
QR-Codes for the Chronically Homeless

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Abstract

We propose a system to use QR codes and cheap cell phones to alleviate some challenges faced by the chronically homeless. We propose combining the affordability, simplicity and portability of cell phones with the fast emerging QR Code technology to develop an information system which could augment current data entry methods utilized by homeless service agencies. The system offers simple interfaces which employ QR Codes for configuring cell phones to perform basic functions such as setting up reminders. The system is robust to the loss of its components, individual phones and QR cards. We developed and refined our design concept through an iterative design process of contextual inquiry, persona development, prototyping, and user tests.

Keywords

Homelessness, QR Codes, cell phones, chronically homeless, QR Reader.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

Homelessness is an enormously complicated problem, defying easy solution and persisting through a tangled web of social and personal issues. A large



Figure b - Affinity Diagram

portion of the population experiencing homelessness consists of families with small children, single women and unaccompanied youth. While the most visible segment consists of the chronically homeless, homelessness is experienced as a temporary phase rather than a permanent condition. A 2006 survey conducted by the U.S. Conference of Mayors found that people remain homeless an average of eight months [2]. The transitory nature of homelessness makes quantifying the problem difficult. In what is regarded as the best estimation, the National Law Center on Homelessness and Poverty reports about 3.5 million people in the United States experience homelessness in a given year [4].

Our literature review as well as contextual inquiry revealed that homelessness is being addressed through a patchwork of specialized services. Most of the entities tackling the problem are small organizations with very limited resources. In 86% of cities surveyed in 2006, emergency shelters had to turn away homeless families due to lack of resources [2]. The fragmentation of services creates significant coordination overhead. The homeless are frequently referred to other agencies for different types of services. Moreover, the situation creates problems related to the maintenance of disparate information systems such as input duplication and data discrepancy.

Contextual Inquiry


We started our design process by researching the issue in the context of the service agencies trying to support the homeless population. We visited a number of organizations in the Ann Arbor and Detroit area. During our visits we conducted semi-formal interviews in conjunction with ethnographic observation of the social

workers conducting their daily jobs. Our interviewees in this setting included case managers, intake coordinators, homeless persons and program managers. All in all we conducted 15 contextual inquiries. We also interviewed subject matter experts engaged with the homelessness issue academically. After each interview, our team met for a session of compiling our observations and organizing notes.

We charted our findings and the relationship among the recurring themes in an affinity diagram. This process helped us organize our discoveries into a limited number of topics. The first theme coming from the synthesis is that homelessness involves severe resource constraints. The homeless themselves as well as their service agencies are, in general, financially strapped. The homeless are also characterized by low level of education and technological proficiency. Additionally, homelessness is consistently accompanied by a number of other problems, especially health issues. Yet another observation highlights the mobile nature of the homeless. Related to this issue is that the homeless struggle to hold on to their possessions. Due to lack of a permanent location, the homeless lose quite regularly the little amount of belongings they have.

We developed five personas to help us explore the above topics from our affinity diagram. The personas included relevant characteristics of demographic attributes, causes and length of homelessness experiences, related health and financial problems, as well as family dynamics that may alleviate or aggravate the homelessness experience. We utilized the personas as we considered the goals, motivators and objectives of the homeless. We also formulated various scenarios to help us think through the challenges and

Figure b - Persona of chronically homeless

 <p>Michael Williams Homeless, Ann Arbor</p>	
<p>Personal Information</p> <p>Age: 35 Location: Ann Arbor Profession: Unemployed Marital Status: Divorced Children: 2, ages 15 and 10 Hobbies: likes to read books at the library</p>	<p>Profile</p> <p>Arrived in a divorce with 2 children and has been homeless for the last 3 years. He wife and children left him over his drug use problem. He has been in and out of many shelters. This juggling between shelters has enabled him to learn the system and it also helped him in developing a good network of people in the area. Life on street has made him frantic to solve problems. He wishes to get rid of his drug addiction. He is constantly on the lookout for a way to keep his belongings secure. Mutual love to internet and other people experiencing homelessness. He wants to try to get back in touch with his wife. He has a high school diploma, is learning to use computers for his job search and for communicating through email.</p>
<p>Technology Usage</p> <p>Computer Usage: 0-4 hours per week Phone Usage: Intermittent Primary Uses: primarily for job search and used for communication</p>	<p>Goals & Motivators</p> <p>Alcohol events for... <ul style="list-style-type: none"> Get rid of his drug addiction achieve a sense of financial security by obtaining a job be able to find a safe, affordable, stable, secure avoid greater interaction with the cops </p> <p>Objectives</p> <p>We need Alcohol to... <ul style="list-style-type: none"> learn the computer fully offered by the shelter properly Learn using computer technology for his job search and also for communication with others Learn using computer technology for his job search and also for communication with others Use the resources offered by the shelter judiciously </p>

