The Mobilization of Crime Mapping & Intelligence Gathering

Evaluating Smartphone Deployment & Custom App Development in a Mid-Size Law Enforcement Agency

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Advancing Policing Through Innovation & Science

Final Report for Project #2010-DE-BX-K006

This project was supported by Award No. 2010-DE-BX-K006, awarded by the National Institute of Justice, Office of Justice Programs, US Department of Justice. The opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect those of the Department of Justice, the Police Foundation, or the Redlands Police Department.

Abstract

Purpose: The last few years have seen tremendous growth in the law enforcement deployment of smartphones. The availability of high performance hardware and law enforcement relevant commercial off-the-shelf apps has driven significant interest in how this technology can be optimized for law enforcement use. This project had two goals. First, identify the mobile data needs of law enforcement officers and build custom apps to deliver, and capture, relevant information. Second, evaluate the effectiveness of smartphone and custom app deployment using rigorous experimental methodology.

Research Subjects: Surveys and focus groups were conducted with sworn officers, civilians working in field positions, and civilian supervisors in the Redlands Police Department (RPD), Redlands CA.

Methods: The project was divided into four phases over a two-year period:

Needs Assessment- The needs assessment phase was structured to determine the data and analytic tools needed by RPD field personnel. This phase determined the type of data and formats that could be developed to provide users with actionable information. Users were surveyed and focus groups were conducted.

Software Development- The needs assessment was used to inform the app development process. The Omega Group was responsible for developing the NearMe and FI apps. Smoke & Mirrors Software developed the RPD Flyers app. All apps were developed specifically for this project.

Software Implementation- Mobile app distribution was controlled by the RPD's mobile device management software, MobileIron. The MobileIron Enterprise App Storefront allowed for secure, authenticated, role-based access to the apps.

Implementation Assessment- An implementation assessment was conducted to assess how users integrated the devices, how their behaviors changed after using the software, and additional features that may be desirable. A randomized experimental design was utilized. Users were randomly assigned to treatment (enterprise apps installed on device) and control (no enterprise apps installed on the devices) conditions. The experimental condition was maintained for a period of three months. After three months, users were surveyed and convened for focus groups. The Police Foundation and the Center for Evidence-Based Crime Policy (CEBCP) conducted the evaluation. The RPD Flyers app was not included in the evaluation because it was developed after the evaluation was completed.

Results: Surveys, focus groups, and administrative records tell a consistent story: there was minimal adoption of both the NearMe and FI app during the study period. Complex user interface and questionable relevance were oft-cited reasons for not adopting either/both apps. Although users generally recognized the value in digitizing work processes, the apps were criticized for being difficult to use and generally not conducive to existing workflows. Users suggested ways that the apps could be improved to align more closely with user expectations.

Conclusion: This project sought to develop methods of increasing information to officers in the field by combining commercial off-the-shelf technology with custom app development. Three apps were developed and subject to field testing and rigorous evaluation methodologies. The app evaluation found several areas where the apps could be improved. These suggested changes are documented here to serve as a roadmap for future development.

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Executive Summary

The last few years have seen tremendous growth in the law enforcement deployment of smartphones. The availability of high performance hardware and law enforcement relevant commercial off-the-shelf apps has driven significant interest in how this technology can be optimized for law enforcement use. This project had two goals. First, identify the mobile data needs of law enforcement officers and build custom apps to deliver, and capture, relevant information. Second, evaluate the effectiveness of smartphone and custom app deployment using rigorous experimental methodology.

Problem

Technology plays a major role in nearly every facet of law enforcement. In particular, radio communications systems and mobile computing technologies have created dramatic changes in how police officers conduct their business. Law enforcement in general has been quick to adopt a wide range of technologies affecting everything from officer safety to how officers interact with citizens. Notwithstanding law enforcement's technological sophistication in some respects, a report issued by the Police Executive Research Forum identified five major areas of concern regarding technology in law enforcement (Koper, Taylor, & Kubu, 2009). Three of the identified areas directly relate to the current research and development proposal.

First, police departments are producers of a tremendous quantity of data. However, access to these data has not kept pace with the rapid development of sophisticated data storage and retrieval systems. Scholars have long recognized that simply having access to data is not synonymous with having actionable intelligence information (Ratcliffe, 1999, 2002, 2008; Groff, 2009). Rather, turning raw data into actionable information requires sophisticated analytic tools,

and this transition may be particularly important given the place-based focus of many contemporary policing strategies (Mastrofski, Weisburd & Braga, 2010).

Second, communications technology has become a high priority issue for many law enforcement agencies, both as a method of receiving information and also as a method of delivering information to the public. While there is no reliable indicator of the adoption of smart phones in law enforcement agencies, it is clear that there is a growing recognition of the potential value of deploying mobile devices to field personnel.

Third, technology development and acquisition have greatly outpaced efforts to determine the impact of such technologies. Koper and colleagues (2009) suggest that evaluation on the effectiveness of law enforcement technologies has been limited; thereby minimizing the implications about how these technologies could be used to improve police effectiveness or better utilize resources. This study sought to move beyond these limitations by conducting a comprehensive evaluation using randomized assignment.

Taken together these three points suggest that: (1) law enforcement agencies may be simultaneously overwhelmed with data while being intelligence poor, especially in regards to geospatial data, (2) agencies may be unable to communicate available intelligence information in a format relevant to the mobile nature of law enforcement officers, and (3) many agencies may be unwilling, unable, or simply do not understand the need for robust evaluation of innovative technology.

Purpose

The purpose of this project was to create a method of delivering and capturing data from officers in the field using commercial off the shelf smartphone technology with bespoke iOS apps developed to meet the unique needs of law enforcement.

Research Design

This project was divided into four phases: (1) needs assessment, (2) software development, (3) software implementation, and (4) implementation assessment. The needs assessment was designed to evaluate the type of data that should be made available to participants using the application being developed. Surveys, focus groups, and expert groups (both researchers and app developers) were convened to determine the data needs of users, how those demands could be met from a technological standpoint, and how the effects of the project could be evaluated.

During the software development phase, the technical development team worked on creating the iOS apps and backend architecture needed to run them. The Omega Group (NearMe and FI) and Smoke & Mirrors Software (Flyers) developed the apps identified during the needs assessment phase. These three apps were custom developed for the Redlands Police Department (RPD) in response to the needs assessment and findings from the advisory board.

During the software implementation phase the apps were deployed to all users for a short period of time for training purposes. Once training was concluded users were assigned to treatment and control groups for the evaluation component. Individuals assigned to the control group had the apps de-provisioned from their department issued devices.

The implementation assessment phase evaluated the impact of providing the apps to users[1]. The implementation assessment was conducted using stratified randomized design where treatment consisted of having access to the apps while the control group did not receive the custom apps. Stratification for randomization was made within field civilians, detectives,

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1. The RPD Flyers app was not included in the evaluation because it was developed much later in the project.

patrol officers, special operations (including the department's narcotics and multiple enforcement teams), and supervisors (sergeants). Email based surveys, of the treatment and control groups were conducted before deploying the apps and three months following app deployment.

Following the three-month implementation assessment phase the apps were made available to all individuals with Department issued iOS devices. After approximately six months of availability two focus groups were convened. The first group focused on individuals that had used the apps extensively. The second group focused on individuals that had not used or expressed interest in the apps.

Findings

The needs assessment phase commenced in January 2011. A multi-method approach was adopted for the needs assessment: (1) a survey of project participants (the needs assessment survey); (2) a meeting of the project advisory board; (3) an in-depth discussion with officers that covered a number of topics that are detailed in a later section; and, (4) the technical working group focused on implementing data connectivity, security issues, and general application performance. The needs assessment clearly identified the need for three apps. First, crime mapping was a desired capability. Second, users desired a way to collect field interview data on mobile devices. Third, users wanted an easy method to create informational flyers on their mobile devices. Apps were developed to meet these data demands.

The implementation assessment found that app integration into existing workflows was lacking. Administrative data, survey results, and focus group discussions provided a consistent narrative: app adoption and usage was minimal throughout the experimental period. Even after

the apps were made available to all users, adoption remained low. Survey and focus group respondents indicated several reasons for the lack of adoption.

Respondents were asked to rate the NearMe app on various dimensions of effectiveness: did the app help them to view information about incidents more quickly, investigate incidents, communicate with the public/residents/businesses on their beats, and decide where to focus efforts during patrol time? There was a lack of consensus about the utility of the NearMe app. Sixty percent of respondents stated that the app helps them view information more quickly at least sometimes, but nearly 24% did not express an opinion. Similarly, 50% stated that the app helps them investigate incidents more quickly at least sometimes, 52.6% could communicate better with the public at least sometimes, and 45% found it at least sometimes helpful in focusing their patrol efforts. However, in all these cases around one-third of respondents did not express an opinion (consistent with the one-third of respondents who had never used the app).

