple questions regarding their experiences about the entire day.

Questions we wanted to answer

- What factors do users care most about when running late?
- What tools do users gravitate toward when in a rush?
- What factors into the decisions people make when in a hurry?
- What are users' overall emotions during the process of commuting?



Think-Aloud Protocol 1

When

11/2/18, 11/4/18

Where

CMU Campus

How

We had users download the Lyft and Transit apps and had them complete five tasks. We also created an environment/situation where the user felt stressed and pressured under a time crunch by saying things like "hurry! You don't want to be late!" as well as prompting the task by telling them that they do not have sufficient time to complete the task.

Who

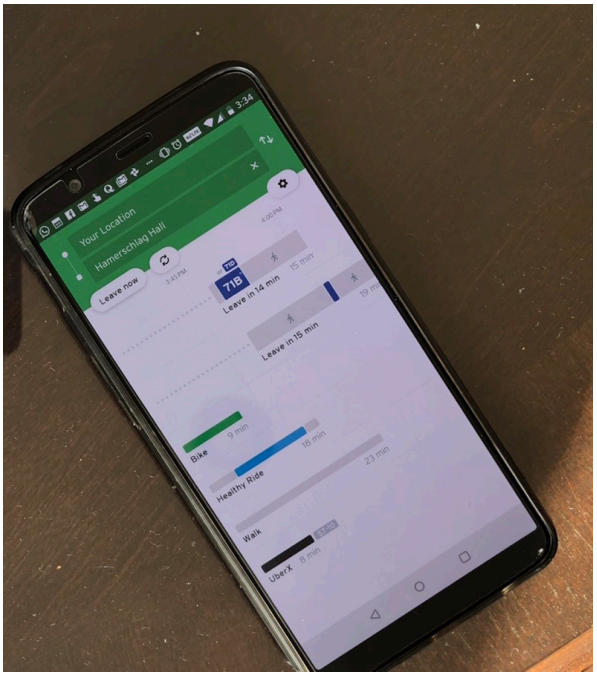
2 CMU graduate students

Justification

In this Think-Aloud, we knew that our target audience uses Transit & Lyft as two aids in their getting to campus on time. Knowing this, we wanted to test these applications in their ability to help users plan ahead, and make decisions in a time crunch (things that a user who is consistently running late would do). We wanted to scope out existing solutions.

Questions we wanted to answer

- Can users find the most important information in a short time period?
- What information do users look for on the App when they are running late?
- How do users compare and contrast different transportation using mobile apps?
- What do users do to when they realized unexpected events occurred?
- Do users produce more errors, neglect important information when they are late?
- Can users plan ahead to prevent the "running late" situation from happening again?



Speed Dating

When

11/5/18

Where

Margaret Morrison/ CMU Campus

How

From the needs that we identified through our previous text diary study and contextual inquiry, we created 7 storyboards that targeted 3 different user needs and presented 2-3 different radical solutions to each. We presented these to users and asked them for feedback on how the felt about the storyboards.

Who

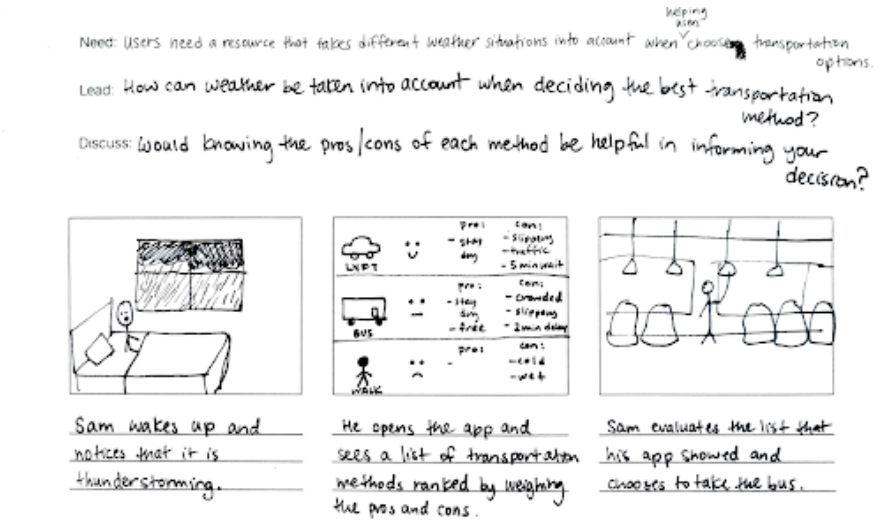
3 CMU students

Justification

Before jumping to any one solution that we believe will fill a user need, we wanted to first validate the needs by having users "speed date" a variety of different ideas. We focused more on presenting the users with the need and ways that the need could be fulfilled without specifying the way that the solution would be implemented.