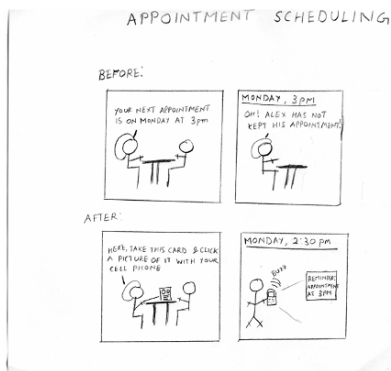


Figure d - Appointment Scheduling Scenario

opportunities faced by persons experiencing homelessness.

Design Goals and Target Population

The exercise of synthesizing various topics with the help of personas and scenarios guided our design goals. We wanted to develop a solution that is affordable considering the resource constraints mentioned above. Moreover, the solution needed to be a robust system able to withstand the loss of one or more components. Simplicity is another desired attribute because our users have low technological proficiency. Finally, we wanted a portable solution for a population characterized by constant mobility.

As we developed our design goals, we also decided to focus primarily on the chronically homeless. Our contextual inquiry confirmed what we had found in our literature review that most people experience homelessness temporarily as a result of other root causes. Consequently, the effective solutions tend to be holistic approaches to a wider set of social issues. However, we believed we could make a significant dent into the homelessness issue by focusing on persons experiencing homelessness for long periods of time. More specifically, we decided to address a subset of issues faced by the chronically homeless.

Several issues are specifically prevalent among the chronically homeless. They generally suffer from long-term health problems for which they have to take medication regularly. However, they fail to follow their drug regimen assiduously. The chronically homeless also tend to check in and out of numerous shelters as they traverse their experience of long-term homelessness. This creates complications with the

need to duplicate data entry of personal information during the intake process of various service agencies. Another issue is related to time management. The chronically homeless spend most of their time in the streets and go to shelters that open their doors at the end of the day. With a largely unstructured daily schedule, they struggle to follow strict rules concerning specific time-windows of the day when they are allowed into the shelter for basic services such as food, shower, laundry and overnight stay.

In addition to the points listed above, there are additional facts that are generally true of the larger homeless population. For example, they are constrained by lack of resources, low level of education, and lack of technological proficiency. A surprising observation from our field research is the relative frequency of cell phone use among the homeless population.

The finding that the homeless manage to obtain cell phones frequently despite their dire financial situation grabbed our attention. Although it surprised us initially, it made sense as we explored the idea further. Cell phones have become so widely available at low cost they are being utilized effectively to alleviate poverty in many developing countries. Notable examples include Tapan Parikh's work in rural India of automating paper-based processes using camera-equipped mobile phones [5] and MIT Media Lab's program, led by Nathan Eagle, to foster mobile phone-related entrepreneurship in East Africa [1]. Proponents of the Bottom of the Pyramid (BOP) development strategy such as C.K. Prahalad promote inexpensive cell phones as the computer of choice for the untapped billions of "consumers" living under \$2 a day, thereby creating enormous profits to private corporations while reducing world poverty [5].

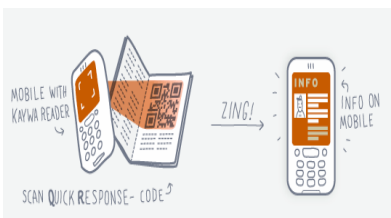


Figure d - Use of QR Code (from www.kaywa.com)

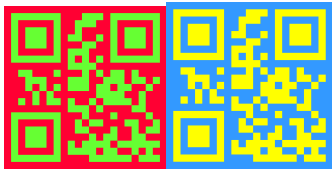


Figure g - QR Codes

Proposed Solution

Our proposed solution is to leverage QR Code technology and take advantage of the cell phone's popularity. QR (Quick Response) Codes are two-dimensional bar codes with storage capacity of up to 7KB. A camera-equipped cell phone can decode QR Codes after installing a freely available QR Code Reader. No additional hardware is required. The cell phone takes an image of the QR Code from any surface (paper, billboard, wall, T-shirt etc), and decodes the contents using the installed reader.

