

# **Final Portfolio: SU Restrooms**

## **Overview**

### **Problem Statement**

Seattle University restrooms are not meeting user demands. We want to address how the current usability and accessibility of SU restrooms may negatively affect the overall feeling of being in the space. We aim to create a product and design a better restroom that will maximize the restroom experience on campus for faculty, students and staff of Seattle University. By creating a more desirable restroom experience that drives increased usage by and overall well-being of our target group will be the measure of success for this project.

### **Context**

This project was part of an upper-level undergraduate course in User Experience Design at Seattle University-- offered by the College of Science and Engineering in Spring 2019.

Everyone needs to use the restroom at some point. We were drawn to this problem because we felt that bettering the restroom experience at Seattle University is something that the entire SU community would benefit from. In order to accomplish this task we followed a classic design pattern, which we learned in the class. We conducted a number of user interviews with SU students and went through several rounds of design iterations before settling on our final product.

### **Team Members**

Ho-I Lin — [linh3@seattleu.edu](mailto:linh3@seattleu.edu)

Audrey Kan — [kana@seattleu.edu](mailto:kana@seattleu.edu) | [audrey-kan.superhi.com](http://audrey-kan.superhi.com)

Aaron Pollack — [pollack2@seattleu.edu](mailto:pollack2@seattleu.edu) | [lolpack.me](http://lolpack.me)

Isaac Ortega — [ortegai@seattleu.edu](mailto:ortegai@seattleu.edu)

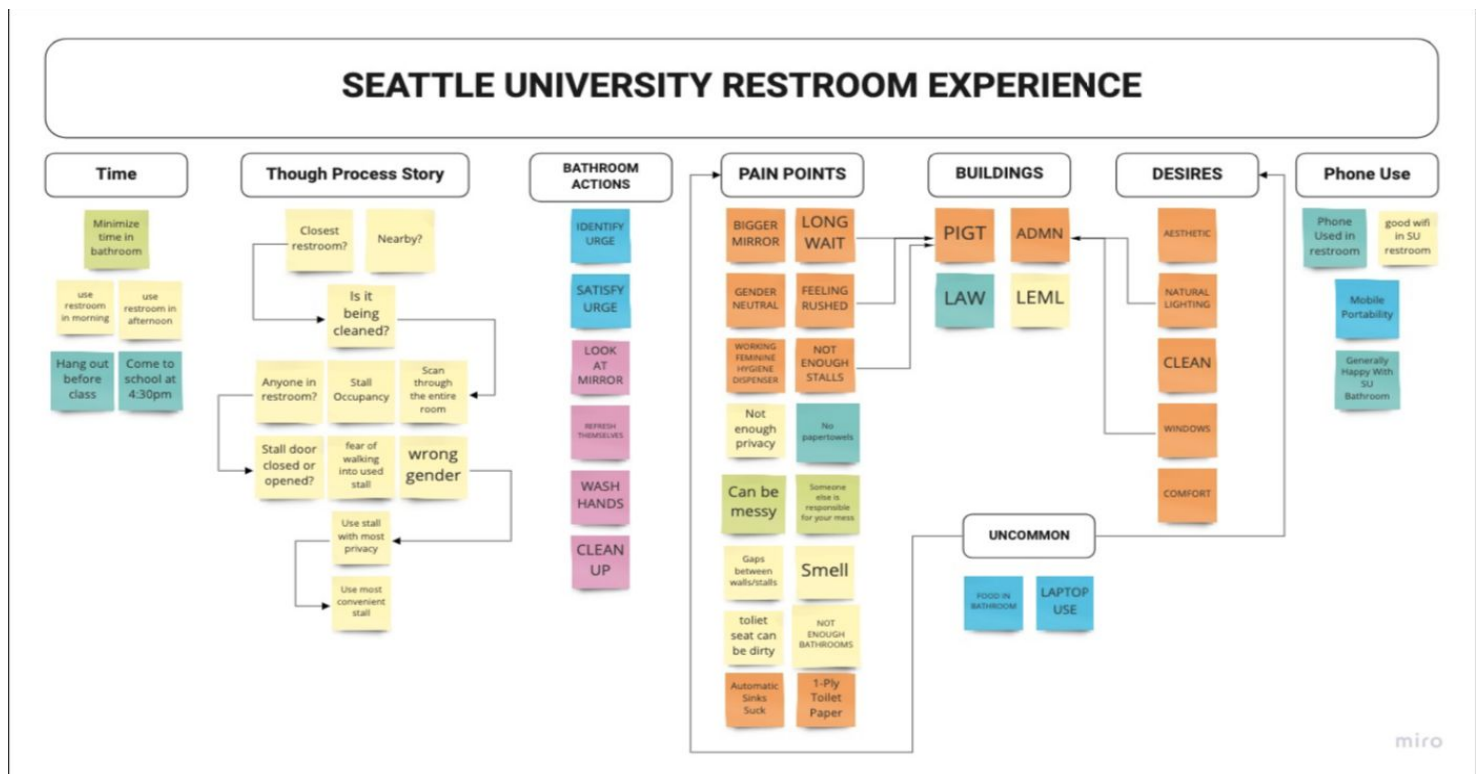
## **Design Process**

### **1. Project Description**

We are working to redesign a better restroom experience for users at Seattle University by improving the usability, accessibility, and overall feeling of being in the restroom space. Our target users are the users in the Seattle University community (i.e. faculty, staff, students, and custodial workers).

## 2. Interview Findings

	Interviewee 1	Interviewee 2
<b>Audrey Kan</b>	Mari Iwasaki Age 20 Seattle University Student	Devin Robichaux Age 21 Seattle University Student
<b>Ho-I Lin</b>	Daniel Wang Age 21 Seattle University Student	Bryson Shea Age 25 Seattle University Student
<b>Isaac Ortega</b>	Rohan Panuganti Age 21 Seattle University Student	Nyall Padre Age 21 Seattle University Student
<b>Aaron Pollack</b>	Omer Burstein Age 30 Seattle University Student	Jordan Boulanger Age 25 Seattle University Student



Upon completing our eight user interviews, we found both overlapping and disjointed results:

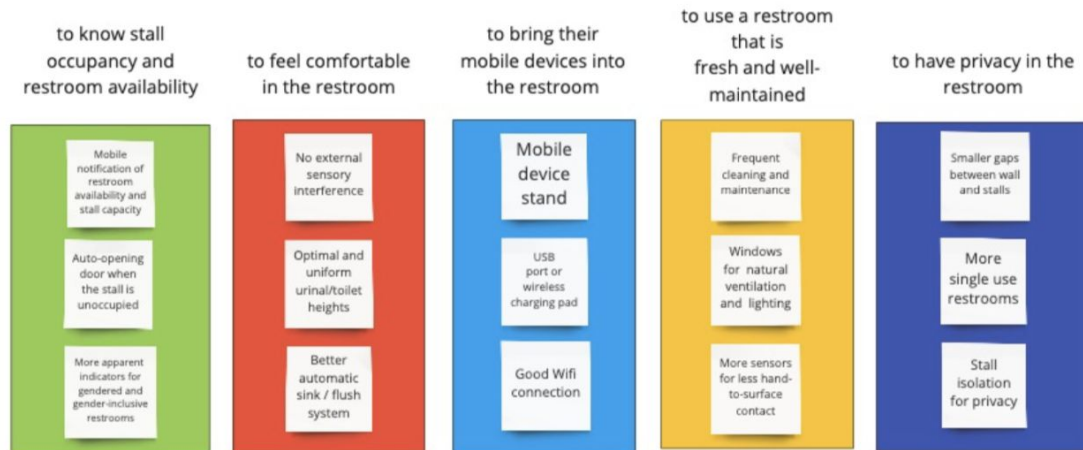
For our student users, the amount of time spent in the restroom was crucial. And for commuter students, they scheduled their commute times around restroom use. Users voiced their frustration at long wait times as well as the feeling of being rushed when inside restrooms (which is possibly due to lack of stalls).