The FI app suffered from different criticisms, with users expressing concern over the user interface and complexity of data entry. The majority of respondents said that completing a field interview in the app took more time than filling it out on paper (N=21, 61.8%); the remainder believed that it took the same amount of time (N=13, 38.2%). Nobody indicated that FIs could be completed more quickly through the app. Users questioned the number of screens required to enter information and the difficulty navigating between them. While not all users agreed, some users raised concerns over safety because of the perception that completing an FI on the device could be distracting. Results from the administrative data were more positive: meaningful reductions in the time between data collection and data availability could be achieved through the use of the FI app.

Conclusion

The goal of this project was to develop the iOS platform as a tool for the delivery and collection of information to officers in the field. First, a needs assessment was conducted to determine the data needs of users in the field. Second, three apps were developed to meet the demand identified in phase one. Third, apps were implemented in a randomized controlled experiment to all officers and field civilians. Finally, the apps were evaluated for their effectiveness in assisting users in collecting and consuming information.

This study combined mobile device deployment and management, custom app development, and rigorous evaluation methodologies and has provided great insight into what was and was not successful. First, provisioning mobile devices to all users in a mid-size department was achievable. Although cost was a constant concern careful selection of cellular plans and strict control of overages made the total cost of implementation and recurring cost manageable. Second, there has been a clear demand to know the return on investment from such a wide-scale deployment, especially from agencies looking to justify implementing such wide-scale programs. Cost-benefit analysis for this program turned out to be impossible to answer given the data available. Part of the difficulty is in quantifying the cost benefit derived from "increasing communication" or having department members respond more quickly to phone, text, or email communication. Mobile devices have become so tightly integrated into the department that these items simply become tools that are perceived as necessary for employees to effectively carry out their duties.

Third, bespoke app development, although not cheap, is not beyond the reach of most organizations. Custom app development may be even better suited to a regional deployment where the development costs can be divided between multiple agencies. Fourth, our research

suggests that users have good insight into what kind of apps they would find useful to enhance their work capabilities. The needs assessment, for example, noted the previously unknown desire for a method of creating informational flyers from the devices. Fifth and relatedly, the needs assessment was not particularly effective at determining the specific workflows within the apps. Even though great lengths were taken to involve users during all stages of the process, the FI app still received poor marks for usability once the app was deployed for field use.

A considerable amount of time was spent investigating what *didn't* work. Based on the feedback from users the NearMe app may be improved by dynamically generating crime hot spot maps instead of displaying pre-defined maps. Users also expressed a clear demand to have additional data available through the app. The NearMe app would be further enhanced with the development of dynamic distribution capabilities. This could function in two ways. First, there could be a method of pushing crime analysis products, such as those generated by a crime analyst, to mobile devices. Second, mobile users should have the ability to edit, sketch, and annotate maps on their mobile device. These mobile generated crime analysis products should be shareable within the department. Given the potential utility in distributing crime analysis and accurately directing hot spots policing, this ability should be incorporated into future development plans.

Future development of the Field Interview app should recognize that although the FI is a commonly collected and important piece of criminal intelligence, it represents only one of many possible sources of information. Organizations could easily adapt this format for other data that needs to be gathered and submitted securely. Three issues with the current Field Interview app were noted. First, there is a need to reconsider the user experience during data entry. In spite of

extensive testing, it was only after the app had been fully deployed that these limitations become apparent.

Second, users desire the ability to retrieve FI data from within the app. If this type of functionality was implemented the app could serve as a central point for both data collection and data review. Third, the upload process currently requires that the app remain open in the foreground during the entire upload process. While this is not especially problematic given the prevalence of high-speed wireless connections, this process can only be described as sub-optimal. Future development would be well directed to developing an upload process that can continue while the app is in the background.

The Flyer app was not evaluated due to its late deployment relative to the other apps. Nevertheless the utility of the Flyers app to other law enforcement agencies is obvious. The backend architecture of the app has been designed for easy portability between agencies. The types of flyers, agency information, logo, and general layout can be customized to match the existing flyers used by other agencies. One area for future development would be to create a centralized flyer repository within the app. The app would either store the flyers on the device or it could connect to a server to retrieve recently created flyers. This functionality would simplify the ability to archive the documents for later reference.

Taking a cynical view of the findings one could summarize the results of the implementation assessment as follows: The results suggest that the FI and NearME apps did not succeed along any measurable metric. They were not well adopted, they did not provide any additional capacity beyond what already existed, and because of the failure to adopt the technology, they did not appear to improve the Department's ability to disseminate information.

Taking such a cynical view of the findings, however, ignores much of the information learned during the project. There is good reason for cautious optimism towards the deployment of smartphones and custom apps in law enforcement agencies. Users were almost unanimous that even with no custom development, smartphones were valuable tools that facilitated more efficient job performance. The FI app received a great deal of criticism. However, rather than taking this criticism as suggestive of a failed product, it may be more useful to interpret these criticisms as indicative of user demand. Qualitative findings were critical but provided specific ways of improving the product. It seems likely that users would only want to improve the product if they felt underlying potential from the platform. Furthermore, even the limited adoption of the FI app was enough to determine that meaningful reductions in the delay between data acquisition and data availability could be achieved with electronically submitted FIs.

Criticisms of NearMe focused more on the data availability and ultimately the utility, rather than specific user interface problems. Users indicated that the app did not provide any additional benefits beyond what was already available. There was also the suggestion, however, that if additional data were provided that more users would be inclined to use the app. The future success of this app will depend on the ability to ingest and present novel data. These findings suggest that a second generation of apps may garner more positive support.

Introduction

This report discusses the experiences of the Redlands Police Department during a two-year project to develop iOS smartphone applications to improve the delivery of information to officers in the field. The project was conducted in four phases. First, a needs assessment was conducted to determine the data access needs of users in the field. Second, the software development team created the iOS applications based on the data gathered during the needs assessment. Third, apps were implemented using a randomized experimental design. Users were assigned to treatment (enterprise apps installed on their issued device) or control (no enterprise apps installed on their issued device) conditions. Finally, the implementation assessment phase evaluated the effects of the apps on users. The implementation assessment was comprised of two surveys, one pre-app deployment and another three months post-deployment, and multiple focus groups to capture more in-depth qualitative data from users.

Statement of the Problem

Modern law enforcement agencies have become tremendous producers of data. The desire for more data, the occasional mandate for additional data collection, and the advent of cheap large-scale data storage solutions has created a situation where more data is more easily accessible than ever before. Nevertheless, the mere availability of data does not automatically translate into the availability of actionable intelligence information.

This project sought to address three issues that are common to nearly all law enforcement organizations. First, field data collection is often a slow process that still occurs via traditional paper forms. One of the most common data collected are field interviews (FIs). Field

interviews are short forms documenting interactions between officers and citizens. FIs often provide critical information regarding suspects during subsequent interactions. Collecting these data via traditional paper forms creates several inefficiencies. Officers may delay submitting the forms and additional personnel are needed to enter the data into the records management system. To address this issue an app for the Apple iOS platform was developed that allows for field data collection of FI contacts.

Second, crime mapping and crime analysis have developed into a well-recognized and largely accepted component in most modern law enforcement organizations. Crime analysis techniques have advanced significantly in the last few years; they continue to integrate the best available science from criminal justice, geography, and other fields. Nevertheless, crime analysis has yet to tackle the difficult problem of dealing with the highly mobile nature of law enforcement. For example, many documents are distributed in static documents optimized for printing, a sub-optimal arrangement given the nature of police patrol practices. To address this limitation an app for the Apple iOS platform was developed that allows users to conduct sophisticated crime analysis directly on their Department issued smartphone.

Third, a common method of distributing intelligence information is the informational flyer. These flyers take many forms and cover many topics including: be on the lookout, wanted, attempt to identify, and missing at risk. These flyers are typically created on a desktop computer using traditional word processing applications. The needs assessment found that users wanted an easy to use method of creating these flyers that could be conducted in the field without returning to a desktop computer. To address this issue an app that allows users to create an informational flyer directly from their department issued device was developed.

Literature Review

Technology plays a major role in nearly every facet of law enforcement. In particular, radio communications systems and mobile computing technologies have created dramatic changes in how police officers conduct their business. Law enforcement in general has been quick to adopt a wide range of technologies affecting everything from officer safety to how officers interact with citizens. Notwithstanding law enforcement's technological sophistication in some respects, a report issued by the Police Executive Research Forum identified five major areas of concern regarding technology in law enforcement (Koper, Taylor, & Kubu, 2009). Three of the identified areas directly relate to the current research and development proposal.

First, police departments are producers of a tremendous quantity of data. However, access to these data has not kept pace with the rapid development of sophisticated data storage and retrieval systems. Scholars have long recognized that simply having access to data is not synonymous with having actionable intelligence information (Ratcliffe, 1999, 2002, 2008; Groff, 2009). Rather, turning raw data into actionable information requires sophisticated analytic tools, and this transition may be particularly important given the place-based focus of many contemporary policing strategies (Mastrofski, Weisburd & Braga, 2010).

Second, communications technology has become a high priority issue for many law enforcement agencies, both as a method of receiving information and also as a method of delivering information to the public. While there is no reliable indicator of the adoption of smart phones in law enforcement agencies, it is clear that there is a growing recognition of the potential value of deploying devices to field personnel.

