6-3-2014

StreetConnect

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SENIOR DESIGN PROJECT REPORT

Submitted in partial fulfillment of the requirements
for the degree of
Bachelor of Science in Computer Engineering
School of Engineering
Santa Clara University

Santa Clara, California

June 3, 2014

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2014

ABSTRACT

An estimated 2.5 million youth ages 16-24 experience homelessness in the U.S. each year. These youth are disproportionately affected by sexual health issues, including HIV, STIs, teen pregnancy and teen dating violence. For youth, mobile phones are increasingly one of the main ways that they connect to the people and resources around them. Additionally, mobile apps via tech tablet are becoming a major tool for many healthcare providers in the U.S. Healthcare providers can play a critical role in providing appropriate care to homeless youth, and linking them to other health services. Research suggests that linking healthcare with other services needed by homeless adolescents, such as shelter or food, might help improve their continuity of care. Our project developed and tested the feasibility of YTH StreetConnect, a dual-purpose mobile app connecting homeless youths to local healthcare providers. We successfully created two mobile apps to help homeless youth locate resources, rate resources, find information, and communicate with healthcare providers through a technological interface.

Acknowledgements

We would like to thank the following individuals for their help in building StreetConnect:

- Dr. Silvia Figueira of Santa Clara University for her guidance and advising
- Deb Levine of YTH: Youth+Tech+Health for the giving us the opportunity to use technology to advance the health of underprivileged populations

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Chapter 1

Introduction

In the United States, approximately 2.5 million youth, ages 16-24, are considered homeless. Homeless youth are at a significantly higher risk of suffering from health related issues such as sexually transmitted diseases and infections (STD/STI), Human Immunodeficiency Virus (HIV), and unplanned pregnancies due to the lack of health education and resources available to them [1]. Their physical and mental health is often neglected and there is a large gap between meeting their basic needs and accessing health care services [2]. In Santa Clara County, there are over 14,000 homeless youth and another 2,000 unaccompanied youth at the time of service provision in 2012 [5]. Typically, these youth do not know how to find health care services, and if they do, they struggle to communicate with the health provider due to the sensitivity of the situation. Therefore, healthcare providers are not prepared to provide sufficient care due to this lack of information from the youth [3].

1.1 Problem

Nationally, half of all youth living on the street do not have a source of routine health care, and are therefore much more likely to go to the Emergency Department for their health care needs [6]. Reasons for this include complaints that accessing health care is difficult and time consuming [7]. The most immediate needs of those living on the street are safe shelter and adequate food; spending large amounts of time accessing healthcare interferes with acquiring those primary needs. Homeless youth also report that accessing health care is made more difficult by lack of insurance or being unsure how to find the necessary providers, distrust of adults or health care providers, fear of social services or legal intervention, and difficulty obtaining transportation [4]. As a result, both physical and mental health problems go untreated until the person experiences some significant crisis or until the condition is severe enough to require treatment at emergency departments.

Homeless youth are responsible for seeking health care and appropriate services for their individual needs. The government provides funds to health care providers to treat homeless youth free of charge. They are also placed at the top of the waiting list as a part of the high risk demographic. Although youth can receive free health services from clinics, acquiring information on STD and HIV prevention, conception, and other related sexual health issues is not always readily available or easily obtained [7]. Healthcare providers may provide services to these high risk individuals, but they will be inefficient if homeless youth are unaware the services available to them [7]. An alternative approach is needed in order to improve the communication between healthcare providers and homeless youth in order to protect their health and safety.

Research suggests that linking healthcare with other services needed by homeless ado-

lescents, such as shelter or food, might help improve their continuity of care [6]. In Santa Clara County, homeless and unstably housed youth most often use services providing food and clothing, according to a list of over 200 service providers countywide [5]. In fact, food and clothing were the top three terms of service usage by homeless people aged 16-25. By harnessing the services young people are using for nutritious meals and clothing and connecting them to sexual health services, domestic violence resources, and safer sex supplies, this one-stop shopping method could help ensure that the needs of homeless youth are met in a low-cost and convenient way, while ensuring that preventive, mental and sexual health care are accessed, instead of only crisis care [6].

While they might prefer to receive sexual health information from providers, the Internet is a key source of information for homeless youth. Internet access is found in public and private spaces, such as the library, service agencies, internet cafs or friends' homes [10]. Increasingly, youth access the internet via cell phones. Cell phones are one of the main ways that homeless youth connect to the people and resources around them. These devices are invaluable, providing them with the means to access caseworkers, social workers and health professionals, as well as shelter, jobs, family and friends [10]. Studies have shown that 62% of homeless youth have cell phones or mobile devices and 81% of physicians use tablets or smart phones with mobile applications [1][11].

Many healthcare providers already use mobile applications to help them provide care to specific populations. Mobile applications can improve the physicians ability to make decisions and provide correct diagnostics [11]. Research has shown that attending physicians and physicians in training who used professional apps during patient encounters perceived that even occasional use had an impact on their clinical decision making and treatment choices, with up to 72% saying they had altered treatment plans as a result of information

obtained using their device [11]. Recent research indicates that tablet usage is particularly helpful in provider/adolescent encounters. Research also suggests that the completion of an electronic-based history by adolescents prior to meeting with their health-care provider led to increased health risk counseling by physicians [9]. It also led to improved patient satisfaction with the health care visit.

1.2 Collaboration

We will work with the Youth+Tech+Health (YTH) team, an organization based in Oakland, CA that strives to search for new ways to advance the health of youth through technology. With them, we will improve the communication between homeless youth and healthcare providers through technology. We will work to enable youth to track, record, and rate use of local services while assisting YTH partners in keeping updated information on patients. The combination of YTH resources to our technical skills will improve the accuracy of sensitive information communicated between the youth to the physicians.

1.3 Proposal

In this project, we propose to build and evaluate a pilot mobile app that will be a bridge to engage homeless and unstably housed youth in their own sexual health and safety; connect youth to youth-friendly providers; and assist providers with integration of public and sexual health services into primary care. This app, YTH StreetConnect, will be built with interconnected modules for two audiences:

1. For Homeless and Unstably Housed Youth, the app and mobile web portal will pro-

vide links to location-based resources including sexual health care; mental health services; family planning/condoms; general health services; food, housing, and work force training; and records of their usage and satisfaction. We will explore using a check-in feature to ensure that referrals are geographically appropriate, and to allow for tracking of aggregate mobility patterns. The app will also directly offer, via SMS text messaging, health promotion and disease prevention information regarding HIV, STIs, pregnancy, intimate violence and healthy lifestyles.

2. For Healthcare Providers, the app will provide a database of youth-friendly local referrals; it will also contain easy-to-use tools and resources to help connect homeless and unstably housed youth to critical sexual health services, such as HIV risk assessments, STD updates and dating violence screening tools.

1.4 Project Objectives

This app provides a way for organizations serving the homeless in Santa Clara County to send announcements to registered users via text message, and for registered users to filter messages based on their interests and current situation and needs. CTA currently operates the Homeless Management Information Systems (HMIS), a data tracking service used by the U.S. Department of Housing and Urban Development (HUD) to collect information about homeless individuals, the programs and services they use, and the impact of these social service programs on their lives. This project will strive to cover three technical objectives:

1. To develop a mobile app with modules for homeless and unstably housed youth and

for providers who serve homeless and unstably housed youth.

2. To test the usability of the mobile web portal among 9 homeless or unstably housed youth aged 18-25 in Santa Clara County, and to test the usability of the mobile tablet app using inputs from 5 technical consultants who have local expertise in serving homeless and unstably housed youth in Santa Clara County.