Questions we wanted to answer

- Is walking/biking stress relieving?
- When user is talking about safety, do they mean safety of the bus? (like bus is speeding, they'll crash) or safety from crime?
- Are users comfortable with an app gathering their data from other apps?
- Are in-building data useful to users / are users familiar with the CMU campus enough to find the best route without assistance?
- Are users influenced by their peers when choosing transportation methods?
- Do users want possible recommendations during different weather conditions
- What are some ways for people to trust bus tracking apps more?
- Would users trust taking a scheduled uber pool group along with other cmu students?
- Would users want to use car services regularly if it only costed them $1-2 a day?
- Would helping users plan their leaving time more smartly help them be less late?



Desirability Study

When

11/18/18 at around noon

Where

Tepper Quad

How

On sixteen small pieces of paper, we wrote different emotions that users could potentially feel in response to our screens. These words included positive ones that we wanted users to feel, as well as negative words that were the opposite of our intended emotional reactions. We also included a number of neutral emotions. We went through each screen and gave a short explanation of the context of each screen. Then we asked users to pick up to two emotions that they felt in response to the screen and had a short discussion on their choices.

Who

10 random participants (CMU students) sitting in Tepper Quad

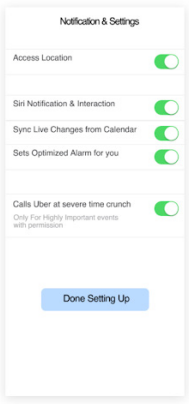
Justification

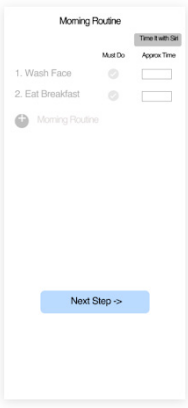
We decided on doing a desirability study because we felt that this method would give us an idea of the emotional response that users can have to our design artifact, as well as determine whether some of our questions could be violating users' privacy standards as well as being annoying. We could also find out what (at least partially) if our questions are annoying, or if we have too many for what we are trying to accomplish (by giving different adjective cards surrounding being annoyed or redundancy).

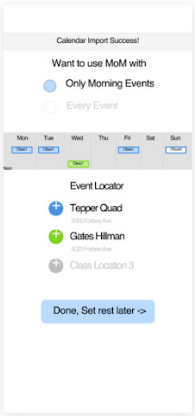
This method was the appropriate for the form & fidelity we have because we want to hear rapid feedback for our design, (especially about how it makes users feel) rather than looking for usability problems in a higher-interactive/visual fidelity mockup (which would be more suited for a think-aloud).

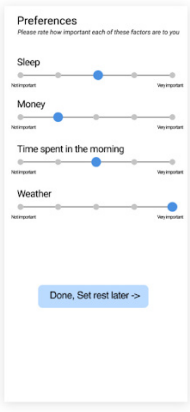
Questions we wanted to answer

- Do users trust our app enough to share their personal schedule/calendar?
- Do users find the amount of questions asked annoying?
- Do users get tired of the process of customization?
- Can users understand the purpose of each customization feature?
- What are users' general feelings regarding our app?