Third, technology development and acquisition have greatly outpaced efforts to determine the impact of such technologies. Koper and colleagues (2009) suggest that evaluation

on the effectiveness of law enforcement technologies has been limited; thereby minimizing the implications about how these technologies could be used to improve police effectiveness or better utilize resources. The current study sought to move beyond these limitations by conducting a comprehensive evaluation using randomized assignment.

Taken together these three points suggest that: (1) law enforcement agencies may be simultaneously overwhelmed with data while being intelligence poor, especially in regards to geospatial data, (2) agencies may be unable to communicate available intelligence information in a format relevant to the mobile nature of law enforcement officers, and (3) many agencies may be unwilling, unable, or simply do not understand the need for robust evaluation of innovative technology.

The current study addressed these key issues by creating a mobile crime mapping and analysis application capable of running on the iOS platform. Doing so addresses the three relevant issues outlined by Koper et al (2009) and is also consistent with the strong scientific evidence that suggests geographically focused law enforcement is effective in reducing crime and disorder (Weisburd et al, 2006; Sherman & Weisburd, 1995; Braga, 2005). The proposed software provides relevant data to law enforcement officers operating in the field while leveraging the existing products created by crime analysts within the department. Producing the application for the iPhone addresses the second point by equipping officers with one of the most popular smartphones on the market[2].

Recent years have seen the development and implementation of sophisticated spatial crime analysis units in many modern law enforcement agencies (see, for example, the rapid

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2. Smartphone use is difficult to measure. One frequently referenced provider of smartphone adoption data is ComScore. Their smartphone subscriber market share reports can be found at http://www.comscore.com/.

growth of Compstat [Weisburd et al, 2004; Willis, Mastrofski, & Weisburd, 2004]). These tools, however, have generally been met with a number of issues, not the least of which is the lack of computers available in many departments (Hickman & Reaves, 2006a; Hickman & Reaves, 2006b). Nevertheless, crime analysis has seen tremendous growth in the last decade as evidenced by recent pushes for the professionalization of crime analysts[3] and the advancement of crime analysis as a science in its own right (Boba, 2005; Chainey & Ratcliffe, 2005).

Traditionally, crime analysis has been confined to officers or civilian employees with extensive training in using the sophisticated tools necessary to conduct analyses. This centralized method of distributing crime analyses has resulted in crime analysts that can easily be overwhelmed by the day-to-day demands of command officers (O'Shea & Nicholls, 2003a). Routine data requests, frequently labeled as tactical crime analysis (O'Shea & Nicholls, 2003b), can prevent crime analysts from conducting more sophisticated analyses that could truly uncover important, actionable intelligence information.

This has led to the adoption of more user-friendly software packages that make spatial crime data accessible to a wide range of officers (White, 2008). Underlying this has been a transition, often subtle, towards a decentralized crime analysis function. For example, user-friendly crime mapping programs have led to some departments tasking supervisors with generating crime maps and statistics for the areas under their command[4]. This decentralized approach places the power of more routine crime analysis functions in the hands of all members of the department (Koper et al, 2009).

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3. See, for example, the recent movement to create crime analysis certification programs.
4. See, for example, the testimonials of agencies using Omega Group software (http://theomegagroup.com/press/testimonials.html) detailing how simplified analysis tools have led to a more decentralized approach to crime mapping and analysis.

The software/hardware platform developed for this project can be seen as an extension of this underlying philosophy. By placing a crime mapping platform on the iPhone, necessary data is located within the hands of each individual officer. By providing these data on a highly mobile platform, officers will have the ability to review crime data wherever or whenever they have the opportunity, perhaps better using short periods of unallocated patrol time.

Statement of the Rationale for the Research

Modern law enforcement agencies have access to more data than ever before. The availability of cheap and reliable data storage and retrieval systems means that a great deal of information can be coded and maintained. Yet the amount of raw data available does not necessarily mean that users will be able to create actionable information. Broadly, this project sought to enhance the ability of officers in the field to gather and use information. The widespread adoption of smartphones presented a natural opportunity to increase the ability to deliver, and collect, information to and from field workers. Given these two factors, a set of apps that would allow field workers to easily create and consume data were created.

Our extensive needs assessment determined that there were three areas that could be addressed for mobile users. One area where data overload has become apparent is in the field of crime mapping and crime analysis. Numerous tools have been developed that aim to make crime analysis easier for users with less sophisticated training. These tools, however, have often focused on stationary desktop users and have largely been incompatible with the highly mobile nature of law enforcement. Given the need for timely crime analysis, a crime mapping app for the iOS platform was developed.

Second, officers frequently conduct field interviews (commonly called FIs) on people they encounter during patrol. FIs traditionally gather information such as name, date of birth,

any identifying characteristics, and the circumstances of the stop. FIs are traditionally conducted on paper and although this method is generally effective, paper data collection has distinct limitations. Users can easily record information that is inconsistent with existing database schemas, the forms can easily be lost or misplaced, it is generally not possible to capture photos, and someone has to duplicate efforts when adding the data to the master database. An app-based field data collection form helps to ameliorate many of these concerns.

Third, informational flyers represent a critical method of disseminating information within and between departments. These informational flyers, such as wanted persons, be on the lookout, and missing at risk, represent a key method of transferring information and are generally created on a full size computer and distributed as PDFs. This method has significant inefficiencies; it requires that the officer travel from the field to the station to create the document. Based on our understanding of the problem, an app that allows for the easy creation of informational bulletins directly from iOS devices was created. Users can then email the bulletins directly to other interested parties without delay.

App Preview

The apps, their specific workflows, and the results of the extensive evaluation are presented in great detail in the following pages. However, in order to place the evaluation in context, it is useful to summarize the different apps developed as part of this project before discussing the methodology and evaluation.

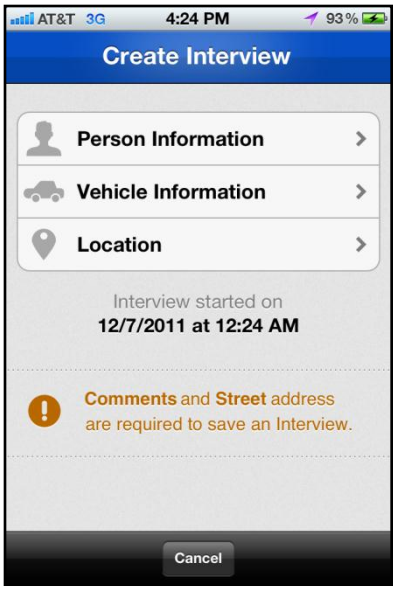
Field Interview

The Field Interview app is a two-way data-transferring app designed to enhance the data collection associated with field interviews. Traditional paper FI cards are replaced by the app

which allows for the collection of all the standard data on the card, as well as data that takes advantage of the technological platform (e.g. capturing photos or using GPS data to establish location). Data is entered into the app and sent through a secured connection to a table in the Redlands Police Department's (RPD) spatial data warehouse.

FI data in the spatial data warehouse are imported to the master field interview table located within the Spillman records management system (RMS). The master field interview table is the primary database containing field interview data from all sources. Data from the Spillman RMS are exported back to the RPD spatial data warehouse. Field interview data, both paper based and electronically captured FIs, can now be queried through the app.

Figure 1: Field Interview home screen



NearMe

The NearMe app provides users access to geocoded crime data, operational layers (including pre-generated hot spot maps as well as parcel datasets), and other spatially referenced data. Users are able to locate crimes spatially and filter events temporally. Users are also able to

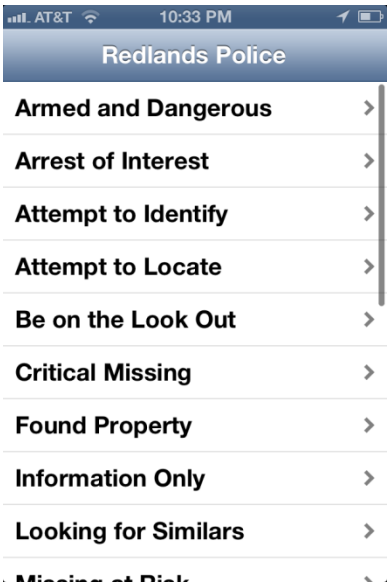
access details about the case such as the officer that handled the event, the type of crime, as well as many other attributes that may be available. Users can access underlying map data such as information about the land parcel. Figure 43 displays the NearMe splash screen.

Figure 2: NearMe home screen

Flyers

Informational flyers represent an important avenue for disseminating information within and between organizations. Informational flyers are typically PDF documents put together on a desktop or mobile computer. Common examples of flyers include, wanted persons, missing at risk, and be on the lookout (BOLO). In most instances flyers are time sensitive, the faster they can be created and disseminated the more likely they are to provide relevant information to other personnel. The Flyer app was designed to create an easy-to-use platform to design informational flyers directly from mobile devices.