One of our users shared that they often bring their laptop and food or drink items into the restroom. This prompted us to consider design changes to the physical restroom to accommodate for users who bring more than a bag or backpack into the restroom. Furthermore, almost all our interviewees mentioned using their mobile devices in their restroom experience, who often balance their devices on top of the toilet paper dispenser. Users also showed praise for good wifi connection in campus restrooms. Therefore, we feel it may be appropriate to implement a product and an additional component in the new restroom design that will promote mobile-friendliness in Seattle U's restroom experience.

Finally, when asked what improvements they would like to see in Seattle University restrooms, our interviewees suggested facilitating a feeling of comfort, better aesthetics, cleanliness, and natural lighting. Their pain points (i.e. specific problems our users currently experience in on-campus restrooms) include: small mirrors, restroom scarcity, wide gaps between stalls, subpar privacy, long wait times, broken or empty feminine hygiene dispensers, untimely paper towel refills, lack of gender-neutral restrooms, bad odor, inefficient automatic sinks, and mediocre cleanliness.

# Top 5 User Tasks

## USERS WANT...



Users want:

- 1) To know restroom occupancy and availability
- 2) To feel comfortable in the restroom
- 3) To bring their mobile devices into the restroom
- 4) To use a restroom that is clean and well-maintained
- 5) To have privacy in the restroom

After analyzing our interview results, we proposed to address the first user task by implementing a mobile application that notifies and relays live data to users about restroom availability and occupancy. To the physical space, we intended to add an automatically opening door dependent on occupancy as well as an eye-catching LED indicator on the restroom's exterior to signify a vacant or occupied status.

We proposed to address the second user task by reducing any external stimuli and implementing an automatic toilet and sink system that should accommodate all our users. We hoped to promote the feeling of comfortability through improved aesthetics and ambiance in the restroom.

To address the third user task, we aim to add a stand or shelf in the restroom that allows users to store their devices of various sizes. We also proposed to install a small wifi router inside each restroom to satisfy our user's need of excellent wifi connection. And for increased mobile friendliness, we proposed to add a USB and charging port which will be compatible for our tech-savvy users.

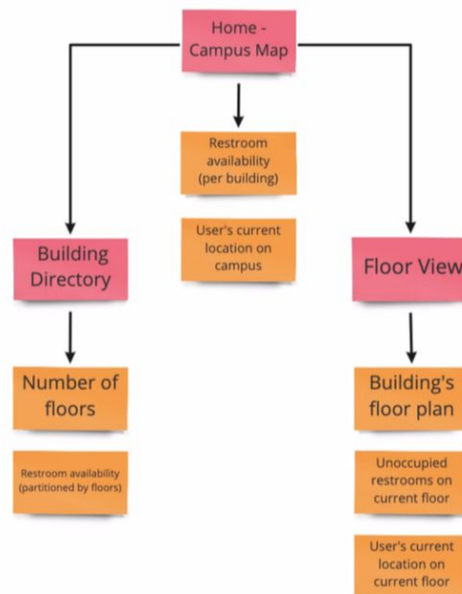
For the fourth user task, we aim to maintain a fresh and clean restroom by facilitating frequent servicing and maintenance. The possibility of adding windows to each restroom was also an attractive option as this would provide natural ventilation and lighting. As for the physical space, we intend to implement an entirely touch-less restroom experience in our new design. With sensor-based interaction at the core of our new restroom design, there will be less hand-to-surface contact, which can hopefully

support better hygiene and cleanliness while using the restroom.

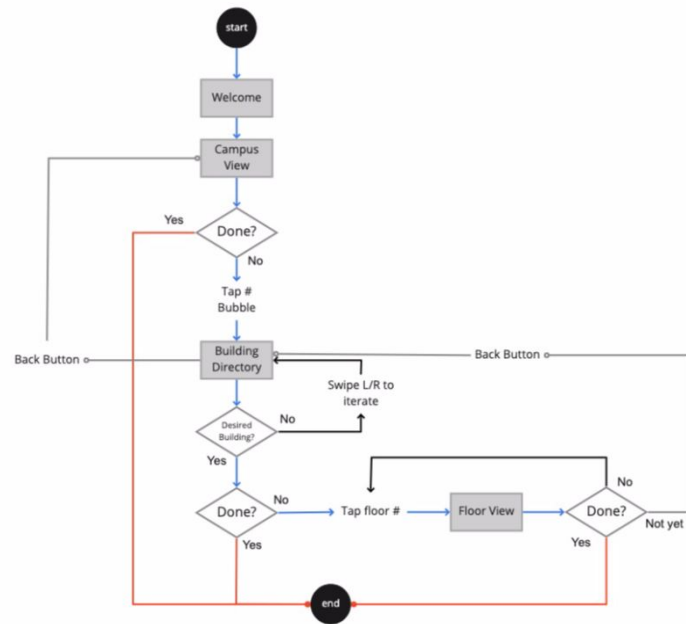
Finally, we propose to address the fifth user task by either reducing the gaps between stalls, or implementing single-user restrooms only. Isolation will facilitate and support our users' desire for a more private restroom experience.

### 3. Information Architecture, User Flows and Task Flows

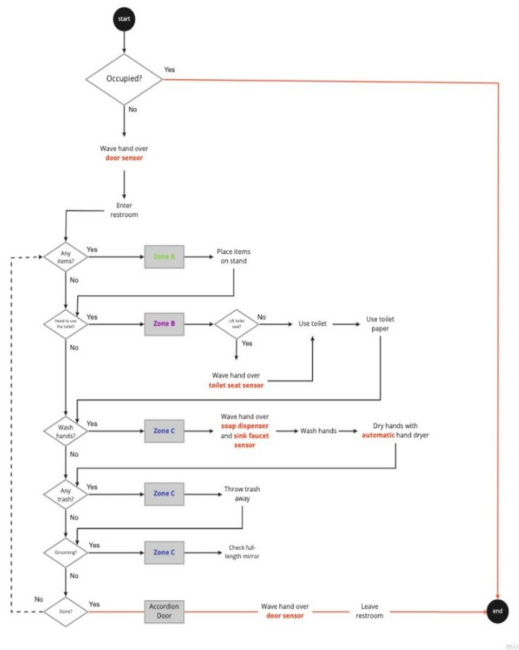
After conducting user interviews, we identified three key tasks to implement in our restroom experience: **mobile friendliness**, **touch-less interaction**, and **single-user space**.



