Safe Mathare: Mobile System for Women’s Safe Commute in a Slum

Abstract
Safe Mathare is a service design project that utilizes interactive mobile technology. It consists of community patrols that use basic smartphone technology to help women commute safely through a slum neighborhood during dusk and dawn hours. The project started as a prototype developed in a Stanford University Design School course and is now being piloted in the Mathare Valley area of Nairobi, Kenya. The project has found willing partners with local NGOs and government, but it has also run into challenges of technology literacy, design from distance, and sustaining a non-profit initiative in transitioning command to local partners. This paper explores the development of the design, raising the questions of whether and how design can leverage technology to build a social network for security, and develop a scalable and sustainable public service.

Author Keywords
Mobile for development; Service Design; Human Security; Policing; Women’s Security; Kenya; Social Networks.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.
General Terms

Introduction
Safe Mathare began as a class project in the Stanford Design School class “Designing Liberation Technologies.” The course teams students from different disciplines together, partners them with non-profit groups in Kenya, and tasks them with building a technology to resolve an issue in the Kibera or Mathare Valley slum areas of Nairobi.

Our team wanted to address the broad issue of safety, particularly for women, in the slums, because we feel that it is the most pressing need facing residents of Mathare. While statistics covering the prevalence of crime have been hard to find for Mathare, we did find the following information about Kibera, another slum in the Nairobi area: 67% of survey respondents said that there was a lot of crime in the neighborhood; 60% of girls reported that they were afraid of being raped; and 36% of boys and 47% of girls are afraid of being beaten by someone in their neighborhood [2].

Another study commissioned from the Steadman group found further indication of insecurity across a wide sample of slum dwellers around Nairobi (including some from Mathare). About 20% have personally experienced violent crime in the past 3 months, and most crime (about 70%) occurs outside the home, and during darkness hours (again, about 70%) [1].

In response to their insecure environment, some Mathare residents (especially women) who wish to travel around after dark have formed small walking groups composed of neighbors or family members. These walking groups can help residents travel more safely to and from Matatu (i.e., minivan shuttle) stands, markets, communal latrines, and other local destinations.

Our project took this as our starting point. What if a person cannot find others who want to walk with her to her destination? What if she is a single woman who does not have male family members willing to accompany her? Safe Mathare began as an idea to address this very specific need: How can a woman in Mathare travel from point A to point B while feeling secure and still have some amount of flexibility -- so that she doesn’t have to find a family member or neighbor to accompany her every time she wants to leave her house. Safe Mathare intended to scale up existing community walking groups by using mobile technology to coordinate safe travel among people who may not personally know each other. If walking in numbers should increase the safety of individual residents of the slum, then maybe mobile technology could be leveraged to coordinate group commuting.

The Project
The solution our group came up with, Safe Mathare, is a moving security system composed of a group of escorts who walk around Mathare’s major pathways with designated, timed stops along the way. It is akin to a bus route -- but lacks a physical bus.

In order to implement our safety solution, our group is working with the District Officer of Mathare (the equivalent to the mayor for the area) and MYSA (Mathare Youth Sports Association), a well-respected local community organization with a network of over 25,000 alumni.
Safe Mathare, at its most basic, is a system of community walking groups led by escort employees that will travel commonly used routes within Mathare. Each walking group will traverse the route according to a rough schedule, making short stops at frequented areas such as Matatu bus stands, markets, communal latrines, etc. We would also build the routes with an eye to known danger zones -- and try to configure routes smartly around them. The routes may run for only a few hours a day, and we endeavor to engage in needs-finding to see when and where the routes may be most useful and used.

Once the routes are in place, the location of each walking group is tracked by GPS: we give each escort leader a GPS enabled smartphone, as data transfer rates cost only 2-3 Kenyan Shillings per megabyte. We envision this to be a cheap and non-intrusive method for walking groups to communicate their location information to potential users.

The Technology Component, v 1.0
Our original plan was for an SMS-based system to coordinate escorts with local residents. We would create a central system (the “dispatch center”) to keep track of the constantly-updating location information. From the user end, the user simply sends a text message to our system, and receives a text in return telling her the schedule of stops along the walking route, as well as a timestamp of when the walking group reached its most recent stop.

For example, Jane, our user, sends a text to 4444, with the message “Route A” because she wants to travel along that route. She receives a text back, telling her that the walking group last left the church at 12:29.

The walking group is scheduled to reach the latrine at 12:38 (based on the average walking time between the two stops), the Matatu stand at 12:47, and so on.

If Jane lives near the bar, she knows roughly when the walking group will pass by her “stop”, (and if she texts again around 12:50, she can get more up-to-date information). She can stay inside her home until she knows it is time to walk to the stop and join the walking group. She can do this without having to wait in the dark as a sitting duck. Once Jane joins the walking group, the presence of the escorts (as well as other residents using the service) can serve as a deterrent to criminal activity, and allow Jane to reach her destination safely. She can depart from the group whenever she likes -- and perhaps she will meet someone else in the group who will be going to the
same final destination (off-the-route), and thus they can travel there together.