Figure 3: Flyer home screen



The workflow and data architecture are described in much greater detail later in this document. The next section describes the process through which these apps were developed starting with the needs assessment and concluding with the implementation assessment.

Methods

This project was divided into four phases: (1) the needs assessment, (2) the software development, (3) the software implementation, and (4) the implementation assessment. The needs assessment was designed to evaluate the type of data that should be made available to participants using the application being developed. During the software development phase the technical development team worked on creating the iOS apps and backend architecture needed to run them. During the software implementation phase the apps were deployed to a random selection of users for three months. The implementation assessment phase evaluated the impact of providing the apps to users.

The Center for Evidence-Based Crime Policy (CEBCP) at George Mason University, contributed substantially to this project. The needs assessment, pre-mobile computer-aided dispatch (CAD) survey, baseline survey, and exit survey were designed in collaboration with the CEBCP.

Research Setting

The research was conducted in the Redlands Police Department. The RPD has a long history of progressive technology adoption and was an early adopter of crime mapping and pioneered a regional approach to crime mapping (East Valley COMPASS). Smartphones have played a key role in the communications strategy of the department for over a decade. When this project was proposed the Department had already issued smartphones (iPhone 3GS) to sworn officers in supervisory positions (sergeants and above) as well as civilians in select positions.

When the project was funded it was necessary to deploy smartphones to everyone in the Department meeting the inclusion criteria discussed in the next section. Existing smartphones had been in use for over a year and a new model (iPhone 4) had been released in the intervening time. It was determined that it would be beneficial to have everyone on a common platform. New devices (iPhone 4) were purchased for everyone meeting the inclusion criteria. Grant funds were used to provide devices to new users; the Department paid to upgrade the devices of existing users. The Department provided little formal training on the use of the devices. A small collection of users, designated as the Innovations Group and comprised of both sworn, civilian, and volunteer department members, compiled a brief electronic document detailing device features and some suggested useful apps.

The City of Redlands has a progressive cost-sharing strategy for the deployment of mobile devices. Typically, employees are expected to use their City issued smartphone for work

related purposes only. However, employees have the option of paying a small monthly fee (currently $15.60/month) that allows them to use their Department issued device as their personal cell phone (including the use of cell phone voice minutes, text, and data). This program proved to be popular with users as almost half of users issued a phone elect to participate in the program.

Device Deployment

At the beginning of the study the Redlands Police Department was comprised of over 234 full-time employees, part-time employees, and volunteers. Eligibility for inclusion in the study was determined by role within the department. All sworn officers were eligible for the study. Civilian employee eligibility depended upon the individual's assignment. All field civilians (such as community service officers and parking control officers) were included. All civilian supervisors were included. Of all the people eligible to receive devices, only three refused. All refusals were from sworn officers. Eligibility for participation in the project was based on the following criteria:

1. All sworn officers were eligible
2. Civilian employees that worked predominantly in field assignments were eligible
3. Civilian employees performing operations support functions (e.g. database or network management, geographic information systems management, or crime analysis) were eligible
4. Volunteers that worked in select field assignments were eligible

App Development

Three apps were developed as a result of the needs assessment (findings discussed in the following section). Two apps, FI and NearMe, were identified early in the process and were fully evaluated for their impact on project participants. The Flyer app was developed later in the process and was not included in the evaluation portion of the project.

The Omega Group, a crime mapping and analysis company located in San Diego, CA, developed the FI and NearMe apps. These apps were custom developed for this project and did not share architecture with any other product. The Omega Group later commercialized the NearMe app by incorporating it into their widely used crime analysis package, CrimeView.

Smoke & Mirrors Software developed the Flyers app. The Flyer app was developed after the conclusion of the implementation assessment so its effects on users were not studied extensively. Flyers was custom developed for this project and did not share architecture with any other commercially available software. It was designed to be flexible with regards to parameter input and therefore more readily portable to other agencies. At the time of this writing the app had not been commercialized.

App Deployment

Apps were deployed according to the randomization protocol detailed in greater depth in the following section. From a technical standpoint the apps were deployed through the use of the RPD's mobile device management software (MDM). Generically known as Mobile Device Management software, these platforms allow the department administrator to centrally manage device deployment, security settings, profile provisioning, and critical to this project, the deployment of secure enterprise apps. The MDM software used by the RPD during this study was MobileIron.

Although a comprehensive technical discussion is beyond the scope of this document, it is instructive to provide a brief overview of the operations regarding app deployment. First, the smartphone is enrolled on the RPD's MDM system. Second, an administrator uploads the app to the MDM system. Third, the app is attributed to a label. Fourth, the label is assigned to specific devices (in this case the label was assigned to those in the experimental group). Fifth, users launch the MDM client on their smartphone and download the app[5].

A distributed network of skilled users handled training on app functionality. The apps were initially made available to all users for a period of a few weeks[6]. Key users, those who had assisted in early developmental phases of the apps, were given train-the-trainer style instruction. This small group of individuals, including sworn and civilian employees, was provided extensive knowledge about how to use the apps and was then tasked with providing end-user training. Training was typically provided during routine briefings. User manuals for the apps were also sent out to all users. After training was conducted the apps were de-provisioned from the devices of the control group so they would not have access to the app.

Needs Assessment

The needs assessment commenced in January 2011. A multi-method approach was adopted for the needs assessment: (1) a survey of project participants (the needs assessment survey)[7]; (2) a meeting of the project advisory board; (3) an in-depth discussion with officers that covered a

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5. At the time of this writing there was no way to force apps onto devices. All apps had to be installed by the user.
6. The random assignment and evaluation only included the NearMe and FI apps. RPD Flyer was developed much later in the process and could not be included in the evaluation. More detail is provided in the following section of this document.
7. All surveys and focus group protocols were reviewed by the Institutional Review Boards (IRB) of the Police Executive Research Forum (PERF) and George Mason University (GMU).

number of topics that are detailed in a later section; and, (4) the technical working group focused on implementing data connectivity, security issues, and general application performance.

The needs assessment survey was constructed with three goals in mind. First, identify the spatial and non-spatial data participants felt would useful while working in the field. Second, determine which features and tools available on the device participants considered most important. Finally, attempt to identify existing iPhone apps that would be useful for law enforcement purposes. The exploratory survey served its purpose of providing an initial portrait of the RPD's needs for mobile technology applications, as well as their current use of such devices.

Pre-Mobile CAD Survey

In mid-2011 the RPD installed a module on the agencies computer-aided dispatch/records management system (CAD/RMS) that allows authenticated users to access current dispatch information and in-house databases from their smartphone. This was accomplished through an intranet based website that had specific formatting that scaled to fit the various dimensions of mobile devices[8]. The web-based CAD/RMS requires that users be first authenticated through the agency's Virtual Private Network (VPN) and then again through the CAD/RMS user authentication. This system was funded by the RPD and deployed to users before the NearMe, FI, and Flyer apps. While this app was not part of this study, it is discussed here because it may have had an impact on users experience with their assigned mobile device. To get baseline

8. The CAD website uses what is broadly known as responsive theming. This allows the website to conform elements and layouts to the size of the users browser, irrespective of the underlying platform being used.

information before the deployment of the mobile CAD/RMS system, a brief electronic survey[9] was conducted of all users[10].

App Evaluation

Evaluation of the NearMe and FI app was conducted through two surveys administered three months apart. Apps were deployed using a randomized experimental design. Half of the users were assigned to treatment (NearMe and FI installed on their RPD issued device) or control (no custom apps installed) conditions. The RPD Flyers app was not included in the evaluation because it was developed much later in the project.

Surveys were administered before deploying apps to the treatment group and three months after the apps were in use by the treatment group. The use of randomized assignment means that any differences in change over time between the treatment and control group can be attributed to the availability of the app on the mobile device.

Survey questions investigated self-described abilities to use the device, typical levels of activity engaging with content on the device, and work activities conducted on the device. Several questions about perceptions of crime and place and crime hot spots were also included. These questions were included to assist in determining if the easy availability of crime data on the devices had an impact on perceptions of crime and place.

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9. This survey was conducted with Survey Monkey. Surveys were sent to department issued email accounts of users. Survey reminders were sent approximately one and two weeks after the original mailing. To avoid possible coercive effects, the emails were sent from the PI's email rather than through the traditional chain of command. Supervisors were advised that participation in the survey was optional and users could decline participation.
10. This survey was reviewed for compliance with human subjects protection protocols by the IRB at GMU.

Baseline survey

The baseline survey was developed by Center for Evidence-Based Crime Policy (CEBCP) in collaboration with the RPD to establish a reference point for officers' use of the iPhone and perceptions of its utility in law enforcement applications prior to the deployment of the FI and NearMe apps. The survey was developed around three themes: use of the iPhone, use of other data sources, and knowledge about crime and place. The questions on iPhone usage were designed to gather information about the extent to which participants used their iPhone for law enforcement activities, their levels of engagement and expertise with the device, and any existing efforts they had made to complete FIs on their phone using other methods or apps. The questions on other data sources examined how frequently users consulted sources other than the iPhone in the course of their duties. Finally, the crime and place section assessed officers' knowledge of crime hot spots and which sources they found most useful in deciding where local crime clustered. The survey also included demographic questions on rank/role, age, and gender. The survey instrument is included in Appendix II of this report.