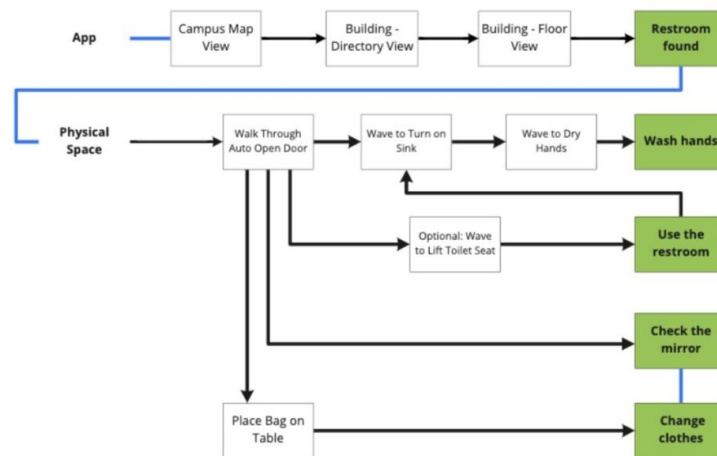
The information architecture above details the structural design of our mobile application. Our initial design feature three screens (indicated by pink) along with the information that is available to users on each screen (indicated by orange). By organizing and labelling our proposed mobile application, this information architecture aims to support usability and findability.



The task flow above details all iterations of how a user can interact with our initial mobile application system prototype.



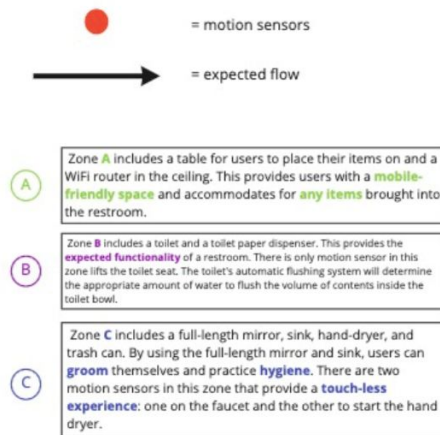
The task flow above details all iterations of how a user may interact with our initial restroom prototype.



**\*Explanation:** The users of the bathroom come in through one of two funnels. The first funnel is *virtual* -> *physical*. This means that the user is looking for a bathroom through the app. The user opens the app and look at a building and optionally drill down into the floor view to find a vacant bathroom. The other option is only visiting the restroom by walking into it - this is considered *physical* only.

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The user flow above, similar to the previous task flows, details the interactions a user may have with our initial mobile application system and restroom prototype. Users may enter a restroom from two specific entry points: the mobile app or the restroom itself. The first funnel is “virtual-to-physical”, where the user seeks out a vacant restroom through the app to arrive at a specific restroom. The other option is “physical”, where the user arrives at a restroom purely by walking up to it.



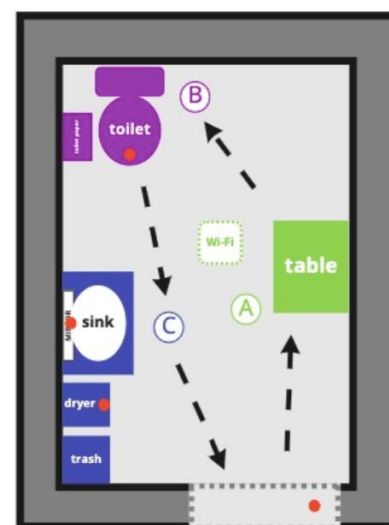
**\*Sensors** provide **touch-less interaction** with the space. This corresponds with our users' need for a **hygienic** and **accessible** restroom experience.

**\*Thicker walls** provide more **sound insulation**. This corresponds with our users' need for a more **private** and **home-like** restroom experience.

**\*Single-person restroom** creates a **non-gendered** restroom space as well as a **private, home-like** experience.

**\*Accordion/Bi-fold door** is the initial point of a touch-less restroom experience. This removes **both** the **push/pull confusion** and the **worry about lack of room** when entering/leaving the stall as the door is opening or closing

**\*Table** can also be used as a diaper changing station.



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The physical restroom user flow is designed to provide common and logical interactions for every user. First, the user will enter the restroom by passing through the automatic door. The door will lock after the user enters the restroom. Then, the user may use the table to put their large items, such as a duffle bag or a shopping bag. Next, if the user is a male, the toilet seat will automatically lift as the user nears the toilet. When done, users will wash their hands at the sink with the sensor-based faucet. Users may use the mirror for whatever means. Lastly, they will use the dryer to dry their hands or use the paper towel dispenser and put the used paper towels into the trash can. Users leave the restroom when the door opens upon sensing the user's vicinity to the door.

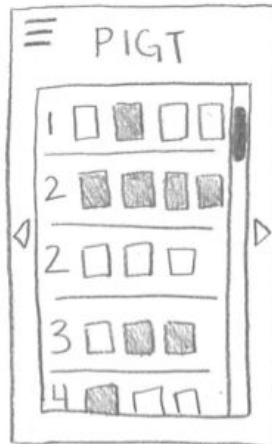
## **4. Design Sketches**



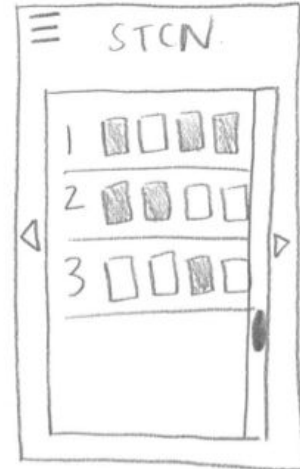
## MOBILE APP



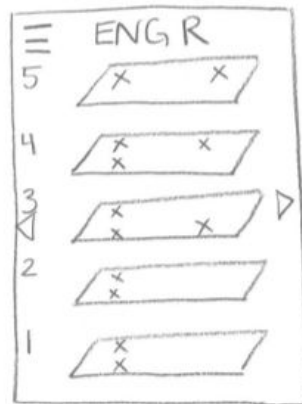
HOME - MAP VIEW



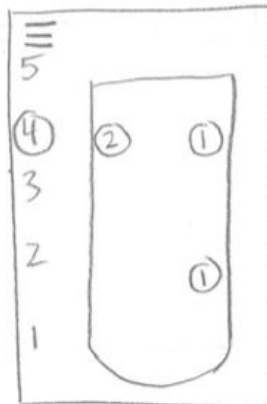
BUILDING VIEW  
- OCCUPANCY



SWIPE FOR NEXT  
BUILDING



BUILDING-  
DIRECTORY



BUILDING-  
FLOOR

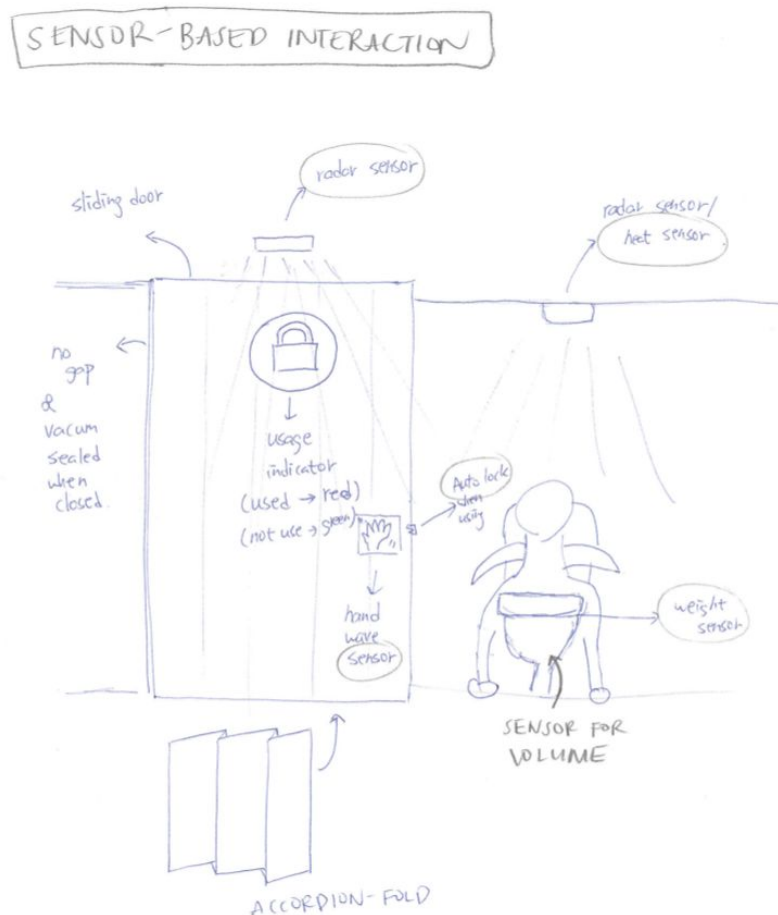
This mobile app allows the SU community to view the availability of restrooms within different buildings. The home page is a Google Maps view of SU campus, which shows the number of available restrooms per building. From the hamburger menu, the user may access an occupancy view of each building sorted by floor. The third and final feature is a building directory view to show where all the restrooms are on each floor and the number of available restrooms. The mobile app is in support of commuter students specifically who need to plan their restroom breaks before and after travel or work. This may also be useful for the general SU community.