3. To assess the acceptability and feasibility of this mobile app for homeless and unstably housed youth and providers who serve them.

Chapter 2

Requirements

After meeting with YTH to identify the deliverables, we created a requirements list shown in Table 2.1. We determined we needed to build two distinct, interconnected modules that communicate with our back-end databases. While discussing requirements, we had to keep in mind that we are building for the future so these needed to be clear and reasonable for future teams. We also need to keep in mind that this is sensitive health information so we needed to comply with HIPAA (Health Insurance Portability and Accountability Act of 1996) privacy rules. The requirements identified in the table define and qualify what the system must provide. This list identifies both the functional and non-functional requirements. Functional requirements define what must be done, and non-functional requirements define the manner in which the functional requirements are met. We will be able to use this requirements table to ensure that our project satisfies the required criteria.

Table 2.1: Requirements Table

Type	Requirement
Functional Requirement	The system will have two distinct but interconnected modules: Module 1 for homeless youth and Module 2 for health care providers.
	The system will provide prevention information and educational text messages for homeless youth.
	The system will connect youth to sexual health services and other health/social services based on their location (mental, family planning/condoms, general health).
	The system will allow youth to rate services.
	The system will provide resources (how to integrate HIV screening into primary care) and tools (online forms and guides) to health care providers.
	The system will assist healthcare providers in identifying referral services for the youth.
Non-Functional Requirement	The system will be scalable and easily expanded for related technology projects in the future.
	The system will be secure and protect the users personal information.

Chapter 3

Use Cases

Once system requirements were elicited, use cases were generated in order to define the core features necessary for any user to interact with this mobile system. The core use cases for this system can be seen in the use case diagram in Figure 3.1.

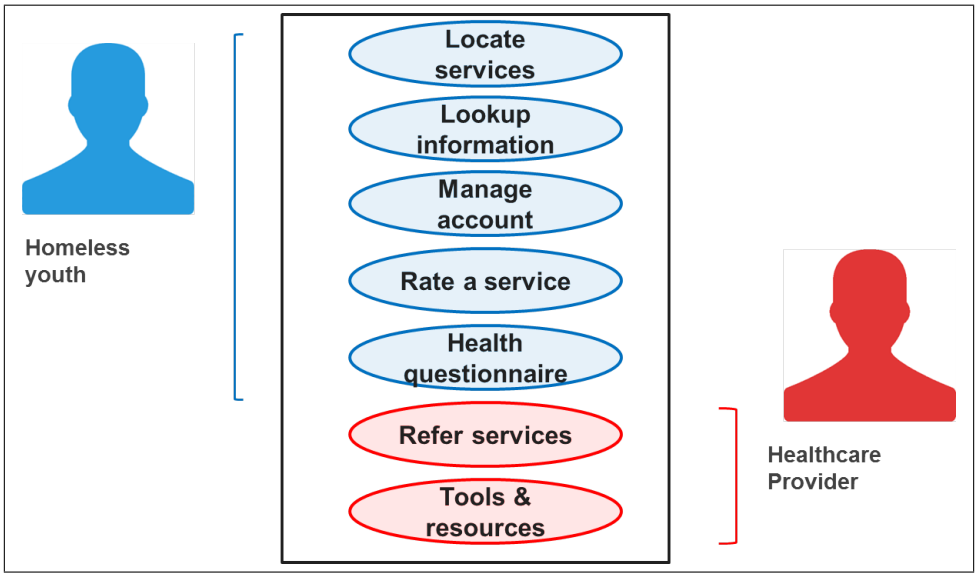

Figure 3.1: Use Case Diagram.

3.1 Use Cases for Homeless Youth

In the following subsections we will explain the use cases for the homeless youth including the goal of the interaction with the system, any preconditions, postconditions, and exceptions. For a better understanding of the text, we provide figures or screen shots for clarity.

Locate local health care services

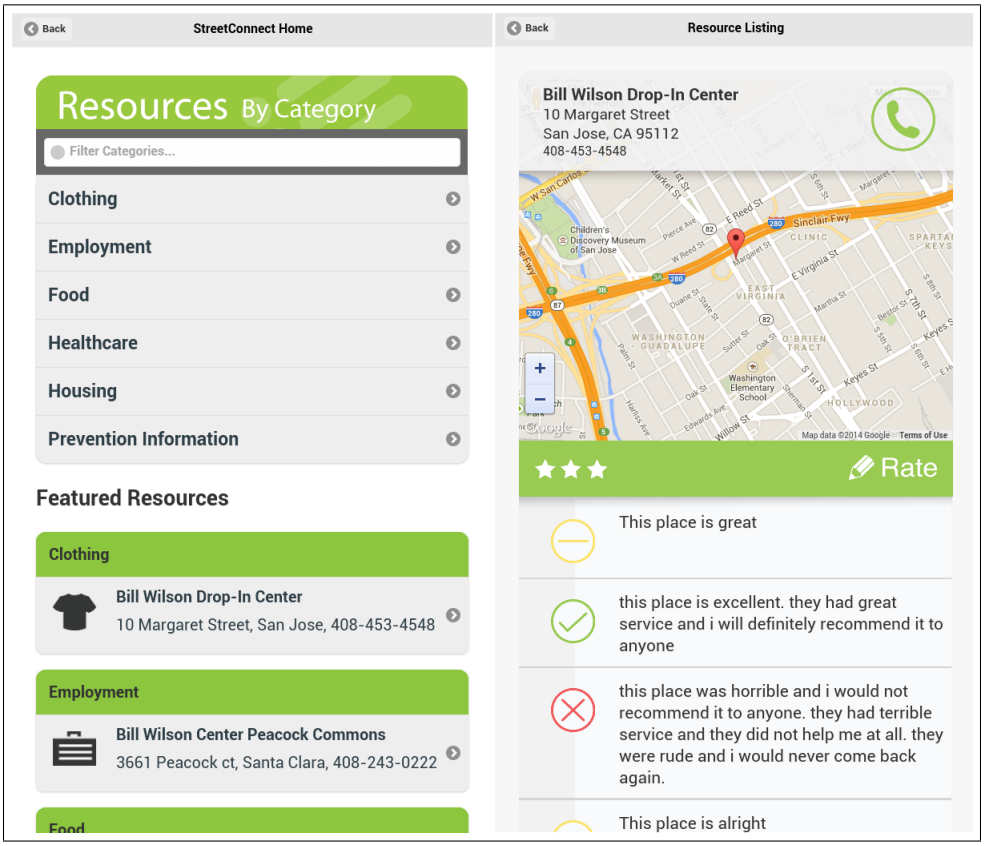

Figure 3.2: Use Case: Locate local health care services.