The sample of Redlands PD staff eligible for the survey was based on the pool of participants selected for the Needs Assessment phase (see p. 11). Thus, all sworn officers were eligible, as were civilian employees who work in field assignments or operations support (including GIS management and crime analysis), and volunteers working in field assignments (N=93). The survey was deployed online via Survey Monkey through each individual's department issued email address. Email reminders were sent approximately one week and three weeks after the original survey invitations. In order to compare outcomes between the two waves, respondents' email addresses were tracked and converted to a random number to

preserve their anonymity. A key was maintained so that the same number could be assigned based on email addresses in the exit survey.

Random assignment

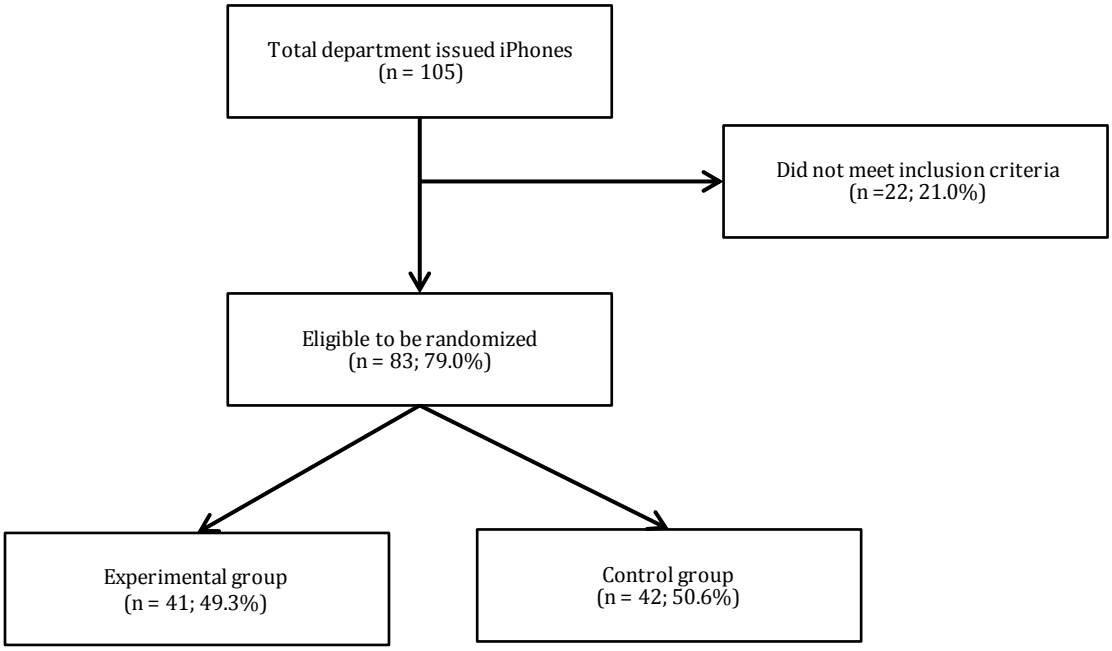
After the baseline survey was deployed and prior to rollout of the apps, a randomized controlled design was implemented to assess participants' perceptions of the apps and any changes in their iPhone usage as a result of the new capabilities. The randomized controlled trial is the preferred research design in evaluation research because successful random allocation of participants into treatment and control groups minimizes the likelihood that individuals in one group will differ from those in the other on all other variables that could influence outcomes (Sherman, 2010). Thus, internal validity is maximized as the effects of the intervention—in this case the deployment of the FI/NearMe apps—are not obscured by pre-existing differences and the effects of other factors (Farrington, 2003).

However, random assignment to conditions is not a guarantee of equivalence. Imbalance may be more likely when the sample size is relatively small. In this study, there was a relatively small, and fixed, pool of participants for random assignment and there was considerable variation between participants in terms of their role or rank, which was likely to influence the way they use technology. If the random assignment failed to distribute individuals with different roles evenly between treatment and control groups, there would have been a risk of drawing biased conclusions about the apps. Furthermore, experiments with small sample sizes are also likely to have low statistical power (too few cases to detect a statistically significant effect). In such cases, partial block randomization provides a useful solution for reducing losses of equivalence and statistical power (Weisburd & Gill, 2013; Gill & Weisburd, in press).

Unlike fully blocked (i.e., matched pairs) randomization, partial block randomization makes no assumptions about the number of statistical blocks into which units are grouped prior to random assignment—this is defined by the structure of the variables the researcher determines are related to the outcome. Cases are grouped into blocks and the random assignment takes place within each block. Thus, this method takes advantage of even limited knowledge about underlying causal processes. Given our belief that participants' specific roles within the police department would substantially affect their usage and perceptions of the iPhone, this variable was used as the blocking factor. Additional blocking factors were considered, including rank and age group, but one limitation of blocking is that each limitation on randomization is associated with a loss of degrees of freedom, which changes the distribution of the test statistic. Given the small sample size only one blocking factor was used.

The CEBCP researchers developed the randomization sequence. Users were stratified according to position within the department to ensure that representatives from all major work groups were represented in the treatment and control condition. Stratification was made within field civilians, detectives, patrol officers, special operations (including the department's narcotics and multiple enforcement teams), and supervisors (sergeants). The randomization flow chart can be found in Figure 4.

Figure 4: Randomization flow chart



Note: 105 iPhones were issued at the time the randomization took place. 22 users did not meet the inclusion criteria and were excluded. 83 were eligible to be randomized to treatment or control conditions. 41 ended up assigned to the experimental group while 42 were assigned to the control group.

A total of 22 people were excluded from randomization for a number of reasons. The chief and his executive staff were excluded (n = 5) from the randomization protocol. Non-field working civilians were excluded (n = 14) because their role within the department did not fit with the goals of the project and they were not expected to have significant interaction with the two apps being developed. Two officers that would have otherwise been eligible to participate in the project were excluded because they were on extended medical leave at the time of the randomization and were not expected to return during the treatment phase. One officer was excluded because of their critical input during the development of the app and their service as a training coordinator during the deployment stage.

The 83 experimental participants were grouped into 5 blocks: patrol officers (N=37), detectives (N=8), civilians (N=10), supervisors (N=12), and special operations (N=16). Within

these blocks participants were randomly allocated to treatment or control, forcing equal numbers of each assignment in each block. In the patrol officer block, which had an odd number of participants, the control group was randomly selected to have the additional member. Table 1 shows the number of participants assigned to each experimental group.

Table 1: Random Assignment

Block	**Treatment**	**Control**	**Total**
Patrol	18	19	37
Special Operations	8	8	16
Supervisors	6	6	12
Civilians	5	5	10
Detectives	4	4	8
Total	*41*	*42*	*83*

Note: Block randomized assignment was conducted along users' work role. Equal group sizes were forced between treatment and control groups. The patrol block had an odd number of participants. The control group was selected, at random, to have the additional participant.

Exit survey

The exit survey was administered to the 94 participants at the end of the three-month experimental period[11]. The instrument was deployed electronically using the same procedure as the baseline survey. It followed similar themes as the baseline survey, with a number of identical questions intended to capture changes in iPhone usage and perceptions over time and between the treatment and control groups. The survey was developed around three themes: use of the iPhone, use of the experimental apps, and use of other data sources. The crime and place questions were dropped due to limited take-up of the NearMe app (see below).

The questions on use of the iPhone were similar to those used in the baseline survey, and were designed to measure how the use of the phone had changed over time and whether

11. This number exceeds the number included in the original randomization protocol because of new hires brought into the department during the experimental period. Although not part of the experiment, their responses were collected for departmental purposes.

use of the experimental apps impacted overall perceptions and use. The questions on use of the apps were designed to capture information about how those in the treatment group (and those who did not participate in the experiment) used the FI/NearMe apps, how useful they found them, and whether they had any suggestions for improvements. Finally, participants were asked about their use of other data sources to understand how the iPhone fits in with the range of technologies available to officers. Fewer demographic questions were asked as these were already established in the baseline survey and it was possible to connect responses; however, questions on rank/role were repeated to capture promotions and other changes since the baseline survey was implemented, and a question about participants' level of education was added. The survey instrument is included in Appendix II of this report.

Focus Groups

While focus groups at the end of the project were not originally planned, it became clear during the experimental period that take-up and use of the apps were lower than expected within the treatment group. This was abundantly clear in the exit survey. As a result, focus groups were conducted shortly after the exit survey closed with two groups of officers selected based on their survey responses and phone usage records: one group who did not download the apps, or tried them but did not adopt them for daily work (non-adopters); and one group who used the apps regularly and appeared engaged (adopters). The discussion prompts developed for the focus groups followed the themes of the survey, but allowed for a more in-depth discussion of how the officers used their iPhones in general, how they used the apps or why they did not want to use the apps, what other apps they used, and suggestions for improvements or changes. Users were also asked about their experience of taking part in the experiment to help improve future research design in this area. CEBCP researchers conducted

both focus groups independently. Personnel from the RPD and the Police Foundation with personal knowledge of the participating officers were not present during focus group proceedings. The discussion prompts are included in Appendix III of this report.