After the upfronts, it will be relatively cheap to maintain and provide a unique service no other campus has. This application will be highly beneficial to commuter students, students in

need of a restroom during passing periods, and more. Yet, a weakness of this design may be that it is too expensive to gather the data we need, which may not even be possible to gather.

Given the data for restroom occupancy is available, this application should be feasible. However getting real time data would be expensive. We could possibly project availability and occupancy based on user feedback and real-time input.

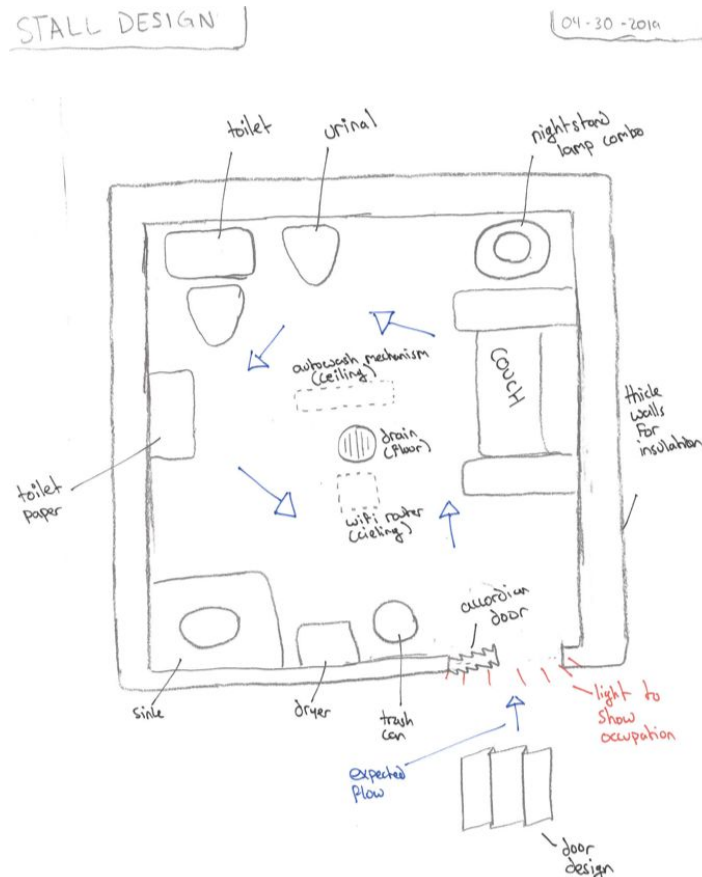
A mobile app specifically for campus restrooms is unprecedented, so we feel this is fairly innovative, though it adopts design concepts from existing designs. Our design is also original, considering the app portrays data down to the individual restroom.



The majority of our interviewees expressed the need for cleanliness in the restroom. This, along with increasing accessibility for those who cannot easily use conventional doors, lead us to build automatic doors that work based on motion and radar. This helps the user not need to touch the door before or after using the restroom, promoting hygiene. In addition to door sensors, we will also have heat sensors to know if the restroom is occupied to prevent someone from walking in on an occupied restroom. Automatic faucets and flushing mechanisms are industry standard for many restrooms already, so we want to build off of those innovations and bring them to every interaction in the restroom on our campus.

Automatic accordion-folding doors (like aircraft restrooms) will remove the hassle and awkward act of pushing or pulling doors inwards or outwards. The sink, toilet, hand dryer and

auto-locking will remove the need for users to touch any surface in the restroom, which will improve hygiene. This design is expensive because it will require an advanced locking mechanism and fail safes if power goes out or hardware/software malfunction. On the other hand, this design seems very feasible assuming funds are available. The increased accessibility makes a strong case for this type of investment.



The shift to having all restrooms be single use is a direct response to our interviewees desiring more privacy in the restroom. In addition to that, this makes the restroom experience much more accessible for people who do not fit into a gender binary. Not only is privacy important for users, but it could also change SU students behavior. One interview who lived close to campus planned her restroom breaks because she did not like the restrooms on campus. By making them more private and inviting, we are providing a more enticing restroom experience. Includes a stand for mobile phones, food items, drinks, and bags. This design includes a wifi router in each restroom.

The strengths of this design includes gender inclusivity, increased privacy, and comfortability. However, a weakness of this design is that it could work against our 'Availability' feature by reducing overall restroom capacity. In terms of feasibility, this design totally feasible! We could make this a requirement for all new buildings that get built on campus. Slight modifications to existing restrooms to support this as well. The community that SU is in would

likely strongly support this shift. Tables, wifi routers, and slightly restroom modifications and definitely within the scope of changes we could implement.

In conclusion, a single use restroom is not very original. They have been in your home for 100 years. However, making this a chief feature of our design we are prioritizing user sentiment and accessibility over other factors that drive gendered restrooms.

