Phase 10: Final Report
HoBo: Homeless Board

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Abstract

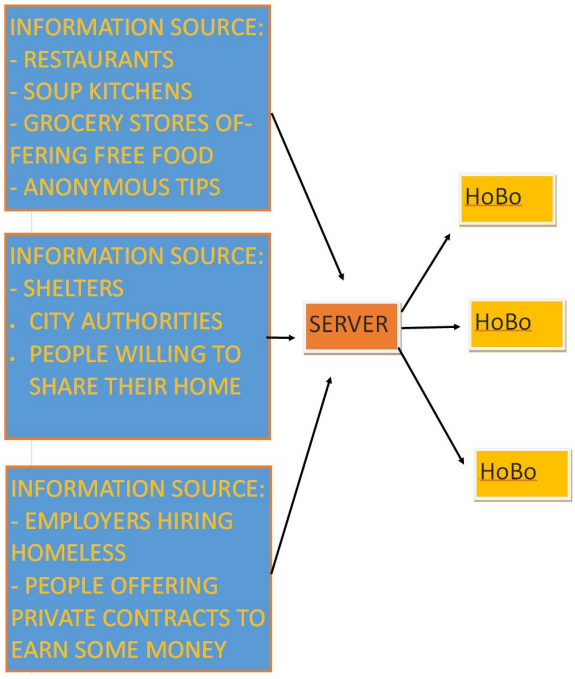
In this document the Orion D3s18n team describes a new product meant to enhance the ability for socially marginalized homeless to interact with computers. We research existing work in this field and the current limitations and challenges surrounding homeless people and technology. We then describe our methods of research, the results that we found and how this information can improve upon existing research and provide new and meaningful interaction methods for the homeless. This is followed by the ideation process where we theorize how to use this new information to develop a product that addresses the issues homeless face in a more effective manner than the already existing solutions. We then describe the development of a prototype and its usability testing and explain subsequent changes that were made to enhance the user experience. We conclude by talking about possible next steps for this project.

Introduction

Homeless people believe that the Internet is unreliable [1]. They believe that the information available online is unfocused, irrelevant and often deceptive. However, studies show [2] that as Internet penetration levels increase, this creates a digital divide between people who are willing to use this technology and those who are not. The Internet provably enriches the lives of its users - a study [3] by Fortune 500 firm PWC confirms that giving Internet access to people in social housing increases their likelihood of having more disposable income and more upwards social mobility. In other words, at-risk communities benefit tremendously from internet access.

Our solution to this dichotomy of untrusting homeless people and useful technology is to create a product that incorporates fluid, changing information into a format that is highly visible and accessible while not specifically associable with the Internet.

In this paper, we present HoBo - the Homeless Board. This is an information kiosk specifically tailored to the needs of the homeless. We incorporate previous studies on how to optimally present information to marginalized groups with new research on what specific issues the homeless are currently facing and how technology can help solve those issues. Our product will be scattered across major cities to maximise visibility and streamline accessibility. The board is the "Client" to a server that constantly updates with the most important information that our research shows homeless people are in need of. Food, housing and opportunities to earn money - research shows that these three are of critical importance to the homeless but online sources do not adequately present correct and relevant information about them. Therefore, our product is intended to first collect information from sources and then broadcast them to each board through a distributed system as shown in this diagram:



This distributed system serves two purposes:

- Allows any **offline source** willing to provide information to help the homeless provide it to an always-available, centrally located server.
- Allows the server to connect to any number of homeless boards which will be located throughout the city in places found to have a high incidence of homeless individuals.

This will allow reliable offline information to benefit from network technology and present information to the homeless in a manner that they are more likely to trust and use.

Related Work

We conducted our literature review with a view to learn more about problems that the homeless are currently facing, instead of attempting to find existing solutions to a specific problem that the homeless may be dealing with. The benefit to this was that our future iterations could then be tailored to the resolution of problems that our research pointed towards. The disadvantage is that our literature review found some sources that were vague and did not contribute to our ideation process. Therefore, we retroactively did further research once we knew what product we would be developing.

The literature[6] suggests that the homeless do have some access to technology. However, tech penetration levels remain stagnant and knowledge on how to use such devices is lacking. Cost is also an issue. It suggests that giving access to mobile phones improves the ability for homeless to communicate and better anchor themselves to society through social networking apps, the ability to call loved ones and to search for services. Homeless veterans, in particular, have embraced novel uses of smartphones such as keeping track of healthcare appointments. While the homeless have shown interest in using computers to search for jobs, the youth cite a lack of knowledge on how to use it for specific roles such as finding jobs[7].