The QR Codes can hold various types of content. For example, a small program that customizes the cell phone to serve as a personalized alarm device. It would be helpful, for instance, to have a cell phone that beeps at certain times of the day and displays messages reminding the user to take his/her medicine. It has been already mentioned that many in our target population have a hard time making it to the shelter in time. They could have their cell phone customized to remind them of the shelter's opening time. It is easy to think of many instances where reminders could be helpful to someone whose day is not structured by regular hours of work or school.

In addition to small programs, the QR Codes would also contain personal data. This would be helpful in reducing the data input time that is common when the homeless visit various shelters to receive services. Rather than asking a homeless person to fill out a form, a case manager would snap an image of the QR Code containing data entered previously in another shelter. Case workers and intake coordinators would spend less time inputting data and focus more of their attention on building rapport and gaining other important information from their clients.

Setting reminders is possible in most cell phones with calendar applications. However, each model comes with its own set of steps that vary in complexity. Using QR Codes, the process is made consistently simple. It merely involves taking an image of the QR Code.

Our solution incorporates several components to create a fault-tolerant system. The QR codes would be printed in an assortment of small cards (1inch by 1inch or less). Each piece would store instructions for a specific reminder or a logical grouping of personal data. These cards would be inserted into easily re-closable plastic mini bags. The plastic pockets protect the small pieces of paper from dirt, moisture and other environmental elements to which the homeless are regularly exposed. Moreover, the cost of replacing obsolete QR Codes is reduced as it entails merely replacing a piece of paper and putting it in an empty plastic pocket.

Obviously, any collection of small cards would be susceptible to be lost, more so with the homeless. One idea to enhance retention is accessorizing the cards into bracelets or necklaces. The cards could be hung in lanyards made from beautifully braided parachute cords. When we tested our idea with several homeless men who may not wear ordinary necklaces, they expressed interest in wearing the lanyards. The QR Codes could be printed in various colors and shapes to make them visually appealing. It is also possible to overlay portraits or other images as a way of personalizing the cards.

One might ask: What is the need of having the cards with QR Codes; why not install the program directly into the cell phone? The main reason is that while the homeless tend to have a cell phone around most of the time, they also tend to change their cell phones quite frequently. When a cell phone is lost or replaced, the

A screenshot of a web-based 'Data Input Form' titled 'BIOGRAPHY INFORMATION'. The form contains several input fields: First Name (Jackie), Last Name (Stewart), Gender (female), Date of Birth (7/19/1973), Social Security No (123456789), Email (jstewart@yahoo.com), and Phone No (7341234567). There are also dropdown menus for Size (SM) and Shape (Letters), and a 'Generate QR Code' button. A QR code is displayed on the right side of the form.

Figure g - Form to input biographic information and generate QR Code



Figure g - Personal Information on mobile

data and programs added to it are also lost. The QR cards are kept to make sure the individual could transfer the required information to the next phone readily. Even if he does not get another phone, the information stored in the cards can be used at shelters. The cards could be lost as well, but that is expected to happen much less frequently. One of the reasons for designing the cards to be visually appealing is to encourage safeguarding them more carefully.

In our user tests, people expressed concern about privacy issues related with having personal data in QR Codes. Such concern is understandable, but may come from misunderstanding of the solution's application. The user (in our case, the homeless person) decides what kind of information to store in the QR Code. That may be common demographic data (name, address, DOB...) repeatedly asked for in virtually all registration procedures. The idea is to facilitate the intake process by reducing redundancy of data entry. The QR Codes would augment rather than replace data entry forms in desktop or web applications.

To conclude, we would like to sum up the uses of QR codes for the chronically homeless. QR codes can be used to set up appointment reminders, medication

reminders, as well as to store the demographic information of people experiencing homelessness.

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