Actor:	Homeless Youth
Goal:	Find health care services in the nearby area
Preconditions:	Access to a mobile device with the YTH StreetConnect application
Postconditions:	User accurately locates the health care service or resource desired
Scenario:	1. User opens the homeless youth application 2. User utilizes the portal home page to navigate to the Find A Health Care Service page 3. User selects the health care service they need: sexual health care, mental health services, family planning/condoms, general health services 4. User enters geographical mile range they wish to find services within 5. User locates nearest health service that provides their requested service on the map
Exceptions:	No health services within range • Notify user no health services were located within the inputted range • Prompt user to enter a larger range number

Look up prevention information

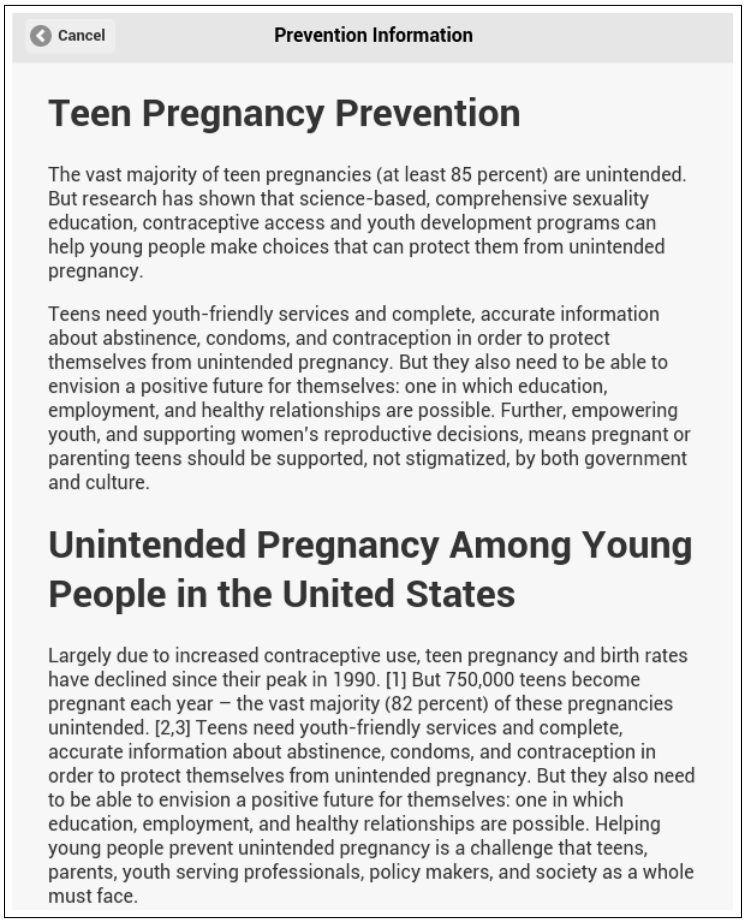

Figure 3.3: Use Case: Look up prevention information.

Actor:	Homeless Youth
Goal:	Youth look up prevention information
Preconditions:	Access to a mobile device with the YTH StreetConnect application
Postconditions:	User gains access to the prevention information they are seeking
Scenario:	User opens the application and utilizes the portal home page to search or navigate to the page providing the appropriate information
Exceptions:	User does not find the information they are looking for • Prompt user to find a local health service for more information • Tell user to sign up for a YTH StreetConnect account to receive additional information

Login to StreetConnect for Youth

Figure 3.4: Use Case: Login to StreetConnect for Youth.

Actor:	Homeless Youth
Goal:	Find health care services in the nearby area
Preconditions:	Access to a mobile device with the YTH StreetConnect application and a valid phone number
Postconditions:	User successfully logs in to the portal system
Scenario:	1. User opens the YTH Street Connect application 2. User navigates to the Login page 3. User enters in their phone number into the provided fields and presses the login button
Exceptions:	User enters invalid 10 digit phone number

- Tell user to re-enter their phone number

Interactive text message tip

```
<?php
include ( "NexmoMessage.php" );
// Step 1: Declare new NexmoMessage.
$nexmo_sms = new NexmoMessage('24563175', 'c3ec10f4');
// Step 2: Use sendText( $to, $from, $message ) method to send a message.
$info = $nexmo_sms->sendText( '+14082447982', 'YTH StreetConnect', 'Thank you for
// Step 3: Display an overview of the message
echo $nexmo_sms->displayOverview($info);
?>
```

Actor:	Homeless Youth
Goal:	Receive and respond to interactive text message tip and receive additional information
Preconditions:	Access to a mobile device and YTH Street Connect Account
Postconditions:	User will respond to the interactive text message tip and receive appropriate answer
Scenario:	1. User will receive an interactive text message asking them to respond with an answer 2. User will respond to the text message with their desired answer 3. User will receive a text message with additional information regardless of the response they texted
Exceptions:	User does not respond to text message with an answer

- User will not receive a response

Rate a Service Provider

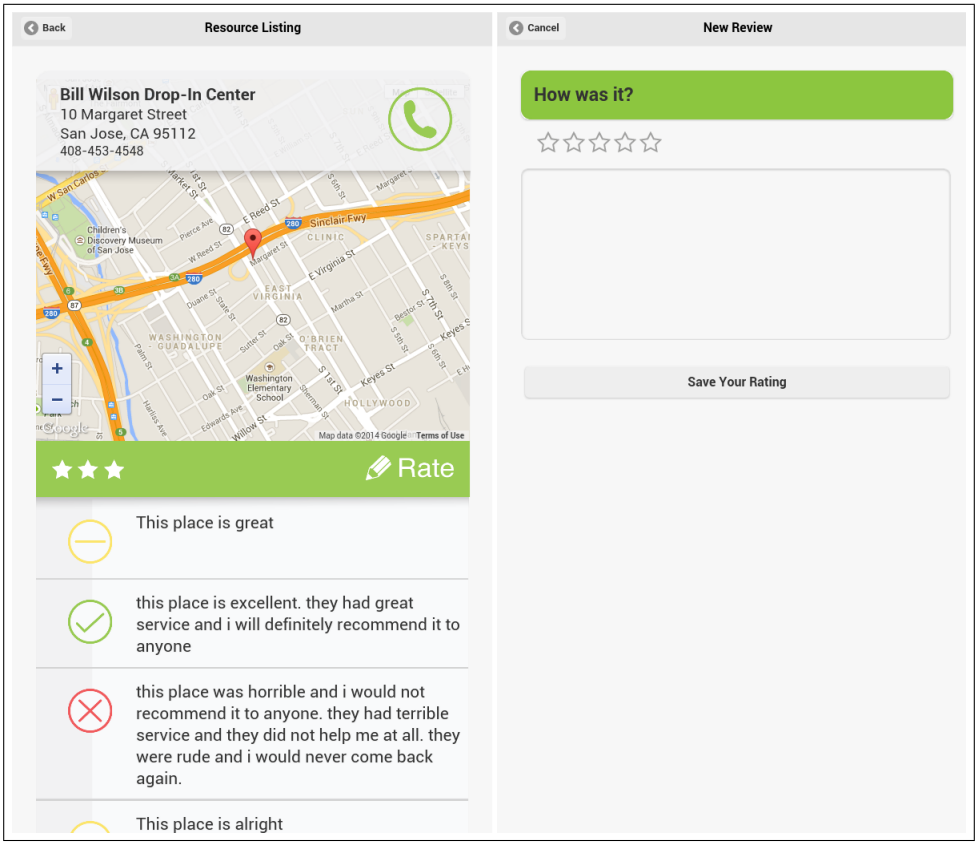

Figure 3.5: Use Case: Rate a Service Provider.