The literature[6] also indicated that 'homeless' is a very diverse group that can be divided into multiple sub-groups, such as male, female, youth, elderly, veterans, drug addicts, HIV-positive and more. They each have unique requirements regarding things unrelated to tech, but the literature suggests that there is little difference between these groups in the way they interact with technology, except that the youth display a higher likelihood of using social media. All subgroups display certain commonalities, such as a decreased use of tech compared to higher class people, an interest in wanting to use them for social networking and job searches, and issues coping with the price of phone plans/mobile data.

Once we decided that we would be creating an information kiosk, we did further research on information delivery systems for the homeless. Research [4] shows that gestalt psychology, typography and color can all play an important part in making a user interface more accessible for socially marginalized groups. These factors both allow an individual to more easily navigate an interface and psychologically increase their disposition towards believing that an interface is useful, thus letting them use it more. We also found studies[5] that attempted to do usability testing on groups with low income and literacy. We found that there are specific techniques that the observer must do during usability evaluation to gain useful information during this process, such as wording the questions simply and clearly, and not asking questions that are too intrusive about the tester's social situation.

User Needs Research and Results

Our first research instrument was a questionnaire that consisted of questions about technology among the homeless including ownership, use, existing technology, missing technology and so on. Since the questionnaire was conducted online, our observations are biased towards people who already use technology. On the other hand, these people understand what technology is available or missing and what improvements should be made. We had a total of 33 respondents.

Our second instrument was covert observation of homeless people on online forums. We observed some of their posts on Reddit and noted how they access technology, what challenges they face and what problems they believe that need solving. This gave us more in-depth knowledge of specific technological problems they were facing because we were able to read first person accounts of specific scenarios that individual homeless faced during their lives. We observed 13 people in total.

Our research pointed out that homeless people are comfortable with using modern technology to access the Internet. However, they are constrained by the cost of technology and lack of Internet access. They also encounter difficulties when trying to use these devices to satisfy their primary needs - finding food, jobs and shelter:

In response to the question, "Which of these services are difficult to use with current tech?" searching for food/shelter had the highest response with 80% selecting this option.

Searching for jobs (40%), browsing the Internet (20%) and staying in contact with friends and family (15%) were the other options selected.

The most common reason for this is the lack of technology targeted for this marginalized group and secondly, the lack of information about these resources in the digital world as well as a belief that traditional communication methods like word-of-mouth, flyers etc provide more focused and accurate information. Many homeless people browse the Internet in spite of believing that non-internet sources of information are still relevant and useful. If we can find a way to interface traditional information sources (that aren't already available on the Internet) with modern communications technologies, we can allow the homeless to more effectively access the information they need.

Based on our research, the problem that we are interested in solving is, "How can technology be used to help the homeless locate services that they deem important?" and relatedly, "How can this information be made easily accessible to all?"

Our target audience are homeless of any age and gender. The user requirements that our solution has to meet are as follows:

- The solution should cater to both personal electronic device owners and those without any.
- The solution should be intuitive and someone with little tech background should be able to grasp it immediately.
- Our target audience should be able to search and find resources that they deem important - food, shelter etc.
- The solution should be affordable and accessible. - It should be able to provide localized information. For example, shelters in the neighbourhood.

Job Stories

When I am hungry, have a limited budget, and am not sure of free/cheap places to get food from in my area, I want to be able to locate a place in my immediate vicinity that provides either free or affordable food, so that I do not have to sleep on an empty stomach and I have the energy to find jobs and interact with others.

When I have no place to sleep at night, it is extremely cold and I do not have a blanket to keep me warm, I want to be able to find an organization in my area that safely shelters me so that I do not have to spend the night on the streets and worry about people taking my personal possessions while I am asleep.

When I am in need of money and employers are unwilling to give me a chance due to prejudice against the homeless, I want opportunities to quickly earn some money by doing one-off tasks for private contractors. These tasks should be doable given my skillset and should immediately return payment to my mobile phone, whether it be through PayPal or Interac.

When I have been out on the streets for a long time and have not showered because I don't have access to basic necessities like running water, I want to be able to find places in my local area that will let me shower or wash up so that I can feel clean and rejuvenated, look presentable for job interviews, meet other people without feeling self-conscious and feel good about myself overall.

Ideation

Our ideation process closely mirrored the process used at Google Venture(GV). Below are a few examples of the best brainstorming ideas.