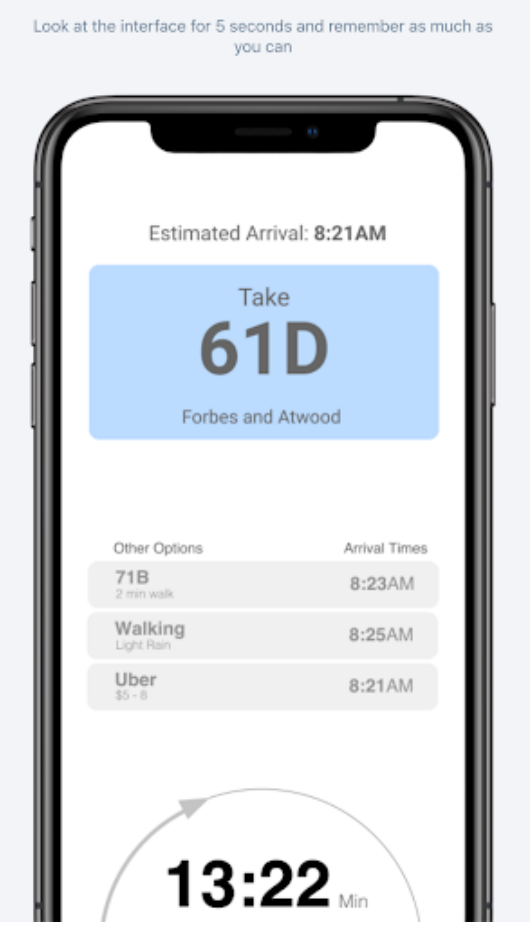


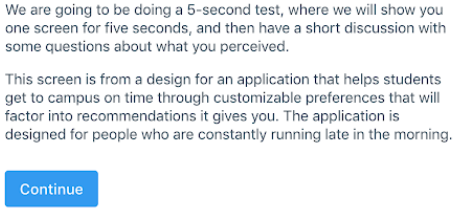


Five Second Test

When
11/28/18
Where
fivesecondtest.com
How
We used the usability test website to generate a 5-second test for our users to take.
Who
10 CMU students
Justification
We thought that this methods would give us an idea of what information users glean from a quick look at our dashboard (when they are rushing in the morning).
This method was appropriate for the form & fidelity we have because we were able to receive rapid feedback about whether our dashboard is informative to users in a short amount of time.
Questions we wanted to answer

- Can users understand the purpose of each screen within 5 seconds?
- Are the most important elements of the screen grabbing users' attention first?
- What are users' first impressions of the screens?

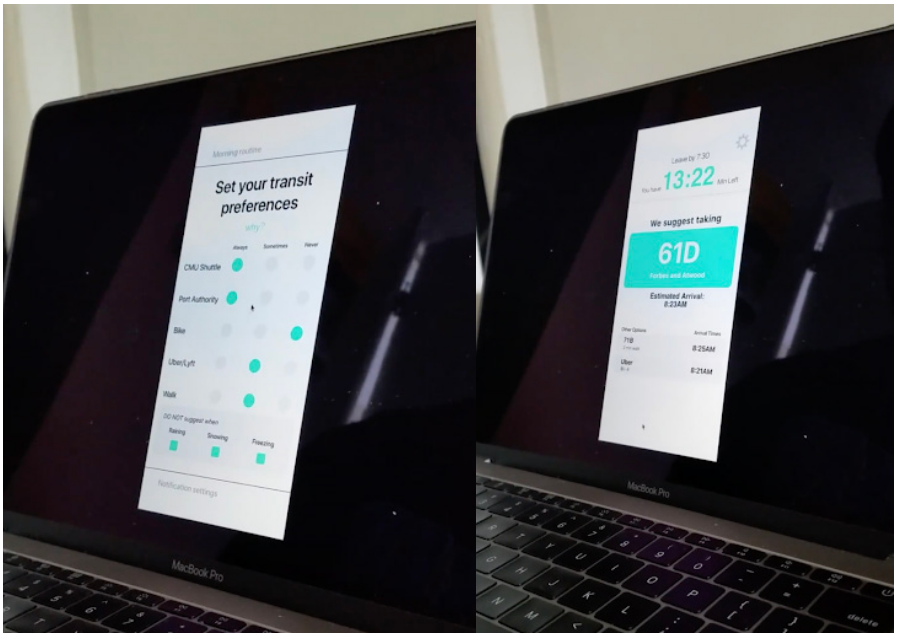




Think-Aloud Protocol 2

When
12/2/18
Where
CMU Campus
How
We had users walk through the digital wireframes we had of our application and complete two different tasks.
Who
2 CMU students
Justification
We thought that this methods would give us an idea of how users feel about the entire experience and whether users would trust the app to make good recommendations, given the customization section.
These methods was the appropriate for the form & fidelity because we were able to test the user's ability to complete complete high-level goals with a simple-navigation mockup once we have iterated over the dashboard screen, and combined it with our customization screens (under a think-aloud protocol).
Questions we wanted to answer

- Can users successfully navigate through the customization screens of our app?
- Do users understand the purpose of each screen and each element on the screen?
- Can users locate where to find relevant and necessary information in a short amount of time?
- Can users understand how the preferences affect the dashboard?
- Do users trust our application when they change their preferences (to make better recommendations?



Evidence

Quotes from Conducting think alouds on the Transit applications

U1.mov / 12:56

"Can you type in intersections to the search bar?"

U1.mov / 13:10

"Hmmm...I'm just gonna do Liberty Avenue."

U1.mov / 13:25

"I'm just gonna Google Liberty and Ella just to know where I am."

User was searching for the intersection Liberty Ave. and Ella St. User typed Liberty Ave. at Ella, and saw that there were no search suggestions. User thought that the search feature didn't accept intersections, so she just searched Liberty Ave. The map showed the Liberty Ave. in the Strip District, and she searched along it for a little bit, trying to find Ella. Then, she switched to Google to try and find the intersection that way.