## 5. Paper Prototype

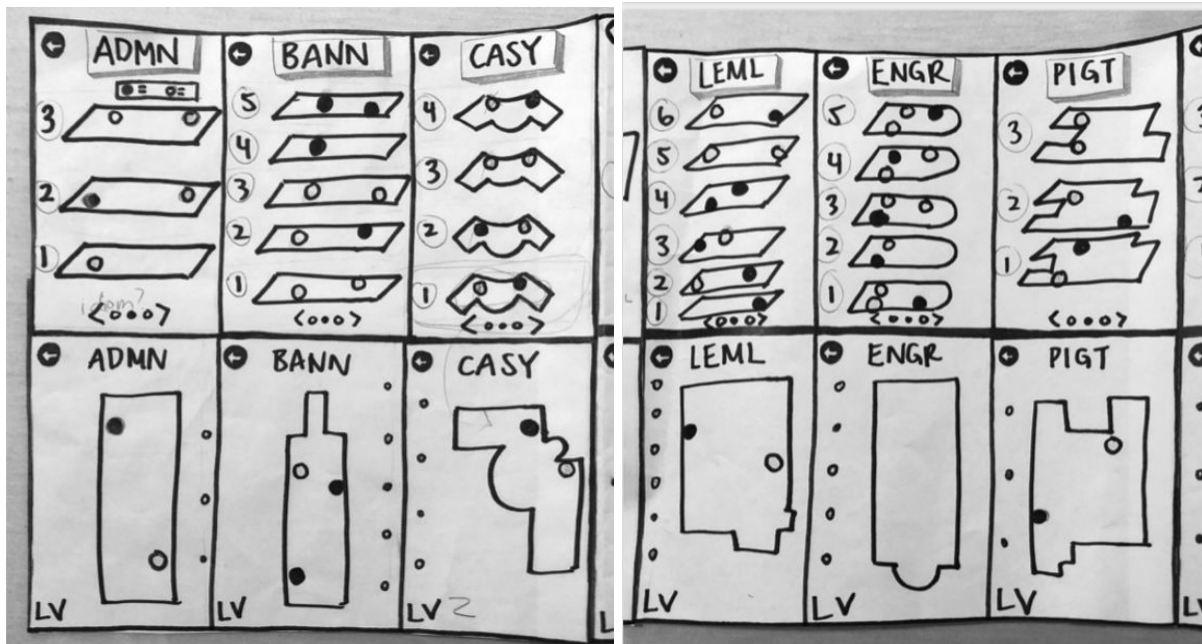
### Five Key Tasks

- 1) Provide live information on vacant and occupied restrooms in all SU campus buildings on all floors as well as individual restroom reports that detail cleanliness and amount of use.
- 2) Allow users to search for vacant restrooms by quantity, distance, and cleanliness.
- 3) Provide a space of privacy and home-like comfort
- 4) Provide a touchless restroom experience to ensure cleanliness as well as the safety and health of the users
- 5) Provide a restroom experience that is mobile-friendly.

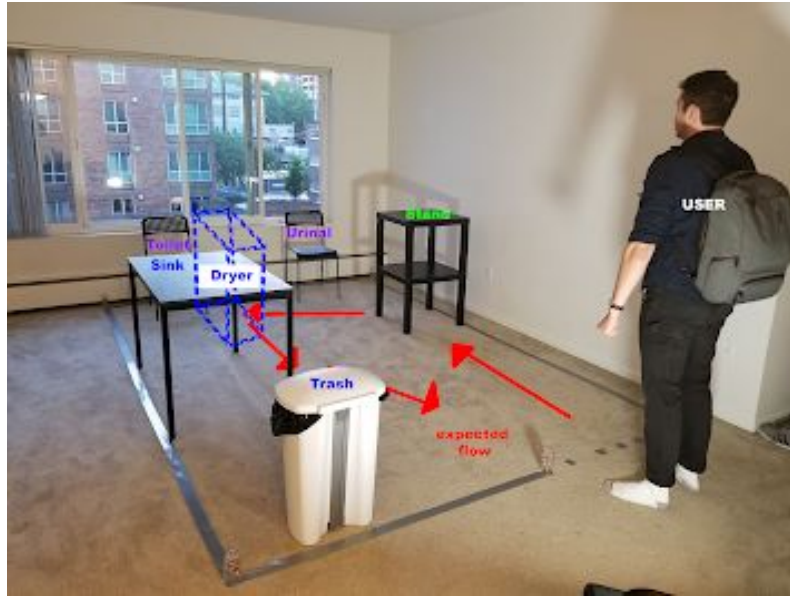


The above picture shows the splash and map screens of our paper prototype. We guided the user through this prototype with construction paper phone cut-out (not shown) that we slid across the screens to represent interactivity. A strength from this design is the map. It is a familiar interface that allowed for an easy way to get a big picture of the SU restroom scene with minimal hassle. The only noticeable changes from the sketch and this prototype would be the addition of the splash screen and the removal of the hamburger menu, which we felt was unnecessary. In our first iteration users did not know how the user was oriented on the map and did not understand what the numbers on the buttons represented. We fixed both of these problems by adding the compass on the bottom-left of the map screen as well as adding the label "Number of Available Restrooms" to the top of the map screen. The tools to implement this kind of software are readily available, but the cost of putting the required sensors in each restroom makes it only somewhat feasible. An interesting bit of feedback that we got from a

user was the idea of showing all the buildings in a sorted list as well in the map which we really liked and implement in later iterations.



The above photos show the paper prototype screens for our building directory and building floor plan screens. These screens allow for the user to quickly access detailed building and floor info relating to restroom locations with intuitive swiping motions. If you compare the prototype to the sketch you can see that we abandoned the preliminary “Building View Occupancy” pages and decided to go straight to directory and floorplan pages. We felt that this was more efficient. You can also see that we used filled out or empty circles to represent the stalls. Another notable change would be the switch from the hamburger menu to the back button to travel back to the map page. We iterated on this as we got feedback for the screens. The breadcrumb dots were added to the bottom of the building directory pages as well as the floor plan pages to make swiping more intuitive. We got lots of impactful feedback from our users when they tried our prototype. We learned that some users might want more information about the building and thought that the building label was a button.



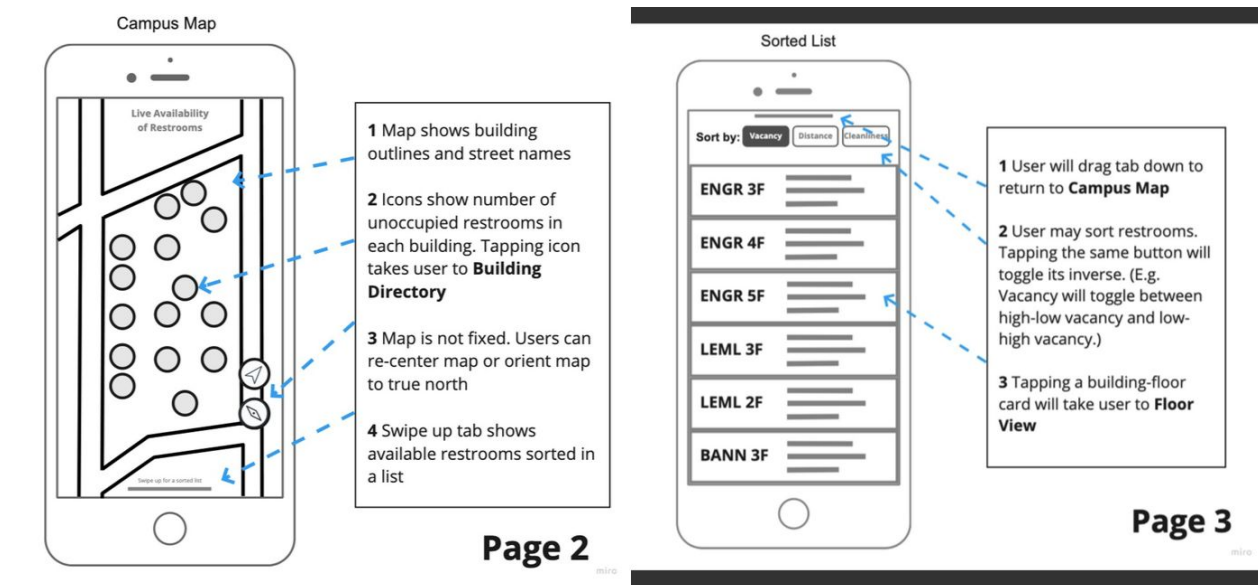
The above photos show the “paper” prototype of our physical restroom floor plan. Unfortunately, due to the difficulty in creating and transporting the physical space we were not able to use it to test many users. Our restroom had an excellent circular flow that we still keep in our later iterations. You can see that in this physical creation that we abandoned the couch as we felt it took too much space, was unnecessary, and would encourage users to stay in the restroom for longer than desirable. In testing the restroom we found that the protrusion of the stand to be a bit awkward and harmful to the restroom flow.