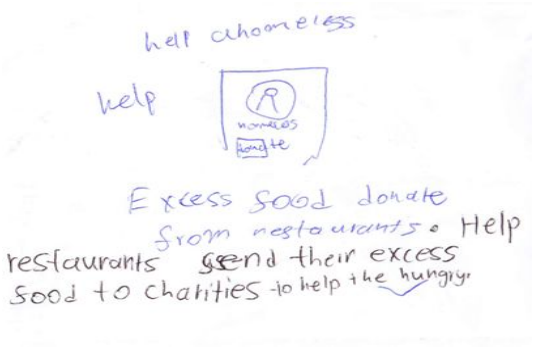


Figure 1: Top Crazy Eights idea

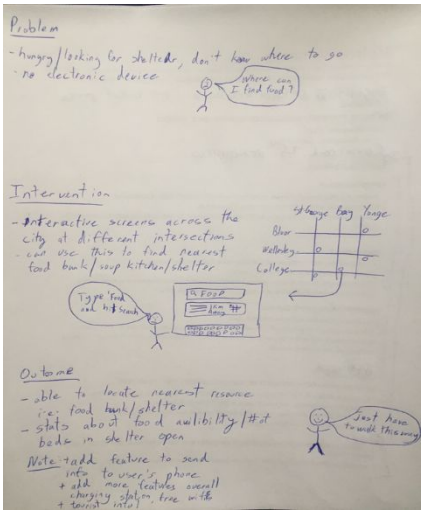


Figure 2: Storyboard for Interactive Boards idea

Some ideas that group members and outside spectators expressed interest in are as follows:

- An application that would connect charities with restaurants to provide food for the homeless. A restaurant can send excess food that they had prepared to nearby charities or food banks. The excess food is often just thrown out and is a waste and this is a possible solution to the idea. Restaurants that participate in the program would receive tax credits as incentive.
- An app that provides job opportunities that are specifically tailored for the homeless and are not discriminatory in nature, which studies show that homeless often have to deal with.

After some deliberation, we decided to implement this idea: Interactive boards would be placed at different intersections across the city. The homeless could use them to search for services such as food banks, shelters and so on. The board would provide relevant, localized information.

Figure 3: A Mockup of Interactive Boards idea

Furthermore, it supported our research which showed that cost was an issue and that homeless people were untrusting of the Internet. This product would allow the homeless to indirectly interact with the Internet and benefit from specific services that the Internet provides while having the assurance that the product is supported by the municipality who gave it certification for usage and deployment in the city.

This eliminated the need for our target users to own a personal electronic device and was much more accessible as a result. However, as indicated in our research, many of our target users owned a personal electronic device and we wanted to cater to them as well. During the tutorial on usability testing, a user suggested that we add a feature that would allow a person to receive information from the board on their smartphone. For instance, the address of a shelter would be sent to their phone so they can consult it for directions instead of memorizing them.

Prototype Description

Our original prototype was designed in Invision. For an interactive version of this prototype, see: https://projects.invisionapp.com/share/JQATE2D9N#/screens/223057357.
The interactive board would be based on the abstraction of "Information Kiosk" that is commonly seen in HCI.

Figure 4: Home Screen of 1st Prototype(Weather)

Our default screen was one that displayed the location and the current weather at that location. Upon timeout at other screens, our app would automatically switch to this screen, ready to be used by the next person. We used the colour orange because of gestalt psychology: it looks inviting and warm and is part of a whole. Since our research has shown that the homeless mistrust the Internet, this colour scheme was chosen with the intention of gaining their trust and making our product look welcoming and safe to use - we are exploiting the nature of human cognition to make our product more usable. Clicking the menu button on the top right corner (the three horizontal lines) would take the user to

the main menu.

Figure 5: Main Menu of Original Prototype

Most of the functionality is located on this screen. From here, a user would be able to scroll through the various services and select the one that he/she is interested in. We included 5 options:

1. Free Food Locator - Display a list of nearby food banks, soup kitchens, or other organizations/events that provide free food along with their location.
2. Public Toilet Locator - Display a list of nearby toilets with their location.
3. Paid Errand Finder - Display a list of nearby errand opportunities. Errands are small one-off jobs offered by citizens who require help. For instance, a person who needs help moving can post an errand on the app and a homeless individual can contact this person to do the job.
4. Shelter Locator - Display a list of nearby shelters with the distances to each one.
5. Job Postings - Display a list of available jobs. Jobs unlike errands are either permanent or part time. This is essentially a job board.