U1.mov / 6:05

"Ummm... I don't know. Is this inbound or outbound?"

U1.mov / 6:34

"None of these look nearby."

The user was searching for an address in the search bar. They typed in the full address, and clicked enter. The user was confused when no nearby busses are displayed, and ended up fruitlessly searching for busses via scrolling. They eventually found the "Inbound/Outbound" filter, but were still unable to find their bus.

U2.mov/7:35

"If the bus isn't tracked then I can't plan my route."

The user attempted to plan out trip within Transit, but was unable to plan far enough in advance. They discovered that they would only be able to plan a trip if bus was currently being tracked.

Quotes from Conducting contextual inquiry

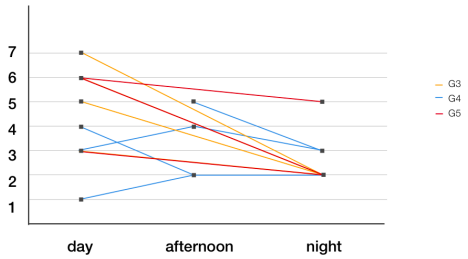
"I prefer not to spend money in my commute."

"I usually enjoy biking rather than taking the bus when going to class."

"Being late really stresses me out and I feel less prepared for class."

"The busses can be pretty inconsistent in terms of when the arrive versus when they say they are going to arrive."

Text-based diary study analytical data



Quotes from Conducting contextual inquiry

"I don't think this is necessary because I like having control of setting the alarms myself and I already know what time I need to leave to get to the location on time"

"Maybe it would be better if it did it automatically without me knowing"

"It's definitely helpful to have my schedule imported."

"I think this would be helpful because the transit app is currently very unreliable"

"If it showed you one choice for you based on your preferences it'd be good because it's faster and you don't have to think and also because I'm indecisive"

Desirability study with 1st iteration of customization screens	User 2: "I like the Uber thing, it makes sense. I like that. How do you (the app) determine what a severe time crunch is? I like the Uber function the most because I know a lot of people have trouble with it." User 5: "There's a calendar in the middle but I don't know what it's doing there an idk how it pertains to the app. I'm just confused. It's confusing because "these" look like "those" and it seems like its just plopped down in the middle. It was unclear that this information was extracted from this." User 5: The ability to customize, is useful. It's very minimal, it doesn't look too complicated to add to. This label doesn't make any sense to me. I don't understand the ways in which my routines can differ each morning, and how that can be inputted.
5 second test on dashboard	"It's clean, my eyes are drawn to the bus number. Maybe if I was running late I'd be more interested in when I have to leave?" "the weird arrow on the bottom i was confused"
5 second test on dashboard	
TA1.mov 3:18	"What is this weather thing ... it says do not suggest but do not suggest what?
TA2.mov 3:34	"Okay, I think I'm done now, but I don't know how to get to the recommendations screen."

Insights

Narrow Down

There are quite a few insights that prompted us to decide to narrow down to the scope to serve students who tend to perpetually run late in the morning. We found that there are quite a decent number of people who either tend to run late in the morning or commute with high stress due to time crunch. Currently, they do not have a one step last-minute options that do not come with the hassle of switching between many apps. They also tend to be wary of taking Uber and Lyft because of the high cost.

People's current habits/ actions

After we narrowed down the scope, we gained insights about what are people's current habits and actions when they are running late to class. Reliability of the method of transportation is very important when in a hurry. We found that main points of stress for people were due to unreliability of transportation options, including PAT buses and Uber/Lyft. It follows that the people preferred different transit apps based on which they perceived to be the most "reliable" and accurate. People are especially frustrated about unexpected situations such as road blockages. The current transit apps rarely notify the users enough in advance.

On the topic of reliability, we were surprised to learn that although Uber/Lyft were generally deemed as the fastest option, people do not always feel that they are faster than other forms of transportation depending on the situation. We learned that people think the Uber/Lyft wait times are sometimes unreliable and inaccurate. They always find it frustrating when time is wasted because the driver cannot find them. They also think that Uber/Lyft has to go through the same traffic that the buses have to go through. All these factors contribute to why some people think Uber/Lyft is not always the fastest option. At the same time, people tend to generally all have Uber/Lyft as the last option due to the cost. However, in dire time crunch in getting to important events, people will now chose Uber/Lyft despite the cost.