## 6. User Evaluation Findings

Video of user experience available here:

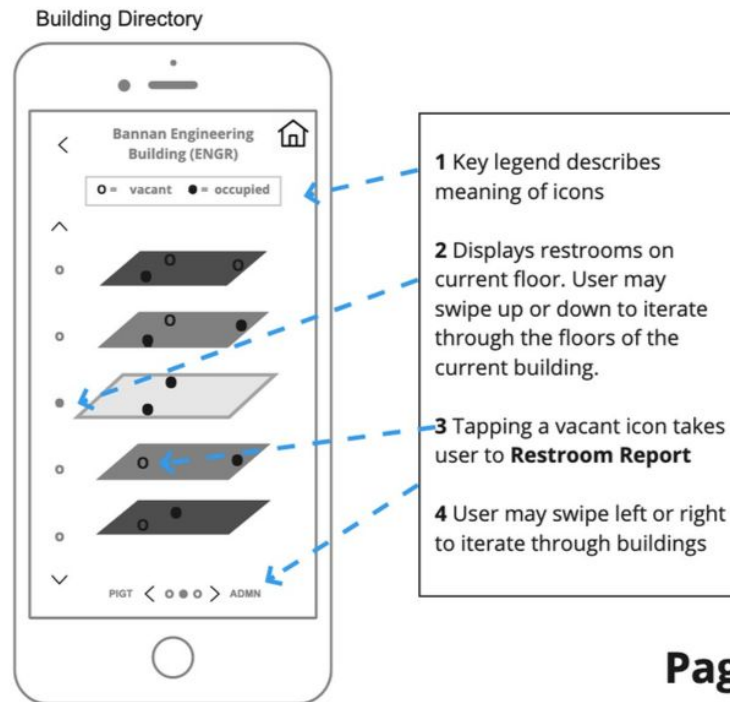
<https://drive.google.com/file/d/1Aoz33pmbppUy6VUsEwe4A-eSgg7vww-k/preview>

## 7. Annotated Wireframes



Displayed here is the map page along with the new sorted list page. These wireframes allowed us to put a lot more content in a much more digestible format. We were able to add significantly more text without sacrificing so much space, such as with the above label shrinking and the addition of an instruction to swipe up at the bottom of the page. Significant changes to the map page were needed. They include but are not limited to: removing the number of available restrooms from the building buttons, relocating of compass, redesign of current position icon, and the bottom drag bar. The sorted list is also a big change as it is a completely new development that stemmed from feedback from the paper prototype. We were blown away by the high quality feedback from our users. In addition to increasing the size of the bottom drag bar to increase its affordance, they also came up with much better ways of displaying the map view as a list of items that could be sorted. This not only provided much utility to the app, but also brought it up to parity with many other applications that utilize location and a map view to display locations.



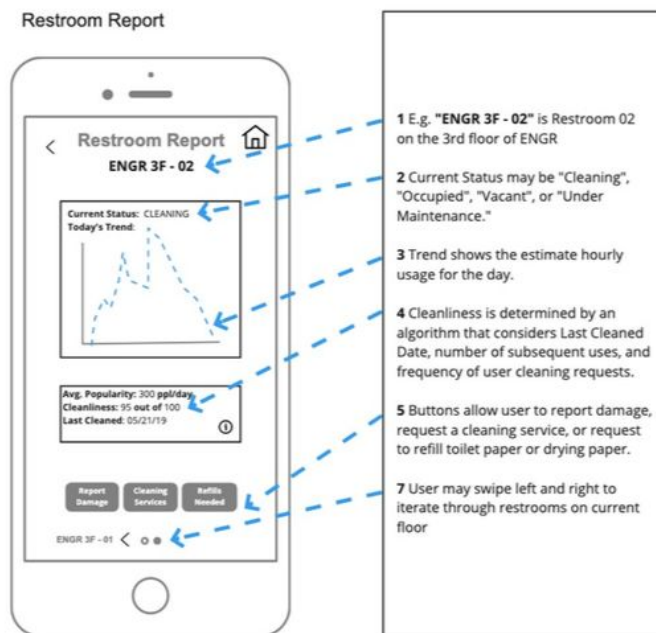


## Page 4

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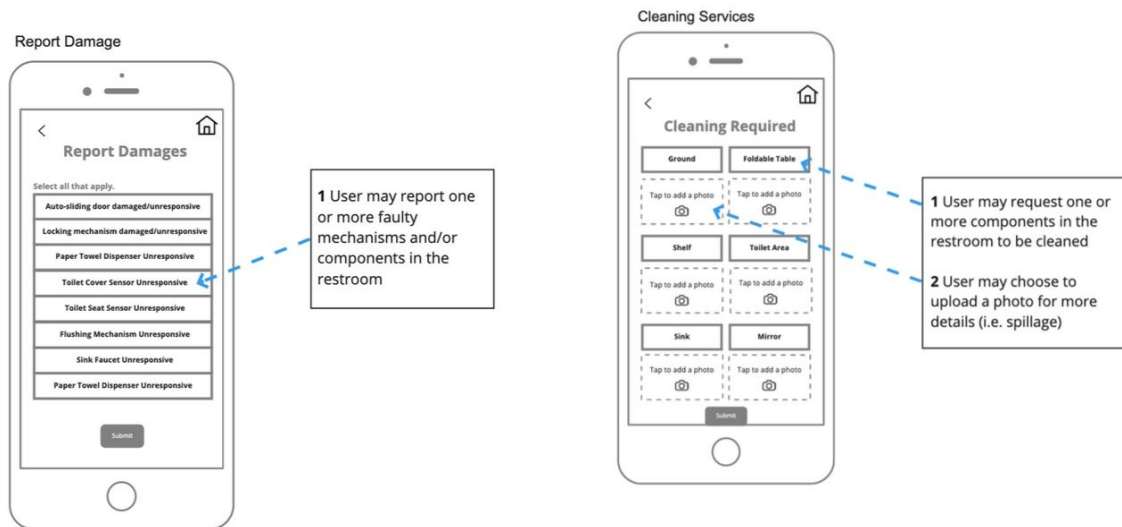
Above is the wireframe for our building directory/floor plan page. This page shows all of the necessary information a user needs to find the nearest free restroom by them in a single page as well as provides an aesthetic “magnification” animation when highlighting a specific floor. While we were proud of the simplicity of the initial single page floor plan, we ended up combining the floor plan page and the directory page after feedback from users. In addition, we added a key that made it easy for users to interpret what the dots on the map represent. Another interesting suggestion we got was that we should open the application on this page if the app detects your inside an SU building. The inclusion of the “Home” button was also the result of user feedback as they did not like pressing the back button so much. We were also informed of the problem of the difficulty to understand these floor plans without markings representing entrances and exits.