Actor:	Homeless Youth
Goal:	Provide a rating for a service provider
Preconditions:	Access to a mobile device and YTH Street Connect Account and received service from the provider they wish to review
Postconditions:	User accurately reviews a service provider
Scenario:	1. User opens the homeless youth application 2. User logs in to the system with their account information 3. User searches for or navigates to the correct service provider they wish to review 4. User selects the Submit a Review button to anonymously review the service provider 5. User selects Done to officially submit their review to the portal page.
Exceptions:	User cannot find the service provider they wish to review • User can create a new page for the service provider they wish to review by following the steps provided on the help page

Fill out Health Questionnaire

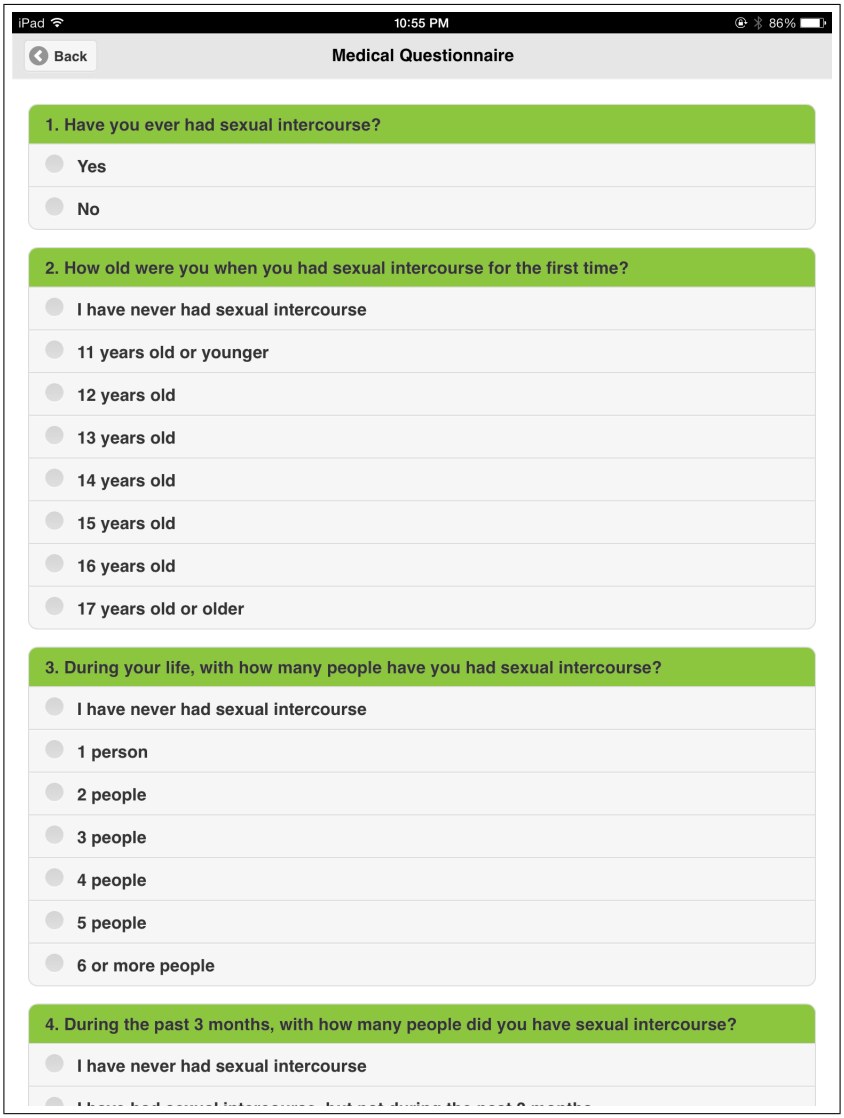

Figure 3.6: Use Case: Fill out Health Questionnaire.

Actor:	Homeless Youth
Goal:	Fill out Sexual Health Questionnaire
Preconditions:	Access to a mobile device and YTH Street Connect Account and present at the health clinic or service provider they are seeking medical assistance from
Postconditions:	User accurately fills out a Sexual Health Questionnaire to provide health provider with additional information regarding their health
Scenario:	1. User arrives at health care facility. 2. User informs medical provider that they fit the high risk homeless youth profile. 3. User privately fills out the sexual health questionnaire tailored to the topic of their visit.
Exceptions:	User does not know how to locate a health care provider

- User can use the created portal system to locate a health care provider

3.2 Use Cases for Healthcare Providers

Refer youth to resources

Figure 3.7: Use Case: Refer youth to resources.

Actor:	Healthcare Provider
Goal:	Refer homeless youth to accurate healthcare resources
Preconditions:	Received information from homeless youth Sexual Health questionnaire
Postconditions:	Make an accurate referral to the youth for needed service, resource, or information
Scenario:	1. Evaluate Sexual Health questionnaire for red flags 2. Search available resource/service or information options and select the best solution to the issue. If there are no health risks, no referral is needed.
Exceptions:	N/A

Utilize tools and resources

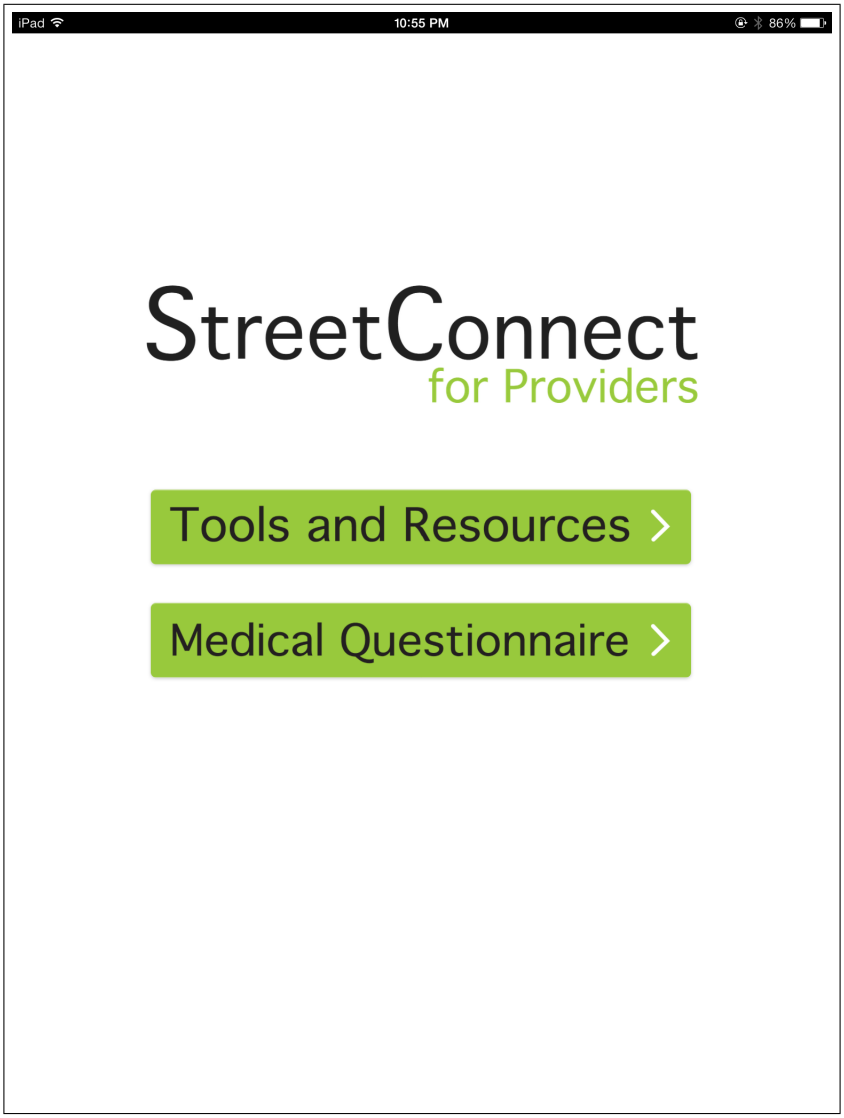

Figure 3.8: Use Case: Utilize tools and resources.