We also learned that weather has an effect of which mode of transportation people choose. Some people also value safety of their commute but tend to not worry too much about it unless it is night time. They also generally have a sentiment that school shuttles are slower than PAT buses and less frequent and convenient but PAT buses can be frustrating when they are unpredictable by arriving late or skipping riders. They appreciate that both of these options are free of cost. In general, people's mood even academic performance is affected by the stress they feel from commuting. An important finding on the overall phenomenon of lateness is that their lateness is directly affected by the amount of the a person put in in advance to plan, prepare and execute their commute.

Insights from testing our ideas

A realization is that although the idea of helping users change their late habits from a fundamental level is good, we need to find a more substantial and tangible way to target a single problem instead of a general problem of "lateness". We neglected that lateness is generated by a lot more deeper ingrained habits people have developed over the years that are not easily changeable just by a simple app function. We were quite surprised that even though riders care so much about reliability and get frustrated when bus tracking apps are not reliable, people still trust the predicted time. They also seem to be fine with an approximate time instead of more extra information that could again

be unreliable. At the same time, it is interesting that some people think the current transit apps are reliable while some do not. Also, as much as road blockages are frustrating, users do not feel like this is a common problem. Instead, what stresses the users out is when the buses are full, which is much more frequent than unexpected accidents.

We also got to see the negative reactions to our proposed ideas. Weather is an important factor people consider when choosing transit but we neglected that sometimes a lot of these knowledge are common sense that as long as users know about the weather, they would not need additional recommendations. At the same time, When in a urgent situation, people wouldn't really care about what other people choose at the moment. The single most important factor is which one is the fastest for themselves. As for our auto alarm manipulation function, moving the alarm clocks only works if the person set one alarm, it would not be as effective to move up a series of alarm.

We were also glad to see some positive reactions. For our planned Uber Pool Group idea, ur subjects do not seem to mind spending $1-2 dollars regularly for fast transportation methods like this. They generally think that in-building navigation will be very helpful. They also think that importing academic schedule will be helpful to remind them important dates. We learned that users find a single recommendation function helpful because it saves them the time of having to compare each option themselves, which we previously thought they would want the ability to compare.

Insights from testing our first customization pages

Because this is just a portion of our app, users in general were not sure how all these customizations would relate to the personalization part/how it will be useful or how it would affect the rest of the app. Users were not sure whether these customizations were set only one time or everyday. Some more organized users felt like our app was fun and cute while some users felt skeptical in that our app seemed to making over-generalizations, for example discussing user's morning routines. We also found that some of our wording were slightly confusing. However, we were pleasant to find that no one thought the customization process is long-winded and annoying, which was one of our biggest initial concerns.

Insights from testing our first dashboard

We were delighted that people were drawn to the correct parts that we intended them to focus on which are the top third: the estimated arrival and the bus number, and the bottom third: the countdown numbers. However, we also learned about a couple flaws from our visual design. A couple users were confused by the prevalence of the "61D" recommendation. They thought the app was made specifically for the 61D. People did not seem to recognize the countdown and was confused by the design. For some additional information, people also want a concrete time in which they should leave, they thought that the countdown was confusing.

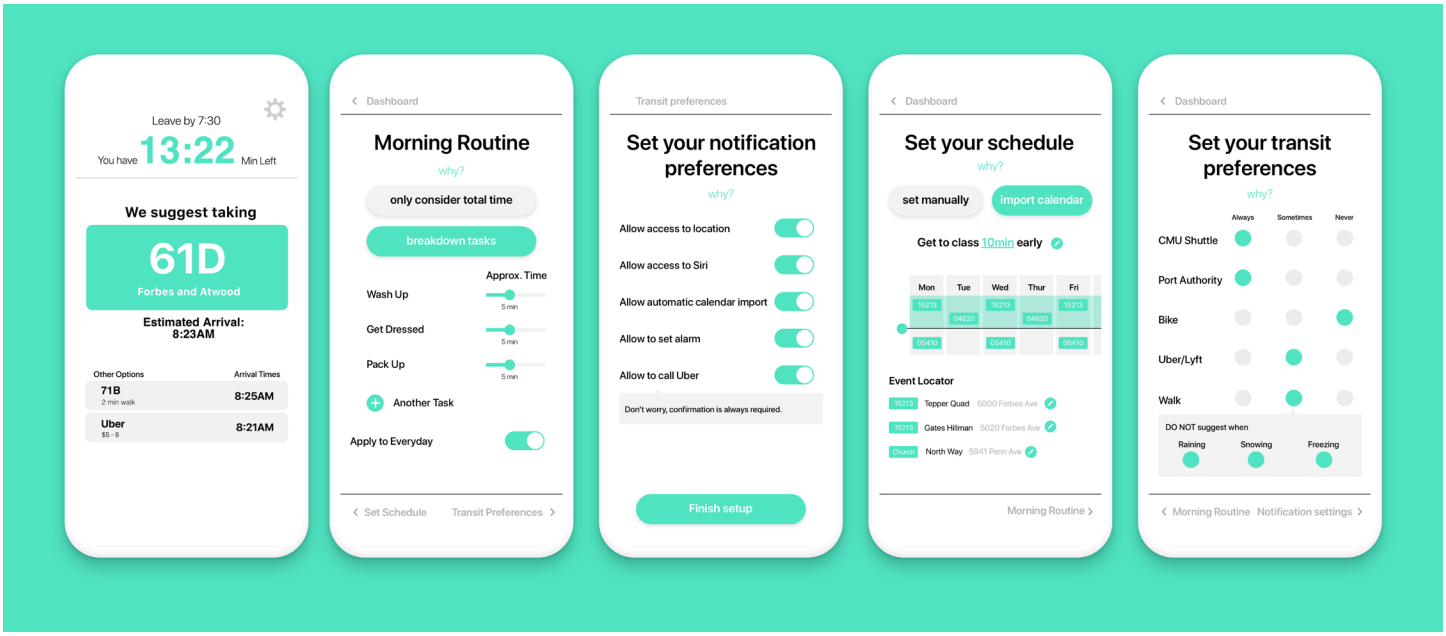
People responded well to our dashboard and can quickly find the way to switch from the dashboard to the customization screen. However, people were mostly confused by our navigation design between the different pages. They found the accordion layout of the settings page is a confusing