Results

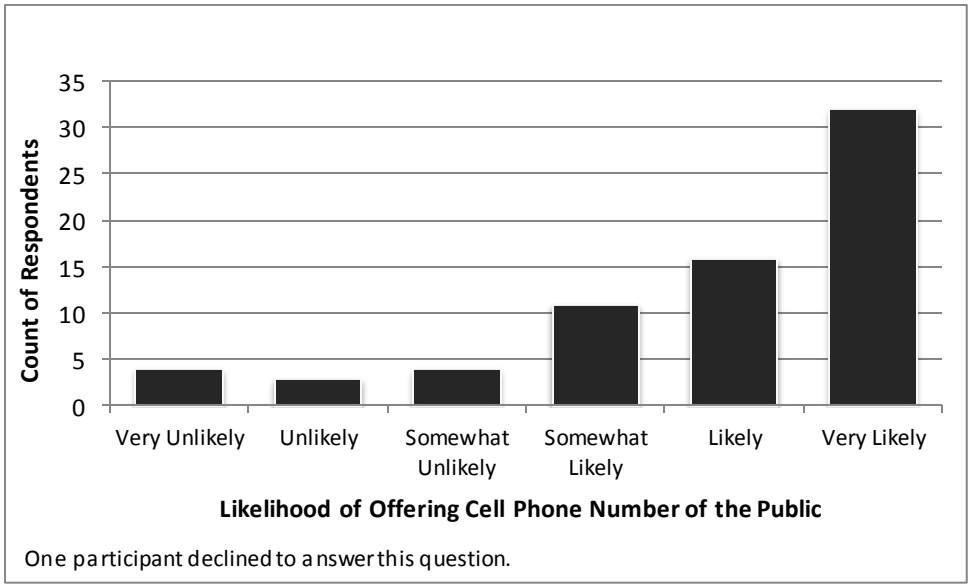
The results section is structured into four phases according to the different phases of the project. The needs assessment was conducted early in the study to identify the data needs and demands of users. The pre-CAD survey was conducted prior to the deployment of the RPD's mobile CAD system and was designed to get a general assessment of users' perceptions towards the use of information technology with respect to their work duties. The implementation assessment was designed to evaluate the impact and effectiveness of the apps. Users were assigned to treatment (NearMe and FI installed on their assigned devices) or control (no custom apps installed) conditions. Both groups were surveyed before app deployment and subsequently surveyed three months later. Two focus groups were also conducted as part of the implementation assessment.

Needs Assessment

The needs assessment survey gathered data on respondents' current or anticipated use of their iPhones. The RPD allows employees to use their Department issued phones as personal cell phones if the user pays a small monthly fee. Forty-four (62%) respondents indicated that they were or would be participating in this program. At the outset of the project it was believed that providing employees with cell phones would increase communication between the Department and the public. Users were asked about their likelihood of giving out their cell

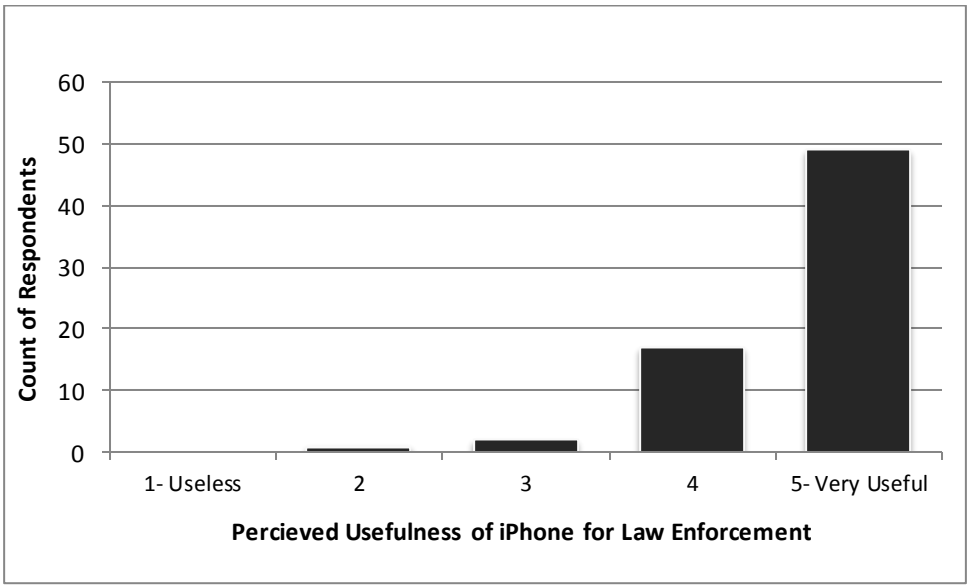
phone numbers to members of the public. Figure 5: Self-reported likelihood of offering cell phone number to the public displays the likelihood that a user would give their number to a member of the public. Most people were likely or very likely to provide their number to a member of the public.

Figure 5: Self-reported likelihood of offering cell phone number to the public



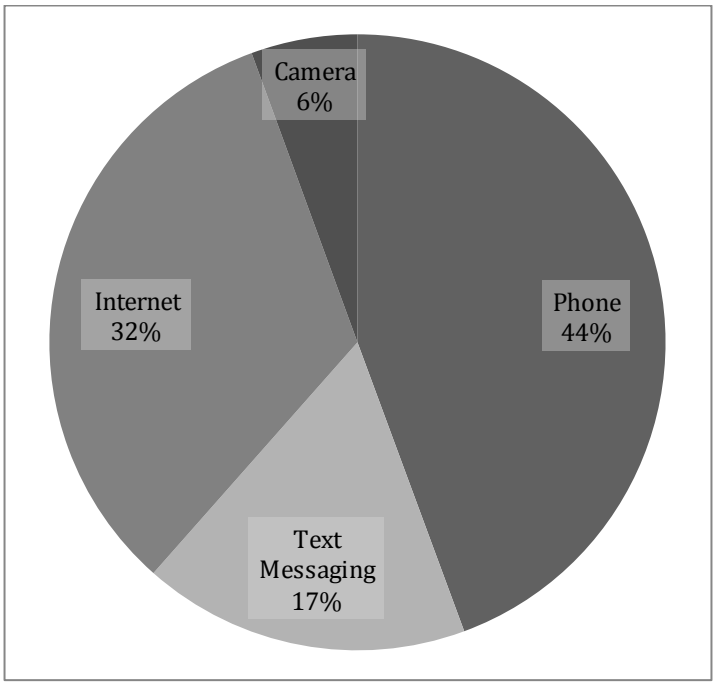
Users were asked to indicate how useful they thought the iPhone would be as a law enforcement tool. It was clear that there was a widely held attitude among respondents that the iPhone is a useful tool for law enforcement. Figure 6 displays the results on users' perceptions of the iPhone as a useful law enforcement tool.

Figure 6: Perceived usefulness of the iPhone for law enforcement



Users were asked to select the feature of the device that they thought would be most useful to their work assignment. The ability to make voice calls was selected as the single most useful feature by the most respondents. The ability to access the Internet ranked a close second. Figure 7 displays the feature that respondents thought would be most useful.