On the backend, each of the escort walking groups would have a low-end smartphone with them. We planned that when the group begins a shift, the leader will ‘check-in’ to the phone, and then the phone begins to track the location of the escorts. At the dispatch center, a computer receives the GPS location updates from the group leaders’ smartphones and stores them in a database. These updates are then used to calculate the estimated times of arrival at future stops in response to Jane’s request. A smartphone at the dispatch center serves as the interface between the computer and the SMS system.

The computer also tracks which leaders are working which routes at a given time using a leader check in/check out system. Once the leaders have checked in, the app automatically transmits the groups GPS coordinates to the dispatch center as the group is walking. Under normal circumstances, no further interaction is needed from the group leader as the group travels the route. The updates would be transmitted to the dispatch center over the phone’s 3G data connection. 3G data service is available in Mathare and is inexpensive relative to SMS messages. However, if 3G service is temporarily unavailable for some reason, the app could transmit updates via SMS.

We proposed this system because we assumed that women in the area would have access to a mobile phone, but likely not a smartphone. From our preliminary research, most Mathare residents had access to a phone, and while there were some signs of smartphone presence, typically these would kept secure in the home and would not be taken on commutes. Thus, we built our system to be used by the most basic of phones.

Our other concern was the cost of SMS. Our preference was to avoid putting any cost on the user, to encourage robust use of the system. In addition, we assumed that after the routes were established, women would be able to use them without first checking the times via SMS. We proposed that the system would cover the costs of the users’ SMS messages, as long as we could negotiate with the local major telecom company to give us bulk messaging rates.

Palo Alto to Nairobi: Iterations on the Ground
During the summer of 2011, our team travelled to Nairobi to conduct interviews and surveys before implementing a pilot of Safe Mathare. Our findings – particularly about the community’s technology
preferences and literacy – caused us to revise our original prototype.

First, we conducted a survey of 440 households in Mathare to collect some quantitative data about our users (and since Mathare is an informal settlement, such data are virtually unique). The survey itself was a challenge, as we had to rely upon local enumerators who were not previously trained in data collection techniques. In addition, language and cultural barriers complicated our work in unexpected ways. For example, we asked respondents whether they personally owned a mobile phone, but in the context of Mathare, perhaps a whole household would share access to a single phone. Phrasing the question as we did was akin to asking an American: "Do you personally own a landline?"

These challenges aside, we did learn several important things about our users: first, about half of our respondents told us that they did indeed need to leave their homes during dawn and dusk hours, and women overwhelmingly felt that walking in a group improved safety. These findings gave us confidence the safety problem as we had framed it, and our proposed solution to that problem, really resonated with the community.

On the technical side, we were able to confirm that mobile phone penetration is high, but we were surprised that, even in one of the poorest settlements in Kenya, people overwhelmingly preferred more expensive voice calls to SMS. Given this finding, we thought it would be a good idea to give our users the option of calling the escorts directly to find out the location of walking groups, as opposed to sending an SMS to the Makmende hotline as we originally envisioned. This was one area where a simple local solution made more sense than the technical solution that we were tempted to test in the context of our Design School class.

During this trip, we also met extensively with the police and community-policing groups. We were gratified to learn that both groups were enthusiastic about deploying Makmende as a tool to improve neighborhood safety, and that they could help us identify trusted local community members who would be willing to play the escort role.

Our partner meetings also helped generate design improvements. For example, the police district officer asked us this: If we could use technology to let users know about the real-time location of escort groups, couldn’t we give the same information to the police as well? And what if we gave the escorts a quick and easy way to alert the police if they ran into trouble – say, a panic button that, when pushed, could draw police to a particular GPS location? It’s possible that such a tool would be enormously useful in Mathare where police response times are often excruciatingly slow, in part because where street names and addresses don’t exist, police officers have trouble finding where the trouble is.

As we began to tweak our project design, incorporating the new information we learned over our summer trip, we also started to think about our role differently. Slowly, we realized that the technology we were bringing to Kenya was useful not so much for distributing location information to users (who could, after all, simply call the escorts directly), but rather for alerting the police about the real-time location of crime.
Group walking still made sense, but we were less sure about how necessary our fancy gadgets were to the endeavor. Certainly the involvement of technology has galvanized the community around the idea of an escort service, but in the end, we expect that Safe Mathare will stand or fall because of community buy-in, not because of any value a smartphone can add.

The Pilot
By November 2011, our team returned to Nairobi to lay the final groundwork for a three month pilot of Safe Mathare in the 3C area of Mathare. First, with the help of the local District Officer, we selected 4 teams of 6 escorts, as well as one coordinator that would oversee the teams, report back to the local police and District Officer, and send us weekly reports. After their contracts were signed, we trained them on walking the routes, interacting with users, and using the Google IDEOS phone we provided to each escort team.