Actor:	Healthcare Provider
Goal:	Utilize tools and resources provided within the portal to serve homeless youth
Preconditions:	Access to a mobile device with the health care provider application
Postconditions:	Make an accurate referral to the youth for needed service, resource, or information
Scenario:	1. User open a web browser and navigate to the portal application 2. Select tool or resource needed to serve homeless youth
Exceptions:	N/A

Chapter 4

System Design

In the following section, we describe the architecture and design of our system and explain the reasoning behind our decisions. We propose to build two separate mobile applications that will combine to form our system. One mobile application, the YTH StreetConnect Youth mobile portal, will be used by homeless youth as a mobile application, downloadable by their feature phone or any mobile device. The other mobile application, YTH StreetConnect for Health Providers portal will be used by healthcare providers on a tech tablet such as an iPad or Windows Surface. Both of these applications will be available across a variety of mobile devices and platforms. Each application will be connected to our back end databases that will store and manage all necessary information. We created two mySQL databases. One for resources in the Santa Clara County, given to us by YTH. The other stores users phone numbers. The other stores users phone numbers. We were told not to store any other information such as name or a password. Research shows that youth are less likely to sign up for a service if they need to remember a password [2].

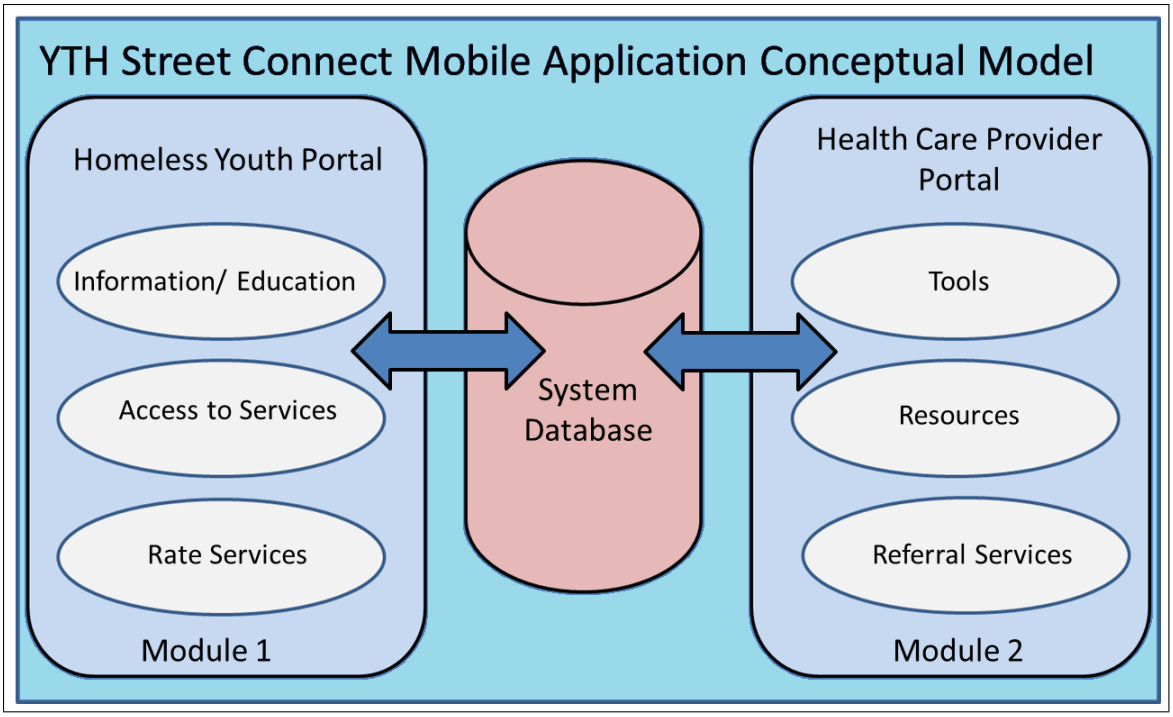

Figure 4.1: Conceptual Model.

4.1 Homeless Youth Mobile Application

The users of the YTH StreetConnect for Youth will walk into a health care facility in need of a basic health care for such things as a cold. The health care provider will hand them the tablet with YTH StreetConnect for Health Providers. Once given the tablet, the youth must enter their phone number to enter them into our system. If they are a new user this will sign them up for weekly text messages. This will be the youth's first interaction with StreetConnect. They can download the application to their mobile device and enter the portal through the health service rating system. They will be able to access health care ratings, locate nearby health centers, and find information. The homeless youth portal application will provide the following functionality:

- Link homeless youth to local health related resources such as sexual health care,

mental health services, family planning/condoms, or general health services

- Provide disease prevention information such as HIV, STI, and pregnancy prevention to increase health promotion and awareness
- Contain a rating system for homeless youth to comment, track, and rate the health care services they utilized
- Support for a check in feature to gauge mobility patterns

They will have the option to create an account with their phone number as their login if they choose to do so. An account with the YTH Street Connect mobile portal will allow the user to do the following:

- Post their own ratings about health care services they have used
- Receive automated text messages twice a week

We will be using a double opt-in process for the text messaging service. That is, once the user receives an automated text message informing them that they have signed up for twice weekly messages, they must reply with a text message to confirm.

These text messages will provide tips and advice on clothing, food, shelter, job referrals, general health information and services, and the results of their health screenings if desired. They will be pushed out once or twice a week in the form of a quiz, question, or general information. The user will be able to interact with the text messaging service and receive answers through their keyword responses.

4.2 Health Care Provider Tablet Application

The main purpose of this application is to assist healthcare in the process of appropriately and accurately treating homeless youth. The health care provider portal will be designed to run as a mobile application for tablets within health facilities.

The main function of the system is to provide a Sexual Health questionnaire that can be filled out by the patient on the tablet. This information will be sent through e-mail to the provider. The results can raise red flags and assist providers in determining the necessary tests and treatments the patient needs. After the questionnaire is completed, the patient will be prompted sign up for the YTH Street Connect mobile portal with their phone number to receive weekly text messages. Due to privacy concerns, we will store only information necessary to contact users and will not store sensitive personal or medical information.

Additional to the Sexual Health questionnaire, the application will also provide the following resources and information:

- Up-to-date information on how to provide care to youth
- How to integrate STI/HIV/pregnancy screenings into primary care practices
- Access to tools and resources
- Referral services and suggestions

The healthcare provider tablet application will use the same backend database as the homeless youth portal.

4.3 Technologies Used

We will be using the following technologies to implement our project:

- HTML5/CSS and JavaScript: front end development of the application. This includes customizing appearance and responding to user interaction.
- PHP: for back end implementation. This includes server-side programming and integrating the front end with the back end databases.
- MySQL database: an open source database that will be used to store a users information such as phone number in order to receive text messages and/or emails. It will also be used to store the applications resources information such as name, location, phone number, and category.
- PhoneGap: a free and open source framework that allows you to create mobile applications using standardized web APIs such as HTML5, CSS, and JavaScript.
  - We will be able to to achieve cross platform development without having to use each mobile platforms native development language.
  - For example, iOS development requires knowledge of Objective-C and Android development requires knowledge of Java.
- jQuery mobile: an HTML5 based user interface system for all mobile platforms.
  - It will allow us to design a website that will work on all smartphone, tablet, and desktop platforms.
  - With basic HTML knowledge, you can build mobile sites easily.

4.4 Conceptual Flow

Below, Figure 4.2 shows the conceptual flow of the user and data with our the system.