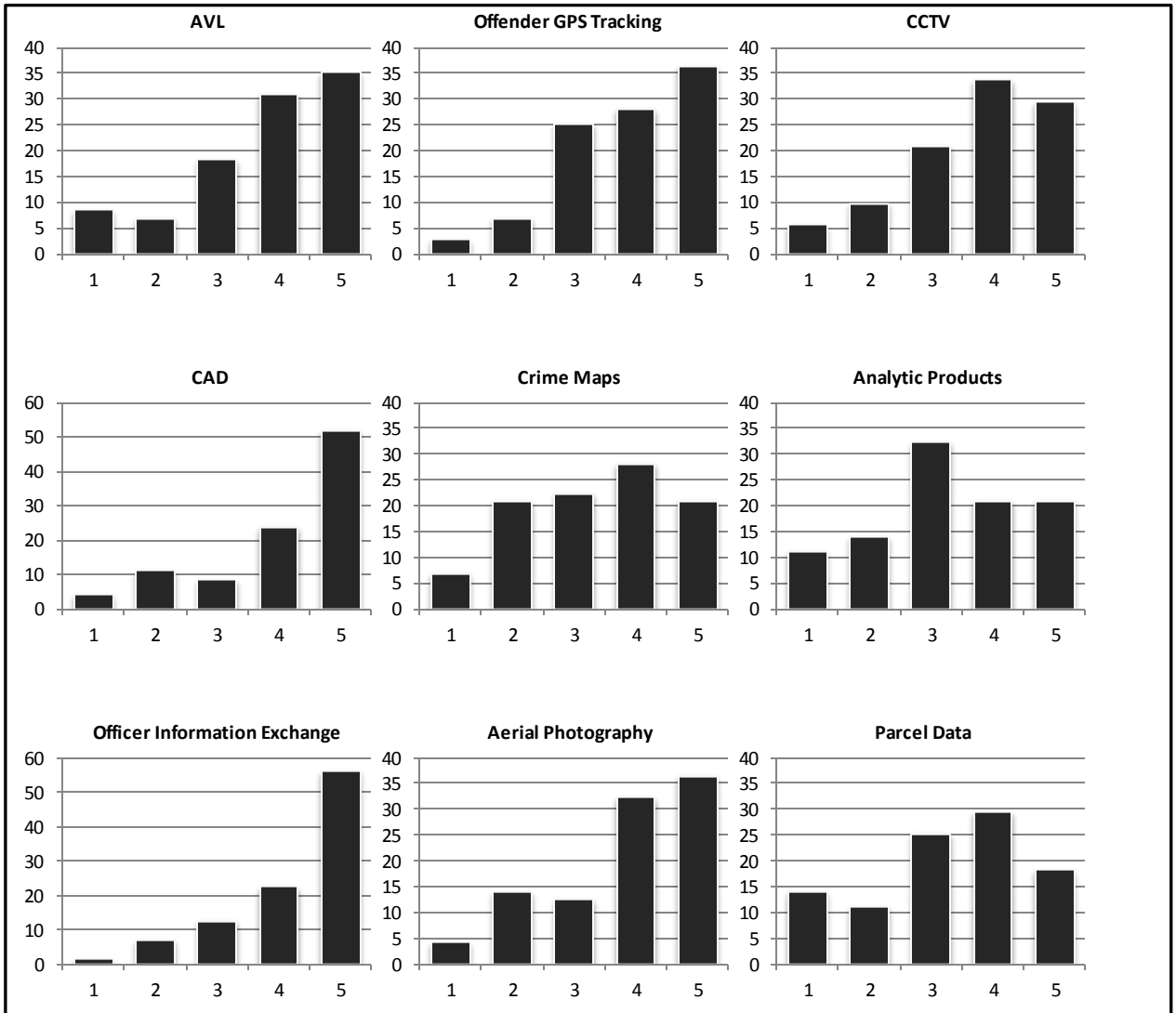
Figure 7: Most useful aspect of having an iPhone



Perhaps the most important aspect of the exploratory survey was the assessment of the respondents' perspectives on the most important aspects and features of the iPhone, and what would be helpful to include as part of a law enforcement specific application. The survey asked officers to indicate the importance of nine different specific features for law enforcement activities.

The technical working group and the advisory board generated the list of potential features. These nine specific features were: officer information exchange, computer aided dispatch (CAD), spatially referenced crime data, orthophotography, land use and parcel data, automatic vehicle locator (AVL) data, active GPS offender tracking, closed-circuit television monitoring, and data and analyses prepared by crime analysts. In general, most users thought that most of the possible features would be useful in law enforcement. Figure 8 displays the perceived importance of having access to various data elements via the iPhone.

Figure 8: Perceived Importance of Data Elements



Scale ranges from 1 (least important) to 5 (most important).

The exploratory survey indicates that there is already a high level of receptivity to the use of smart phones in the Redlands Police Department. Most people reported themselves as having intermediate or higher skills with using the iPhone. It also indicated that there are multiple perspectives on the use and role of the iPhone in police work within the department. Furthermore, most respondents indicated that they would be willing to provide their

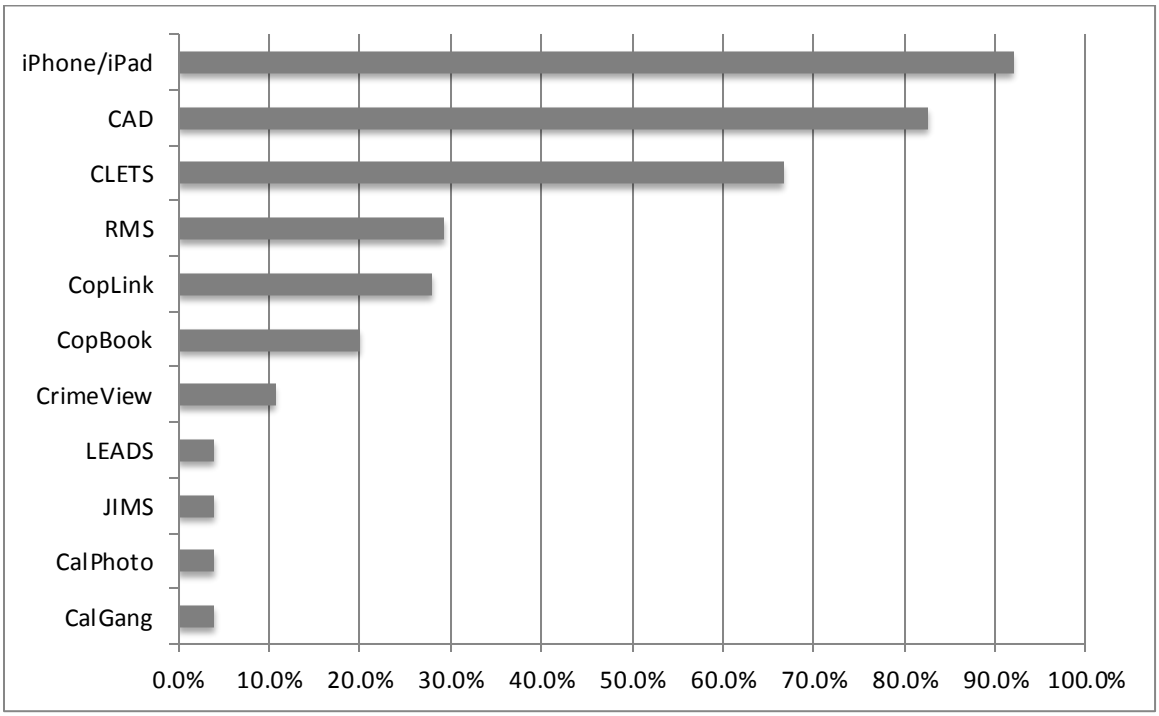
department issued cell phone number to a member of the public. This has potentially positive implications for the ability of the Department to connect with members of the public. The survey solicited feedback from future end-users on specific features they would like to see from the apps being developed. If the responses to the potential data list are any indication, users desire access to a range of datasets covering a broad spectrum of topics and sophistication levels.

Pre-Mobile CAD Survey

The pre-CAD survey was conducted immediately prior to RPD deploying its online, mobile accessible CAD system. 77 of the 100 eligible to participate in the survey responded. 42% held the rank of officer (n=30) while 24% (n=17) were civilians or volunteers. 74% (n=54) were male. Users were asked to report on common information technologies (IT) that they utilize in the course of their work duties, the reliability and quality of available IT technology, and how those technologies have impacted their work experience.

Respondents were asked about common technologies that they encountered during their normal work duties. A list of common technologies was provided along with space for entering undefined answers. Perhaps not surprisingly, the most frequently used technology was iPhones and iPads. Other commonly used applications were the computer aided dispatch system (CAD), the California Law Enforcement Telecommunications System (CLETS), and the RPD records management system (RMS).

Figure 9: Common technologies used by survey respondents



Note: Two respondents skipped this question (n = 75). CAD = Computer Aided Dispatch; CLETS = California Law Enforcement Telecommunications System; RMS = Records Management System; LEADS = Law Enforcement Agency Data System; JIMS = Jail Information Management System. '

Respondents were also asked about how IT systems impact their ability to carry out their work duties and the general ability of the Department to carry out its mission. In general, most respondents agreed or strongly agreed (82%) that the technology implemented by the Department allowed them to be more effective and productive. 80% of respondents agreed that technology allowed them to more effectively manage the information available to them. 72% thought that technology helped to improve communication within the Department. Table 2 displays the responses on questions about the impact of IT systems.

Table 2: Impact of IT systems on work duties and effectiveness

Would you agree or disagree with the following statements about the IT systems you use? (Please select one box for each row.) The IT systems I use...

	Strongly Agree (5)	4	3	2	Strongly Disagree (1)
...have a positive impact on my effectiveness and productivity in my job	37.5	44.4	12.5	4.2	1.4
...make work easier	36.6	42.3	12.7	5.6	2.8
...help me manage the information I need to do my job properly	35.2	45.1	16.9	2.8	0.0
...require me to report my activities more often	6.9	23.6	29.2	30.6	9.7
...require unnecessary steps to finish things	13.9	13.9	20.8	40.3	11.1
...require collecting information that distracts from my main job responsibilities	12.5	18.1	20.8	29.2	19.4
...limit my discretion	4.2	4.2	31.9	33.3	26.4
...improve Department's response to crime	23.9	29.6	32.4	12.7	1.4
...improve Department's service to the public	22.5	36.6	28.2	11.3	1.4
...lead to a more problem oriented police service	22.9	25.7	31.4	14.3	5.7
...lead to a more effective proactive policing	21.1	31.0	31.0	8.5	8.5
...increase officer safety	16.9	32.4	25.4	14.1	11.3
...help employees make better decisions at work	19.7	32.4	21.1	25.4	1.4
...increase employee involvement in decision making	16.9	31.0	25.4	22.5	4.2
...improve capability of management	17.1	44.3	28.6	8.6	1.4
...improve communication within the Department	37.1	35.7	18.6	8.6	0.0
...improve trust within the Department	15.7	17.1	32.9	24.3	10.0

Note: n = 70-72; results shown as valid percentage

Overall the pre-CAD survey found that respondents were generally positive towards information technology and thought that it made them more effective in performing their job duties.