Insights from testing our whole app(2nd iteration)

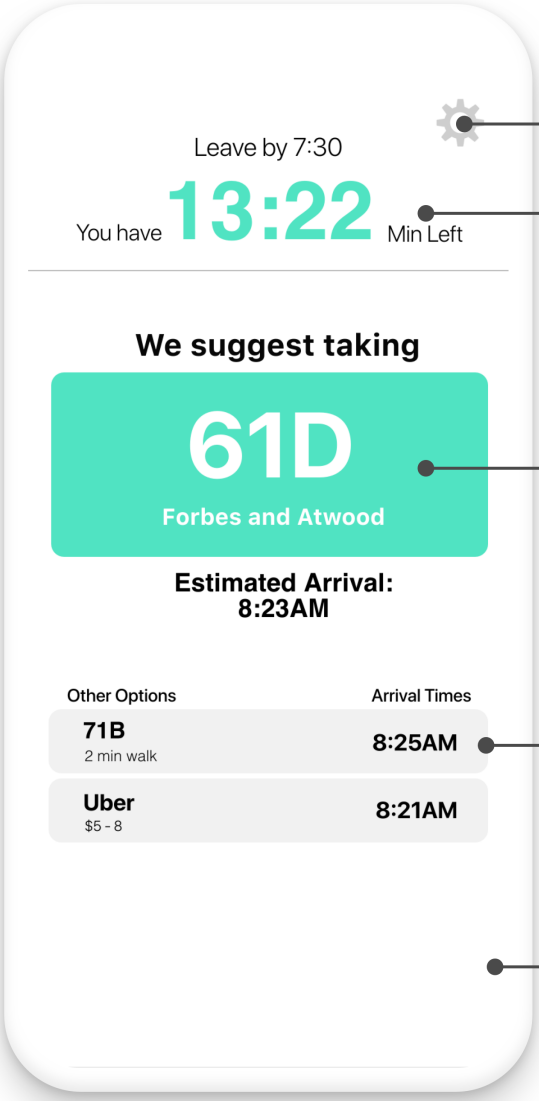
and unintuitive form of navigating through the customization preferences. As for the customization pages, the weather customization section on the transit preferences page does not clearly correspond to a transportation option, as the arrow is too small for some users to see (that connects the weather portion to the commute choice of walking). Something that we did not think about for the calendar import page: some users were concerned about the estimated arrival time that the app automatically recommended for them. For instance, if they had class at 8:30am, they wondered if they could customize the settings of the app to arrive at a specific amount of time before class begins.

Solution

Our solution is an app: OnTime, that allows users to plan their daily commute ahead based on their academic commitments and morning routine. Instead of checking transportation data based on one's morning routine, OnTime prompts users to plan their morning routine based on the available transportations.



Key Features



The Dashboard

Customization button

The top section is a countdown clock that adds (positive) stress to the user to get ready in time.