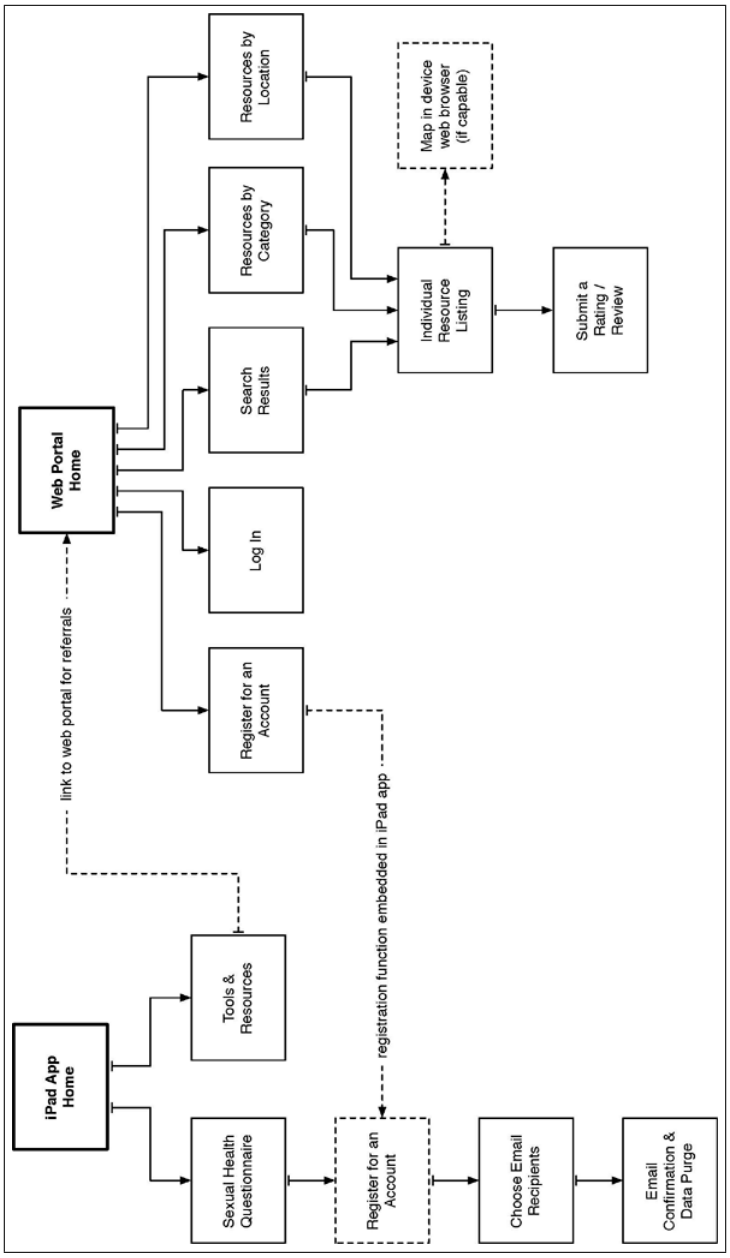

Figure 4.2: Data and User Flow Chart.

Chapter 5

Design Rationale

This system targets homeless youth in the Bay Area and entails the implementation of two modules as a mobile application for the users. The first module consists of a mobile interface to be accessed by homeless youth to provide the user with an information portal to locate information regarding services in their area. The second module is tailored to the health care providers and entails a questionnaire system to be deployed on tablets and devices to assist medical providers in providing the correct services to homeless youth. We researched multiple design techniques to consider and analyze before deciding on a design and implementation strategy for these modules.

5.1 Homeless Youth Mobile Application

We considered two different approaches for the mobile portal interface: a mobile application approach and a mobile website approach. These approaches were analyzed over a variety of metrics to assist in the design rationale process. The metrics we used to analyze the approaches were accessibility, implementation, and maintainability.

Accessibility

One main consideration for this mobile portal system is the ability to provide the system to as many youth as possible. It is extremely important to reach as wide of a range of the population of homeless youth as possible and therefore ease access to the mobile portal system is an important consideration.

A mobile application would only require an initial internet connection to download the mobile portal application. Although some features in the portal would require internet access, many of the features would not. A mobile website approach would require access to internet at all times in order to access any available feature on the portal. This led us to conclude that the mobile application portal was a better choice for this system because it is more available and accessible to homeless youth due to it's larger accessibility range.

Implementation

Given the allotted timeframe to complete this project, it is critical to analyze both design strategies in regards to the time required to implement each system. This can be assessed by the technologies required for the system and how familiar the implementation team is with the desired technologies and functionality.

The mobile website system would require knowledge of all mobile browsers and their compatibility frames. Not all web browsers perform and behave the same therefore the mobile website would require multiple implementations depending on the browser specifications. The implementation team does have prior knowledge of web programming and languages, but have all faced the difficulty of browser compatibility and understand the time required to implement a bulletproof website system. A mobile application system

would only require the knowledge of jQuery mobile, which would be the base platform for the mobile application. Although the implementation team has no prior experience with jQuery mobile, each member has advanced skills with JavaScript, which is the library built beneath jQuery mobile. After assessing the technologies it was determined it would be easier and more time efficient to develop the mobile application system due to the jQuery mobile platform and the development teams ability to learn the necessary technologies.

Maintainability

To ensure that this mobile portal system will be successful and assist the high risk demographic of homeless youth, it needs to be maintainable over a long period of time. It is important that this system can be maintained and updated as easily and efficiently as possible.

A mobile website would need to be available on all mobile browsers in order for it to reach the entire population of homeless youth. This consideration would require the system to be updated and maintained on all browser platforms and browser versions, making it extremely difficult to manage. As web browsers change and a wider range of versions are used, so do the requirements of the system. Thus, resulting in an inefficient maintenance method. The mobile application approach is significantly easier to manage because the jQuery mobile platform handles the multiple platform issue within its framework. This means there is only one code base and one location that needs to be updated and maintained. For this reason a mobile application approach provides a better implementation design strategy in regards to maintainability.

5.2 Health Care Provider Tablet Application

To determine and finalize an implementation strategy for the mobile portal interface, two different approaches were considered. A mobile application approach and a mobile website approach were analyzed over a variety of metrics to assist in the design rationale process. The metrics analyzed are outlined below in more detail.

Implementation

It is critical to analyze the required time necessary to complete each system in order to determine the appropriate design strategy to implement the healthcare provider portal. To ensure the system can be completed on time, the technologies required to implement each system were compared.

A mobile website approach would require the design and development of the system for multiple browsers and versions. Ensuring that a website is cross browser compatible on all available versions is an extremely difficult task and would require more time and development. The mobile application approach will be deployed on tablets. This will be built on top of a mobile platform that is compatible for multiple tablet platforms. This framework will assist in the cross platform process and therefore result in less development time and code. The development team has prior knowledge with the base language of the framework and can easily learn the development framework before the implementation phase. For these reasons it was concluded that the mobile application approach would require less time to learn the necessary technologies and therefore is the better design approach.

Maintainability

To ensure that this system will be successful and available for all health care providers, it needs to be maintainable over a long period of time.

The comparisons discussed in the implementation section above discuss how a mobile website system would require maintenance on a wide range of browsers and versions, where a mobile application approach would only require maintenance on a single code base and system. In terms of maintainability, when information changes it is much easier to maintain one system instead of two, and therefore the mobile application design is a better option in terms of implementing a maintainable system.

Chapter 6

Test Plan

In this section, we describe the different phases and activities of testing for the system. This includes unit testing done by engineering team members to verify that the system works correctly and acceptance testing done by the YTH team to validate that the system works in the way they were expecting.

6.1 Unit Testing

The goal of unit testing is to isolate each part of the system and ensure that each module or function works correctly independently. Unit testing is done by the programmer and will find problems early in the development cycle. Each unit will be tested by a member of the team who did not work on coding it to ensure unbiased testing. Once the unit is tested thoroughly and works independently, it can then be added in with the rest of the system to move into another phase of testing called integration testing. This will ensure that the system as a whole is functioning correctly when the each unit is added. It will also allow us to verify the functional, performance, and reliability requirements defined by our customer.