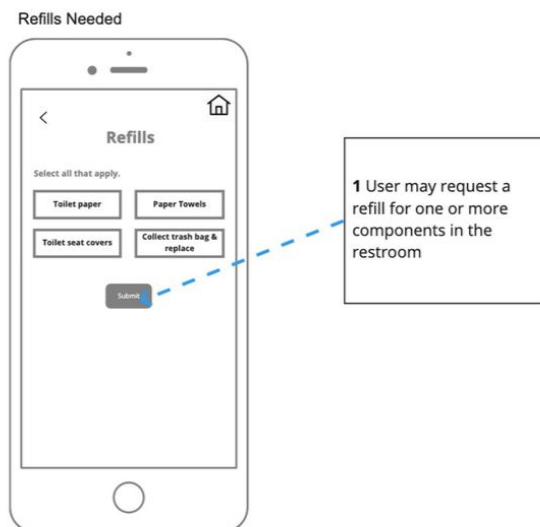
## Page 5

The new restroom report page in the wireframe above was added so users could get more information about the cleanliness and other information about the restrooms that they had requested. This page is highly informative for the user in deciding which restroom they want to, or plan on using. This restroom also has buttons that guide the user to pages where they can report problems with the restroom to the appropriate staff, which many of our users greatly appreciated. This page came as a direct result of user evaluations: originally we had a circular graphic that was less easy to interpret. So we morphed it into the above information box in the bottom of the screen. We also added an information button to a floor plan page from that was suggested by users.



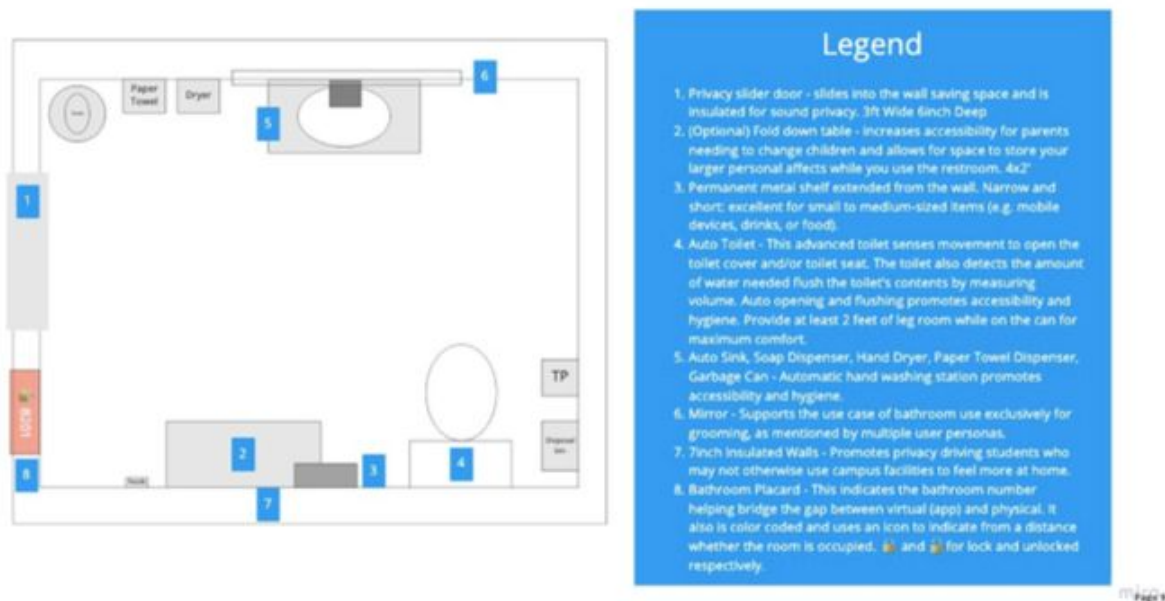
**Page 6**

**Page 7**



**Page 8**

Here we can see the refill and reporting pages that are accessible from the restroom report page. These pages greatly empower the user to help SU keep restrooms up to the student's preferences and standards. These are brand new pages that came into being from user (instructor) evaluations and also opened the door to thinking about this app from a building facilities perspective. While we did not explore the facilities perspective in depth due to time constraints, it was an impactful suggestion. It allowed us to add multiple pictures to aid the 'required cleaning' reports and provided a whole new dimension of functionality to the app.

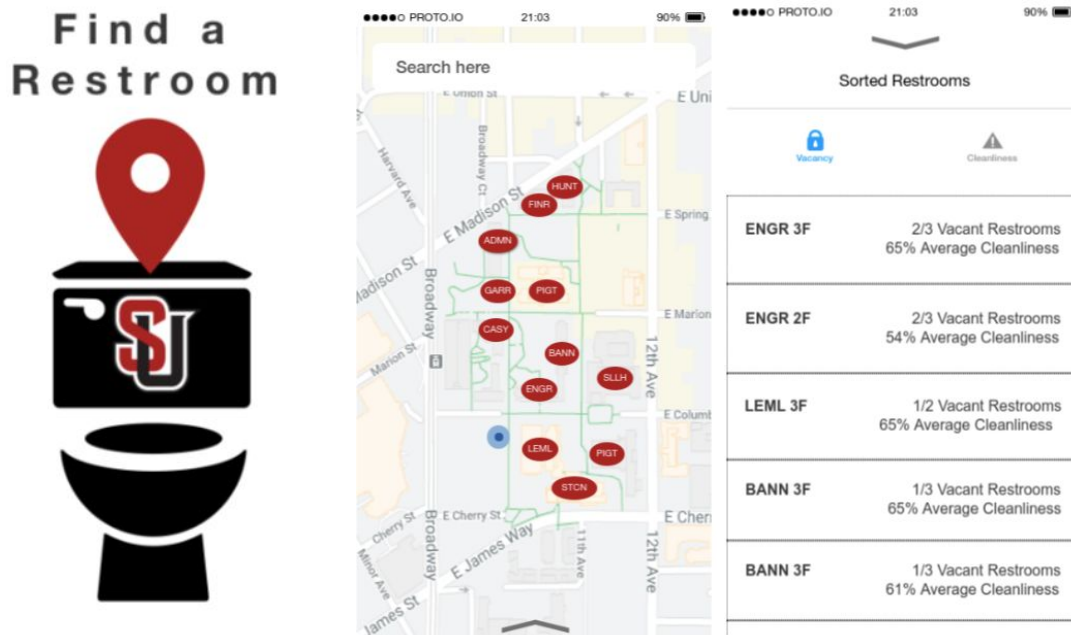


Above is the wireframe for our physical restroom floor plan. This floor plan shows all of the necessary facilities a user needs to use to his or her restroom usage routine. After we had the initial design for the restroom floor plan, we walked through the idea with two interviewees to get their opinion about the initial sketched floor plan. We found out that there were some facilities that may need to be changed, such as the accordion-folding doors may let users think that it's not soundproof, and having a wifi router installed in the restroom will be too much. Based on this information, the above is the updated wireframe includes the following features:

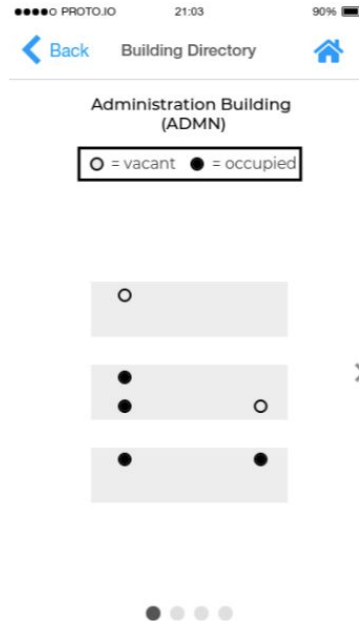
1. Privacy slider door - slides into the wall saving space and is insulated for sound privacy. 3ft Wide 6inch Deep
2. (Optional) Fold down table - increases accessibility for parents needing to change children and allows for space to store your larger personal effects while you use the restroom. 4x2'
3. Permanent metal shelf extended from the wall. Narrow and short: excellent for small to medium-sized items (e.g. mobile devices, drinks, or food).
4. Auto Toilet - This advanced toilet senses movement to open the toilet cover and/or toilet seat. The toilet also detects the amount of water necessary to flush the toilet's contents by measuring volume. Auto opening and flushing promotes accessibility and hygiene. Provide at least 2 feet of leg room while on the can for maximum comfort.
5. Auto Sink, Soap Dispenser, Hand Dryer, Paper Towel Dispenser, Garbage Can - Automatic hand washing station promotes accessibility and hygiene.
6. Mirror - Supports the use case of restroom use exclusively for grooming, as mentioned by multiple user personas.
7. 7inch Insulated Walls - Promotes privacy driving students who may not otherwise use campus facilities to feel more at home.
8. Restroom Placard - This indicates the restroom number helping bridge the gap between virtual (app) and physical. It also is color coded and uses an icon to indicate from a distance whether the room is occupied. 🚻 and 🚻 for lock and unlocked respectively.