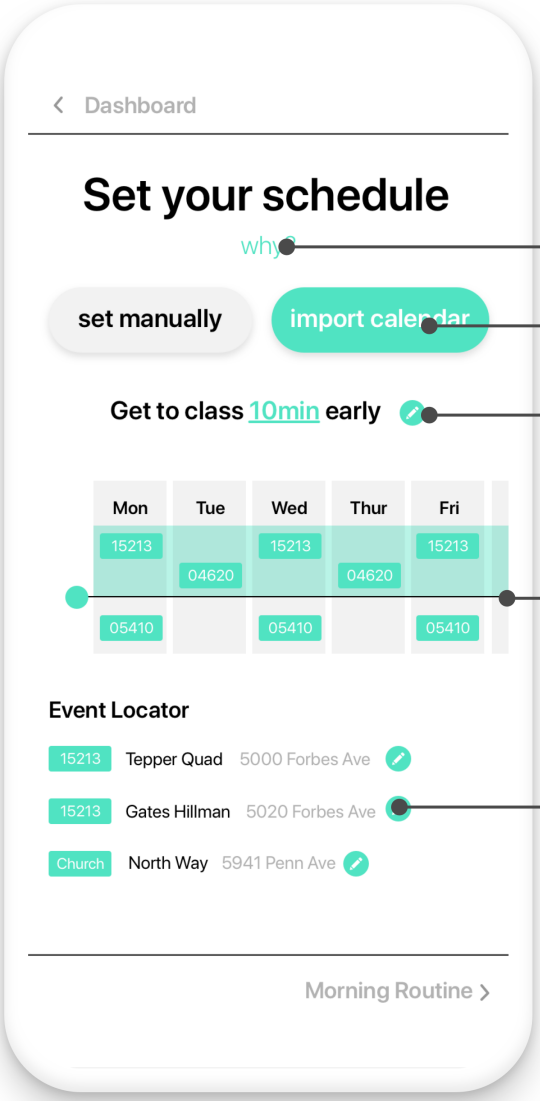
OnTime always suggest the single best form of transportation at the time. The dominant position and bright color attracts user's attention to the most important information.

Alternative transportation avaliable

Clean, light interface for a fresh start for the day!

Key Features

Customization: Schedule



Explains why this is a factor in the algorithm and how it works

Users may input data manually, but may also import from SIO and calendar apps.

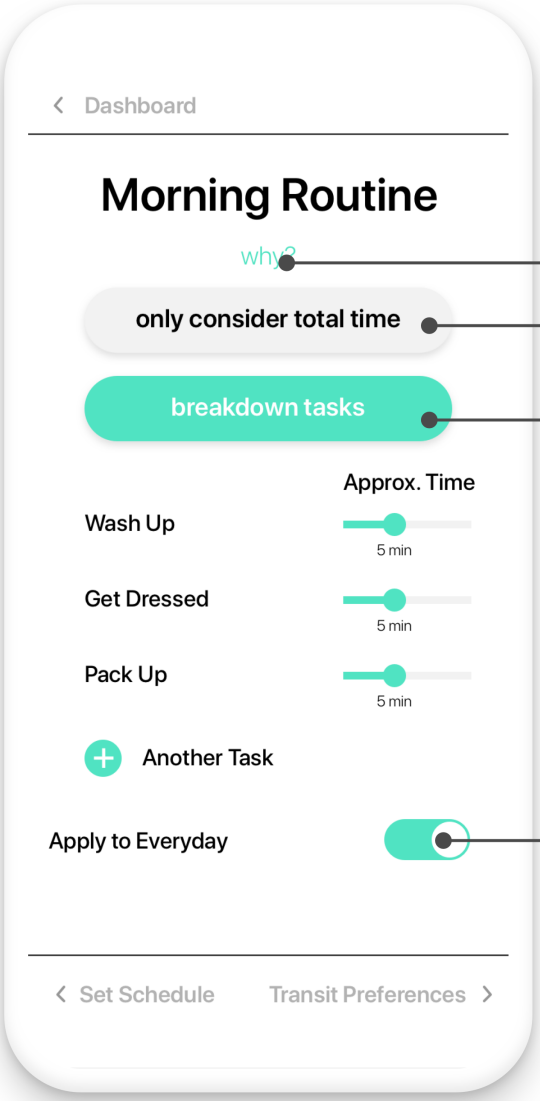
Users may set how early they want to get on campus

A slider to select which range of class is counted as morning classes to be included into the algorithm.