Since it will be necessary for our system to be able to run on many different mobile platforms, we will also need to do unit testing on each platform to ensure it works. For the unit testing to be considered successful, each unit of the system should be fully functional on a basic mobile and smartphone.

We underwent this testing phase twice. In the beginning, we only had simulators of devices to test on our computers. Later, we were given an actual Andriod and iOS devices to test on. We noticed many differences from the simulators and the actual devices.

6.2 Acceptance Testing

Acceptance testing was done by the customer, YTH, after each unit or module was completed. This testing was done twice throughout the design and implementation process to ensure that the system requirements were met. We presented our customer two prototypes: Prototype 1 and Prototype 2. This testing allowed the customer to give useful feedback and a chance to bring up new requirements, change existing requirements, and re-prioritize the requirements list.

Chapter 7

Project Management

7.1 Development Timeline

After determining project requirements, we outlined the project schedule. The tasks necessary for project completion are listed in the Gantt Chart below in Figure 7.1. A Gantt Chart is visualization of the project schedule; it breaks down the project into phases, illustrates the start and end dates of each task, and displays the roles and responsibilities of each team member. This chart will allow us to record pivotal milestones and ensure that we are meeting our goals according to schedule. Please note that an asterisk in the center of a cell denotes a deliverable.

The interaction between the individuals of this project is very tight and we will be working closely together on several components of the project. For this reason, several of the tasks on the Gantt chart are colored to show all members working on the task simultaneously.

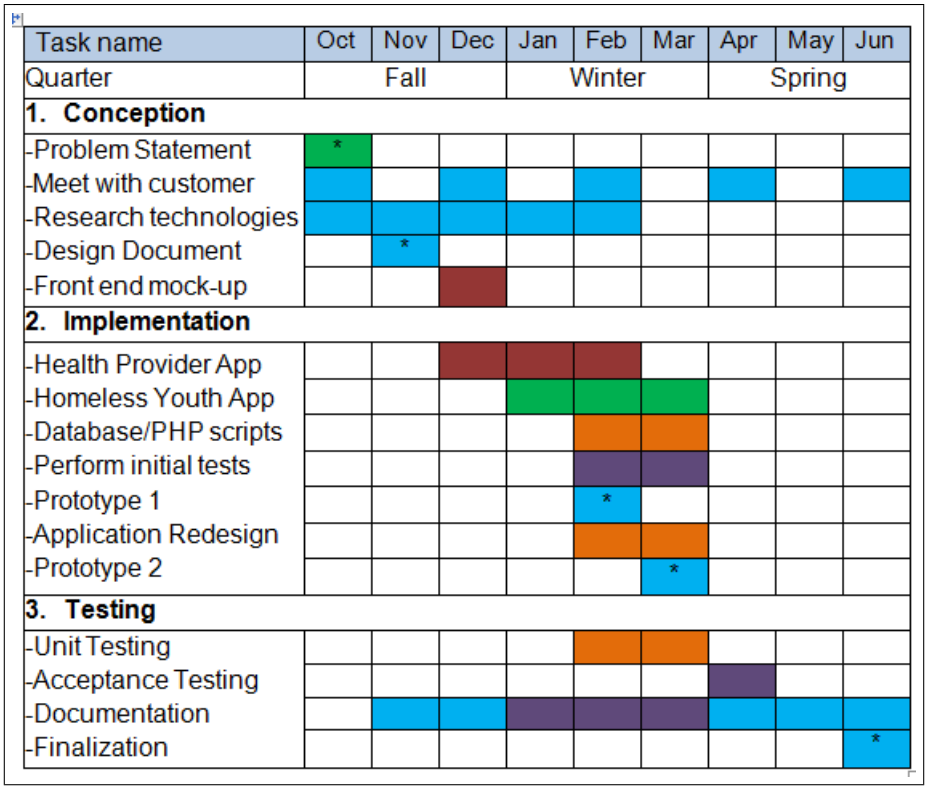

Figure 7.1: Gantt Chart.

7.2 Project Risks

We assessed potential risks that our group could encounter over the course of the project in Table 7.1 below. The risk analysis describes each risk and its consequence(s) as well as the strategy we will use to solve the problem. We ordered the risks in descending order of impact on the project. That is, the risks listed at the top of the table will have most impact on the project. The impact value is calculated by multiplying the probability of the risk occurring and the severity of the risk on the entire project.

Risk	Consequences	P	S	I	Mitigation Strategy
Unfamiliar technologies	Time spent to learn new info	.9	4	3.6	• Conduct research before implementation • Avoid complex implementation
Inability to adapt to changes	Deliverable does not meet criteria	.85	4	3.4	• Design for change • Constant communication with customer
Time	Unfinished work	.5	6	3	• Prioritize features • Time management according to Gantt Chart
Conflicting schedules	Lack of decision-making & communication	.8	2	1.6	• Designate meetings

Table 7.1: Risk Analysis Table.

Chapter 8

Societal Issues

8.1 Ethical and Social Analysis

Ethical conduct is what we believe we should be doing in working with others. It is how we define the right thing to do, the moral action. We realize that there are good and bad ways of working with others, and we need to make the distinction. Analyzing social issues with ethical issues allows us to consider the impact of our work on society in an ethical manner. We assessed potential ethical issues that we would encounter implementing and deploying our project and the impact it would have on the community of users. We evaluate the ethical and social dimensions of our project in three sections: 1) ethical justification, 2) ethical qualities, and 3) safety and risks challenges.

Ethical Justification

In the United States, approximately 2.5 million youth ages 16-24 are considered homeless. Homeless youth are at a significantly higher risk of contracting sexually transmitted dis-

eases (STD) and infections (STI), Human Immunodeficiency Virus (HIV), and unplanned pregnancies due to the lack of health education and resource availability. Homeless teens do not know how to find local health care services, and if they do, they struggle to communicate with the health provider due to the sensitivity of the situation. Thus, healthcare providers are not prepared to provide sufficient care due to this lack of patient information.

Studies have shown that 62% of homeless youth have cell phones and 81% of physicians use tablets or smart phones. We provide a solution by creating an interconnected web and mobile application consisting of two modules, one for the homeless youth and one for the healthcare providers. Justice involves equality in treatment of individuals and technology that is beneficial to the public without neglecting the underprivileged. There are two ethical reasons that have defined our work on the project:

1. All humans have the right to health care information and services.

2. Engineering technology should be committed to the common good.

Our goal is based upon the idea that every human being deserves basic health care to meet their physical and mental needs. We believe that our technology will improve the relationship between homeless teens and health care physicians. Further down the road, this improvement in communication can help bridge the gap between homeless youth and their access to health care.

Ethical Qualities

There are certain technical and professional qualities that we believe a good engineer and an ethical project consists of shown in Table 8.1. In the table, we describe how our group and project meets each of these qualities.

Table 8.1: Ethical Analysis Table

Technical Proficiency	Our group will create a working prototype and quality proof of concept for a deliverable mobile application that connects homeless youth with health care information and services.
Empathetic	Homeless youth and health care providers will be able to download and use our system easily.
Creative	Our project will take customer requirements and creatively design an implementation strategy for those requirements to deliver a quality product.
Cooperative	Our project involves team members communicating and working together with each other, the customer, a user- interface designer, and an advisor.
Able to Communicate	Our group will stay in communication with each other, our customer, user-interface designer, and advisor through group text messages, group emails, and in-person meetings.
Environmental Impacts	Our application strives to be environmentally safe and can reduce the amount of paper forms by creating digital medial questionnaires.
Social Impacts	Our application strives to provide a proof of concept that can be widely distributed to any society with a lack of communication between healthcare providers and homeless youth.