Figure 6: The search result pages for each service. From left to right: Free Food Locator, Public Toilet Locator, Paid Errand Finder, Shelter Locator and Job Postings

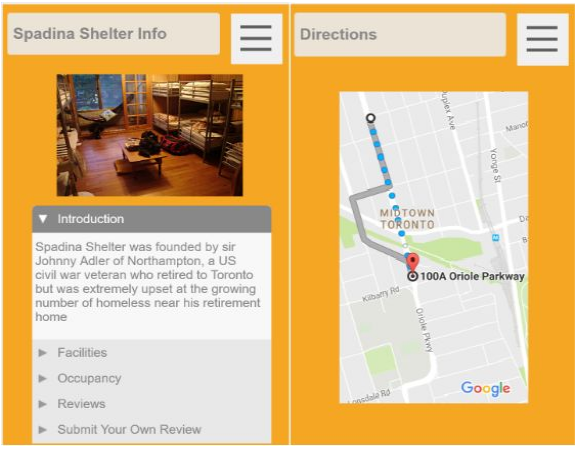


Figure 7: Shelter Info and Directions Screens

From the search results pages, a user can either find out more information about the place by clicking on the name of the place or get a map with the directions to the location by clicking 'Directions.' The info about shelters would be dynamic and the occupancy of each shelter would be updated in real time - the search results would only display shelters that are below capacity.

Usability Research and Results

Two users had the chance to go over our prototype to perform three tasks. The three tasks were:

1. Find the nearest shelter with space still available.
2. Find a washroom and transfer the address to your phone.
3. Find an errand to run and transfer the poster's phone number to your device.

Overall, during usability testing, we found out that users had difficulty in navigating the app at times. In particular, there was confusion between the back button and the menu button. The menu button sometimes went two pages back unexpectedly. Additionally, the back button was at the bottom of the screen and not easily accessible. To fix this, we added the back button to the top left corner of every page. Another concern raised was that the free food search results page looked different from the rest of the app and this was addressed in our final design. Other suggestions included altering the colour scheme and changing the app to landscape to avoid scrolling through the main page. Ultimately, we did not implement these changes because they were low impact, high difficulty problems and we could not justify the time spent on them.

While attempting to perform the first task, the users wanted a way to sort the search results and

suggested sorting them by distance. This change was immediately added to the final product. The users also asked for more information about shelters such as whether they allowed pets or whether they were gender specific. However, this information needs to be provided by each specific shelter. There is a place in the app for this information to be displayed.

In the second task, users expressed that they would like to know whether the bathrooms listed are gender neutral or not. They also had difficulty completing the second part of the task, which required them to transfer the address of the washroom to their personal device. The common complaint regarding this was that there was no button that would allow this transfer to take place, and subsequently, no confirmation message indicating that the task had been performed successfully. We kept these complaints in mind and added gender to the listed information about the bathrooms. We also incorporated a screen that gave detailed instructions about how the phone needs to be aligned with the board in order for information transfer to take place.

In the third task, there was some confusion regarding the difference between jobs and errands. We realized that the difference had not been communicated clearly, hence, we combined the two under "Job Postings" and clearly explained the difference between them. Users could then click on either of the two icons based on the kind of job they were looking for. These icons were placed directly below the explanation provided. Users also indicated the need to know the location of the jobs posted, so that people could choose to contact posters that were located nearest to them. We took this into consideration and included the distance for each job posting next to its name. Finally, a user suggested that we incorporate information about free healthcare in the services that the board provides. This idea was popular among the Orion D3s18n members, and so we added it to the final prototype. To view the updated prototype, see: https://invis.io/SHB1OWKM3

Conclusion

In this project, we defined how a custom, well researched interface to relevant information can significantly improve the lives of homeless. *Our goal is not to solve the problem of homelessness but rather to explore how one could use emerging technology to integrate this marginalized group into society*. The user-needs research we performed suggested that homeless people do have access to connected devices and are quite comfortable using them. The problem is the lack of information about resources on these devices and on the Internet. We came up with a solution that groups most of the needs of the homeless on a single platform, namely an interactive board. This device is to be placed in public locations and provides homeless people a chance to access important information, about job opportunities available to them, shelters around them and weather alerts and will provide a means to acquire many of the things that research shows homeless are lacking.

If we had to continue working on this project, our next steps would include extensive research to compile the data required for the system to actually function, for instance, shelter information and food bank hours. Additionally, we would need to research ideal locations for the board itself. Another step would be to perform usability testing on our actual target users. They would be able to give us the most useful criticism that can improve our design and implementation. Later on, we could add additional features like nearest shopping malls and nearest hospitals to make the board open to a larger set of users. Furthermore, this improvement provides more privacy to homeless people as anyone is free to use the interactive board, which means that the homeless would not stand out as its only users.

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