Set specific location to get the best optimised results

Key Features

Customization: Routine



Explains why this is a factor in the algorithm and how it works

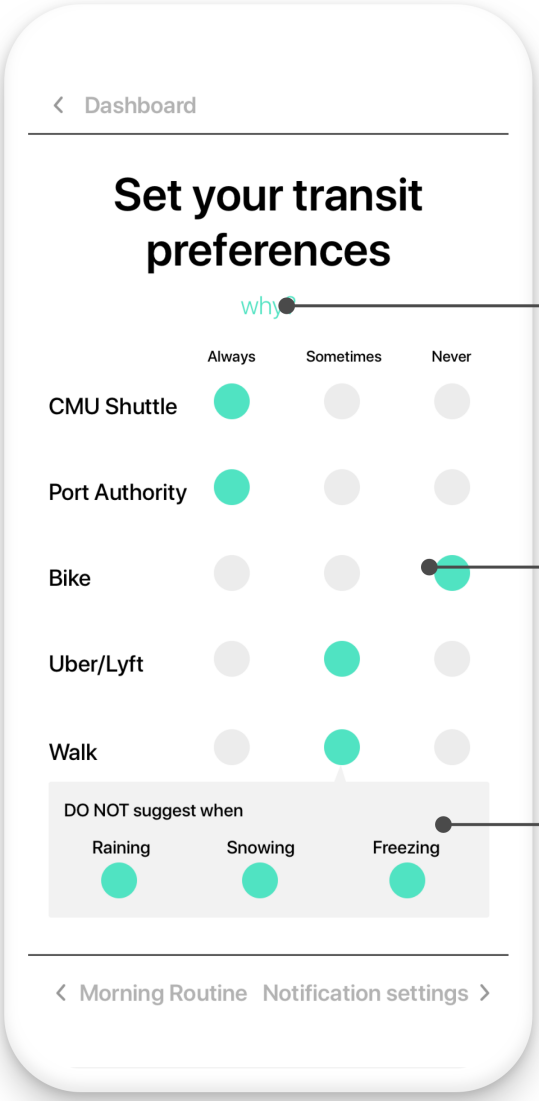
If the user would just want to factor in the total time, he/she may just input the total time.

Breakdown of tasks allows OnTime to suggest skip parts of the routine when the user runs out of time. The user may time their routines in this app.

The routine may be specific to days of the week or everyday.

Key Features

Customization: Preference



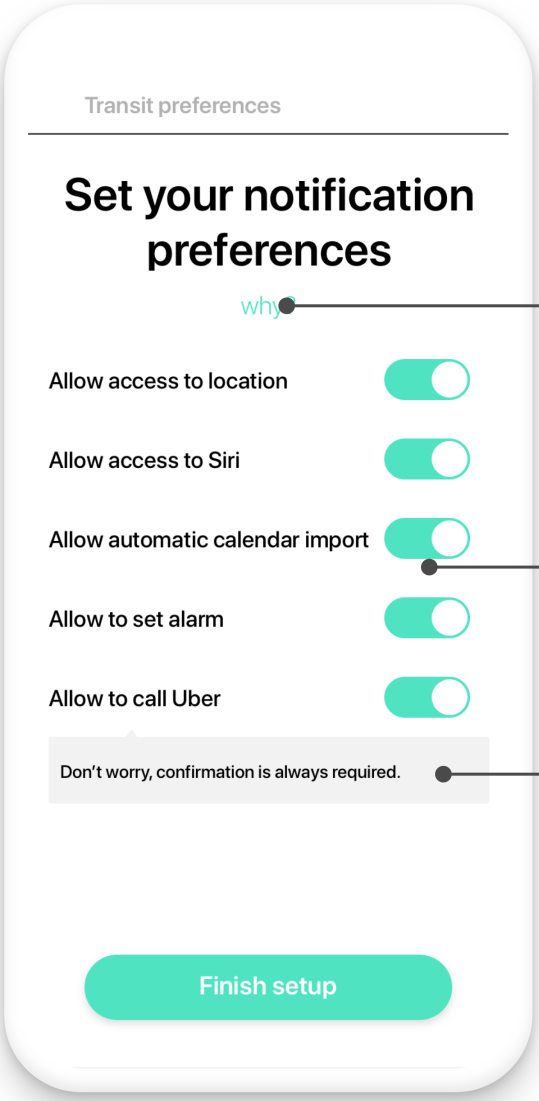
Explains why this is a factor in the algorithm and how it works

Three levels of preferences that allows the algorithm to know which ones to suggest first.

For walking and biking, user may choose not to suggest when raining, snowing, or freezing.

Key Features

Customization: Notification



Explains why this is a factor in the algorithm and how it works

User may control levels of engagement for this app. The more right the user gives the app, the more compulsory it becomes.

The app won't automatically call uber or Lyft, it will ask for user confirmation.