Safety and Risk Challenges

In this section, we address some of the challenges that we face in constructing our application. In terms of security, we need to ensure that personal information entered at health care centers is protected and inaccessible to outsiders. We need to be extremely cautious about the medical information we save or access in order to abide by the Personal Health Information Protection Act.

8.2 Science, Technology, and Society

At Santa Clara University, the school of engineering believes that engineering is done within a social context, within a community of other people. For the scope of our project, our community is the Santa Clara County, specifically targeting the homeless youth in the county. We have identified the social issues to consider the impact of our project on the youth and health care providers in the Santa Clara County. We also must consider future groups' societal impact when our initial working system is deployed and expanded across the nation. We hope for the following societal impacts:

- effectively lessen the gap between homeless youth and their health care needs
- provide a more comfortable interface for homeless youth and talking to health care providers
- allow health care providers to make a better recommendation based on more accurate answers to sensitive questions
- give homeless youth easy access to the resources already provided to them, yet hard to find

- allow homeless youth to rate resources and feel connected to others who have gone or have to go to the same resources as they

8.3 Usability

Usability is how ”user-friendly” the system is with its users. In our case, our customer, YTH, actually specializes in integrating technology with those in need. Specifically for StreetConnect, our interface had to be very simple. It had to be simple because it had to work on simple phones. It also had to be simple so that any non-technologically savvy person could navigate and use the application. We were given guidelines such as only requiring a phone number and no password for homeless youth because of past research and historical data that YTH had collected. Subsequent teams will be the ones who will actually answer the question of how usable StreetConnect is. However, the application's front end design was approved by our customer as a simple, easy, and usable interface.

8.4 Sustainability

Sustainability refers to the degree to which a product that is developed can continue to be useful for a reasonable amount of time. Because our project will be handed over to another team, we knew that our design, implementation, and code needed to be very sustainable for subsequent teams. For design, we chose a very straightforward design and conceptual model. We have two distinct, interconnected modules connected to a back end database. We have well documented code and a well documented design rationale for sustainability reasons. In terms of implementation, we chose to use PhoneGap, which would deploy

our code over multiple platforms. In this sense, our implementation is sustainable because PhoneGap actually takes care of any cross platform incompatibilities. We documented our entire project as we went. We have well commented code for subsequent teams to take over. For sustainability of our code, future teams would need to look into a content management or code control software that backed up and saved copies or versions of code. For the scope of our project, we have one copy of working code, and any bugs or fixes would be done through future teams as a handover project.

8.5 Health and Safety

Our project was developed for the use of the public. Hence we had to consider health and safety issues related to our project. Our project was considered safe in that we stayed inside the IEEE (Institute of Electrical and Electronics Engineers) Code of Ethics. The policies laid out in this code ensures that software is created in the safest manner for the greater good. As mentioned in the Requirements section, we stayed within all HIPAA regulations ensuring we did not store users personal health information. And finally, StreetConnect was built to improve the health and safety of our users, not to harm them. One of our core objectives of the project is to overall improve the health and safety of the homeless youth and our initial working system should prove that.

8.6 Aesthetic Analysis: Usability

Although the functionality and engineering of the project are the key objectives, the look and feel of the product also matters and plays a major role when determining its success. In

this section, we describe the aesthetic dimensions of our web and mobile application that links homeless youth with local health care providers. Aesthetically, our application must cater to our users.

User Identification

The users of our application will consist of nontechnical individuals, such as homeless youth and health care providers. The technology that our application will be deployed on will include smartphones, tablets, and online browsers. Based off of the technical knowledge of our users, the overall project must be tailored and built with an emphasis on increasing user accessibility by optimizing user experience.

Optimizing User Experience

A study by market researchers at Harris Interactive Firm found that a majority of mobile application users abandon an application for the following reasons:

1. The application is challenging to navigate and use or
2. Visually unappealing

In our case, making an easy-to-use application is of the utmost importance because homeless youth will use it to find information quickly. The users will most likely interact with the application in a concise manner because of the sensitivity of the information it provides; scrutiny by the user over design details will be kept to a minimum. Because of the way in which the application will be used, the core functionality of the application should be powerful yet simple. For example, a search-bar that will provide the user with

easy access when navigating through multiple health care databases. We must still focus on creating a design that will make searching for controversial information, such as the location for STD testing, less stressful for the user. After all, the application may be a powerhouse of information, but users will ultimately abandon it if it not easy to use or difficult to navigate.

In order to ensure that the mobile application will be user-friendly, our application must have the following aesthetic elements listed in Table 8.6 in order to offer an enjoyable and fulfilling user experience.

Table 8.2: Aesthetic Elements Table

Simple	Hide all but the most essential elements of the application to simplify the user experience; allow homeless youth to search for local services and find information on the click of one button; each screen should focus on one task and executing that task easily with large, well-spaced content
Intuitive	Each button designed in a way that does not require an explanation for its action to ensure the user's understanding
Cohesive	Connect diverse elements for satisfying user experience
Neutral	Sexual health is a stressful topic, so the interface must have calming and neutral tones that can soothe the user; bright and colorful graphics will be distracting and take away from the core functionality of the application
Character	Create a component or icon that is memorable and will make the user return to the application in the future

System Design Description

With these aesthetics in mind, we will describe the design of our system in more detail. Our system will contain two mobile applications, each tailored towards a different audience (homeless youth and health care providers). The design across both modules will be more or less the same.

The homeless youth mobile application will be modeled after the Yelp application. The application will pull together the multiple functions of our mobile application and allow for users to rate and comment on local services as well as find the information they need.

Research indicates that certain colors extract particular emotions from the viewer. We must choose a color that will generate emotions in sync with the theme of our application. We decided on using different shades of green since it represents peace and calmness. Users should feel relieved when using our application because shades of green will maximize these emotions.

Simplicity is key when creating a memorable product. There is a fine line between adding too many bells and whistles and providing insufficient visual stimuli. It is difficult to determine exactly what will be too much or too little in terms of visual design, but this will be an ongoing challenge as the application is being developed.

Chapter 9

Results

9.1 Test Results

Our team was able to create an initial working system with all of the YTH requirements for the StreetConnect mobile applications. Our applications were able to grab the user's current location (in Santa Clara), and return a list of resources by category in the area. We were given the database of resources by YTH that included the name, address, phone number, location (in coordinates), and category of the resource. The categories were food, shelter, employment, health care, and clothing. We also successfully connected and stored ratings to our backend database to read to and write from. We successfully were able to email questionnaire results from the application to a valid email address. And finally, we were able to connect a link to call the resource from the mobile device.

9.2 Pilot Deployment

We submitted a proposal to NIH (National Institute of Health) for a proposal for funding of our project to be deployed. In order to test our project, we were able to do a small pilot deployment on our personal devices to ensure it will work. Our pilot deployment was done on our Santa Clara University School of Engineering Design Center accounts. Subsequent teams will work with YTH to deploy the project on their servers. They will also work with YTH to create a downloadable file so that anyone can access our mobile applications.

9.3 Lessons Learned

We knew we had to build for the future and we knew that our code had to run on multiple platforms. However, we had two expert iOS programmers on our team who would have preferred to code the applications in Xcode and Objective-C while another member coded an android version of the application. Because of the constraints of the uncertainty of the kind of phone our users would have, we had to use PhoneGap to ensure our code would run across a variety of platforms.

Chapter 10

Conclusion

10.1 Future Plans

Our project is a hand-over project. We made design decisions in order to facilitate the next group's understanding and feasibility for deployment. We made sure our project met the requirements for a pilot app and made sure it had the scalability and reusability to be expanded, duplicated, and grown upon.

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