Second, we did more pre-pilot research. We conducted a survey in the 3C area of local women who live near the selected routes, to determine how often they leave their house, how often they have experienced crime, if they use a mobile phone, and what phone company they subscribe to. We plan to conduct the same survey in the same neighborhood, after Safe Mathare has been piloted, to determine if the pilot has changed women’s perception of safety or their commute behavior.

Third, we began outreach activities to publicize our project in the neighborhood. Our previous community meetings and call for escorts had already gotten some local attention – residents knew that there was some safety initiative set to begin. In addition, we hired outreach performers from MYSA to perform skits and distribute maps with phone numbers to 3C residents. They performed in several locations around 3C and drew substantial crowds, explaining the system and

Fourth, we made final decisions on how the Safe Mathare system would operate. With the help of 3C local residents, we mapped out 4 walking routes, each of which overlapped with at least one other route. We decided that it would be best for escorts to stay on the main thoroughfares, and to not deviate from these chosen routes. Even if community members asked for door-to-door service, the escorts should walk only along the specified routes, in order to improve reliability and punctuality. Safe Mathare would be more like a bus and less like a taxi or shuttle service. We also mapped out ‘stops’, each of which was a well-known shop that was 5 minutes walk from each other on the route. These would be the designated stops to be used in our automatic SMS messages.
In our final preparations, though, we opted not to go forward with the automated SMS service, but instead to simply distribute the escort teams’ phone numbers to the community. If a person wanted to know where the team was, they could call the team on the appropriate route, and directly ask them where they were and what time they would be at a certain landmark. This choice was influenced in part by our summer survey results, which showed local residents’ preference for voice calls. The complications of setting up a server and determining if the text messages were legible and usable also dissuaded us from piloting our original SMS-central dispatch system.

Smartphone training
Training the escorts and coordinator on the smartphone system provided more useful insights. Our escorts ranged in age from early 20s to mid 60s, and only 2 had previously used a smartphone. We had made the interfaces of the phone very simple, in anticipation of this. On the home screen, there were only 4 icons: an icon to call each of the 3 other teams’ phones, and an icon to call the Coordinator, which would be the ‘Panic Button’. The coordinator would be responsible for relaying any calls for help to the police stationed at local landmarks. We used Google Latitude running in the background, to constantly be tracking where the phone was, and communicate that to us in California, but we did not explain this to the escorts. We thought it was better to stay very simple and focus on the basic tasks they would be performing on the route.

In the training, we went slowly through turning the phone on and off, initiating a call, ending a call, and receiving a call. Some escorts were much quicker in picking up these skills than others. Pressing the buttons and screen for the appropriate length of time, and with the appropriate force was an initial challenge. After the training, it seemed that all the escorts could perform each of the tasks, but some concerns remained. On one end, some escorts seemed eager to explore the phone, trying to open other apps, and change settings. On the other extreme, some escorts seemed not to want to use the phone, but rather hand it off to other team members to do the tasks.

Assessment & Moving Forward
The pilot began the first week of December and will run until the end of February. Our team will return to Nairobi to run a post-pilot survey along with focus group user testing of community members, escorts, and the police and government officials. We have some initial feedback that indicates there are very strong

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**SAFE MATHARE ESCORT ROUTES**

4:30-7:00 am  
7:30-11:00 pm  
every day

**Figure 4:** Map of the escort routes in the pilot
numbers of users. There have also been complications, with some locals threatening our escort teams and in one instance, throwing rocks at them as they walked. Our partners suspect that it is local criminals who want to see the system fail.

Our focus now is on assessing what parts of the system worked and which will bear iteration. The phone calls and reports we receive from the coordinator are an initial step at assessment, but we realize that we need to be doing research on the ground to get accurate feedback about Safe Mathare. Our long-term concern is the possibility of making the project sustainable. Our team does not want to continue being the donor, supplying money and technology to the local teams. We would rather transfer ownership of the project to locals to scale in other areas of Mathare, and then elsewhere in Nairobi. We will work over the coming months to explore different funding models, find local partners, and redesign the system to improve the user experience and make it more sustainable.

After our post-pilot surveys and focus group evaluations are complete, we plan to author several papers that provide more answers to the research questions at the heart of Safe Mathare. These include:

- Can a service design leverage an informal social network and develop a scalable and sustainable public service? How can design leverage casual social change kernels, combined with mobile technology, into a scalable and sustainable public service? What are the measures of assessment to judge whether such a system design is a success?

- Can mobile technology work as an agent of social change? As compared to more traditional networking tools, does mobile technology significantly boost the formation and sustainability of social networks? Does tech illiteracy constitute a serious barrier to mobile systems’ success, or can sufficient training and practice address this challenge?

- How can ‘Design from Distance’ work? Can a design prototype developed in a US classroom be transplanted into a Kenyan neighborhood, take root there, and then become a locally-led initiative?

Acknowledgements
We thank our teachers, Josh Cohen, Terry Winograd, and Zia Yusuf. We thank our partners at the District Officer of Mathare and MYSA, as well as our escorts, coordinator, and research assistants. We gratefully acknowledge our grant from the Freeman-Spogli Institute at Stanford University.

References