## 8. High-Fidelity Mock-up

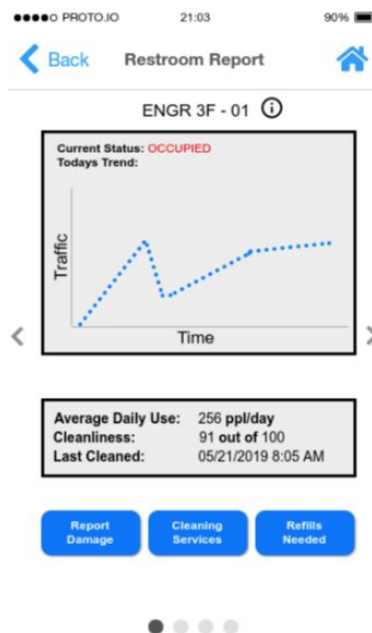
Demo at: <https://share.proto.io/NJC1BZ/>



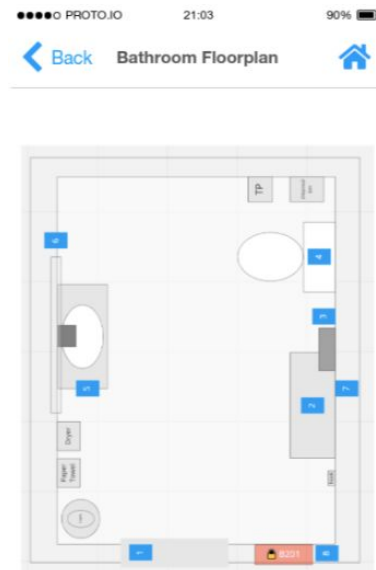
The above photos show our final mock-up's splash, map, and building list pages. These (and the following) pages were developed using proto.io's high-fidelity prototyping software. The labels that we were able to add to the map page make it much easier to find the building that you are looking for or wondering about. Similarly, the color that we added to the user current location icon makes it much easier to determine your closeness to building locations. Another great strength would be the search capability to allow the user to find the exact building they desire. The labels on the buildings, the colored current location icon. We removed the compass. We changed the bottom drag button to a chevron to make the upward swipe affordance as clear as possible. We also added much more clear information on the list page. Another great addition (not shown above) are pop-ups that appear over the building labels when clicked that show the full building name, how many restrooms are available, and their average rating.



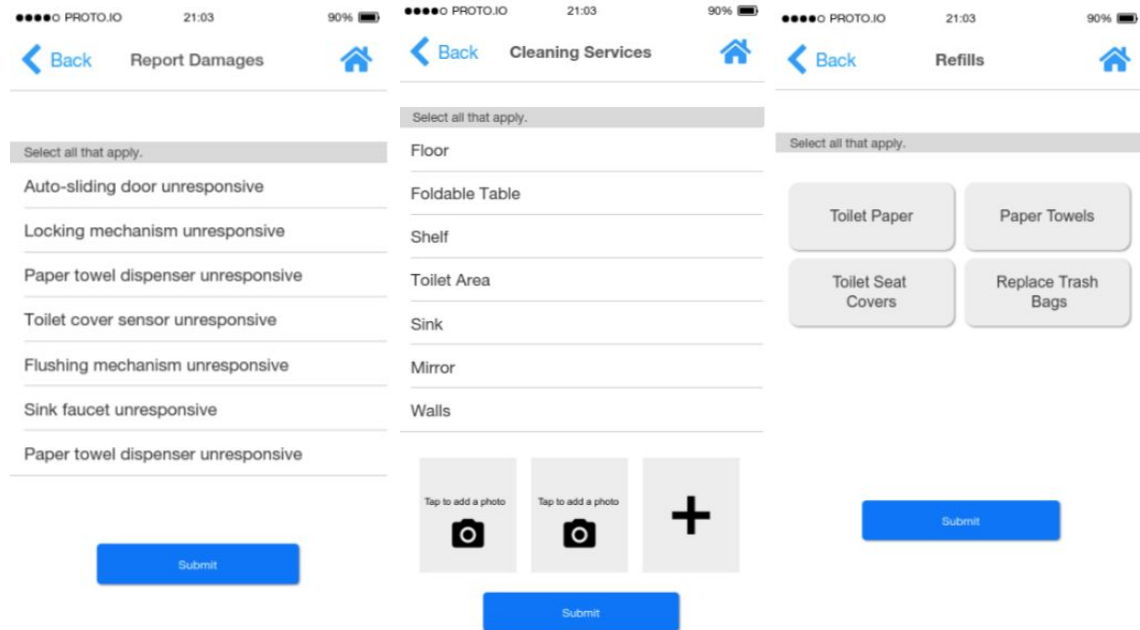
The final form of the building directory page turned into a much simpler experience. We wanted to use visual aids as much as possible to indicate the restrooms status. While the style and design paradigms fit well with the rest of the app. The challenge of figuring out how to orient the user with the building is still present and something we are working through now.



The restroom report page turned out really well in the high fidelity mockups, we think. This page is extremely useful and digestible for the user. It quickly allows them to understand all they need to know about a restroom (and the other restrooms on that floor) in order to make a decision as to where they want to go. There were minimal changes from the wireframe to the mock-up. The most significant change was the addition of color to the text and buttons to increase comprehensibility and affordance respectively. Display data in graphs can be a really powerful way to convey information and we thought it is well suited for this application.



This is the restroom floor plan page. This page allows the user to know what to expect when they enter a restroom and plan ahead if they need to. Although we plan on each restroom having the same floor plan this page would hold any discrepancies any specific restroom might have. This is a brand new page that had no previous wireframe to iterate from.



The three restroom refill/reporting pages gave a new set of functionality that we did not get out of user interviews alone. It only came once we had a seed idea for an app and then got feedback from real users. The most significant changes are the drop-shadows and colors used on the buttons in order to increase their affordance. Also upon selection of items on the “Report Damages” and “Cleaning Services” the items become blue and get a check mark (not shown) which greatly increase software feedback.



This is the physical restroom model. This model shows all the finalized features that will be inside a restroom. So, every restroom will be a single use restroom, and it includes the following features: An automatic opening and locking door which allow users to enter the restroom without touching the door handle, and it prevents user forgetting to lock the door. An automatic foldable table for users to put their stuff. An automatically toilet which will flush or open the toilet seat by itself. A shelf next to the toilet seat allowing user to put their cell phone while using the toilet. An automatic sink and a huge mirror for user to wash their hands and look at themselves. A dryer and a paper towel dispenser for users to dry their hands based on their preferences. An automatic trash can for user to put used paper towel.