App Evaluation

App evaluation took the form of two surveys and two focus groups. First, the baseline survey data gathered during the first survey is discussed. Next, the exit survey is detailed along with

comparisons to relevant metrics that appeared during the baseline and exit surveys. Finally, the focus group results are discussed.

Baseline Survey Findings

Sixty-eight of the 93 participants invited agreed to participate in the survey (one additional participant refused to participate after reading the informed consent page). Of the 68, one participant did not answer a single question and one participant falsified answers to the demographic questions[12]. These two observations were dropped, leaving a final sample size of 66 (response rate 71.0%). Table 3 shows the profile of the survey respondents relative to the full population of 93 participants. Table 3 indicates that the 66 survey respondents were reasonably representative of the overall population. The percentage of female respondents was slightly higher than the overall proportion of women in the department, and higher ranks were slightly over-represented among sworn officer survey respondents.

12. This issue was discovered when it was found that nobody employed by the department fit the reported demographic profile. Because of the potential unreliability of the respondent's answers they were dropped from further analysis.

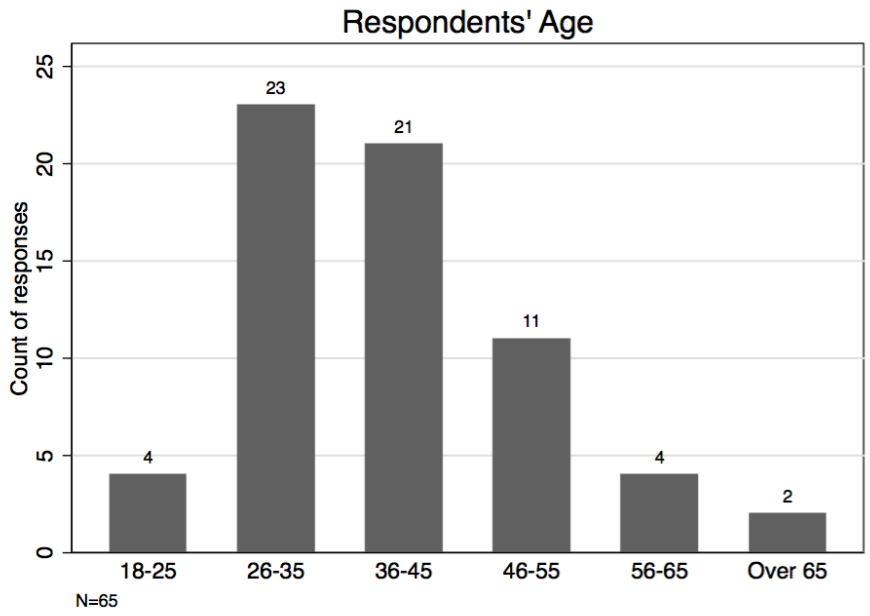
Table 3: Demographic Profile of Baseline Survey Respondents Compared to RPD Population

		Population (N=93)		Baseline Survey (N=66)	
		N	%	N	%
Gender	Male	74	79.6	49	74.2
	Female	19	20.4	16	24.2
	Refused/Missing	-		1	1.5
Sworn vs.	Sworn	76	81.7	50	75.8
Non-Sworn	Non-Sworn	17	18.3	11	16.6
	Refused/Missing	-		5	7.6
Rank	*N*	*76*		*50*	
	Officer	42	55.3	26	52.0
	Corporal/Detective	18	23.7	14	28.0
	Sergeant	11	14.4	5	10.0
	Lieutenant & Above	5	6.6	5	10.0

Note: Population data were based on administrative records provided by the RPD.

Figure 10 below shows the age distribution of the baseline survey sample[13]. The majority of survey respondents were aged between 26 and 45.

Figure 10: Age of Respondents at Baseline

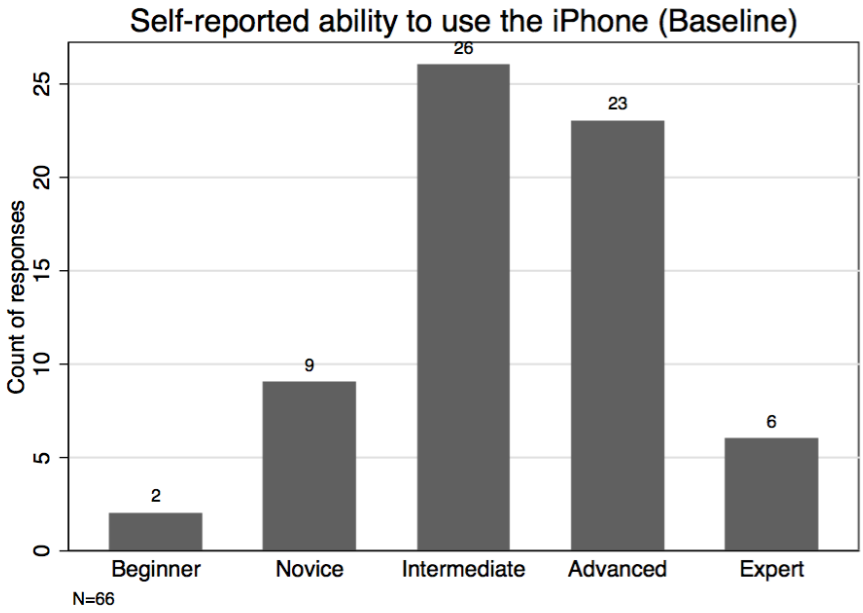


13. Age data for the population was not available.

Use of the iPhone

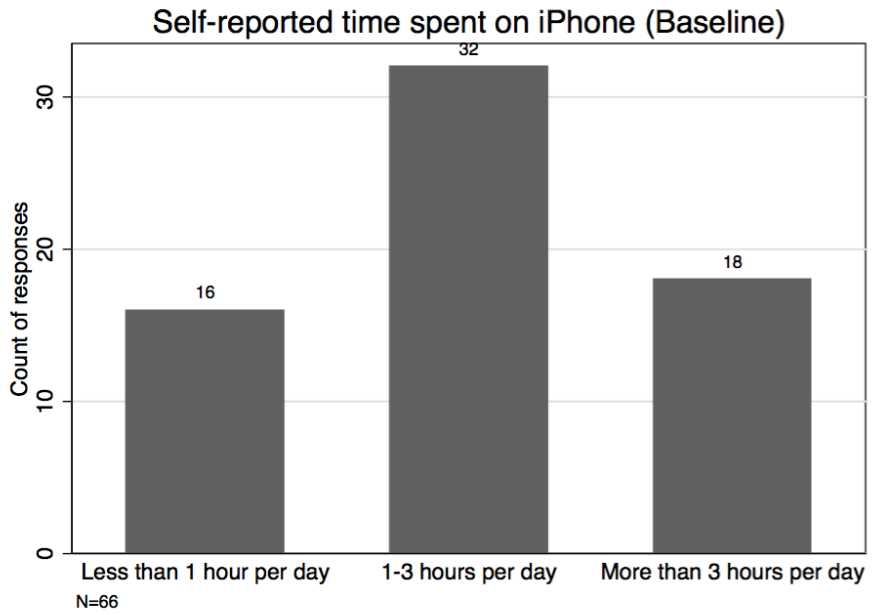
Most respondents appeared very comfortable with their ability to use the iPhone. Over 83% of those surveyed described their ability as intermediate or higher, and almost half of respondents (43.9%) described themselves as advanced or expert users. The responses also indicate improvements in ability compared to the original needs assessment: 44% of respondents described themselves as advanced or expert in that survey, compared to nearly 31% in the baseline survey (Figure 11).

Figure 11: Self-Reported Ability to Use the iPhone



Nearly three-quarters of respondents (72.7%) use their iPhones for up to three hours per work day, while just over one-quarter (27.3%) use the phones for more than three hours (Figure 12).

Figure 12: Self-Reported Time Spent Using the iPhone



Sixty-two of the 66 respondents (93.9%) had downloaded apps to their iPhone. The majority of those (N=53, 85.5%) did so once a month or less. Only two respondents reported downloading apps multiple times per week. Forty-two percent (N=26) of those who had downloaded at least one app had already downloaded an app that allowed them to complete field interviews (FIs) prior to the rollout of the RPD-specific app; however, seven of them had never completed an FI on their device and three had only completed one. At the other end of the scale, one officer reported having completed more than 200 FIs and a further two had completed 100.

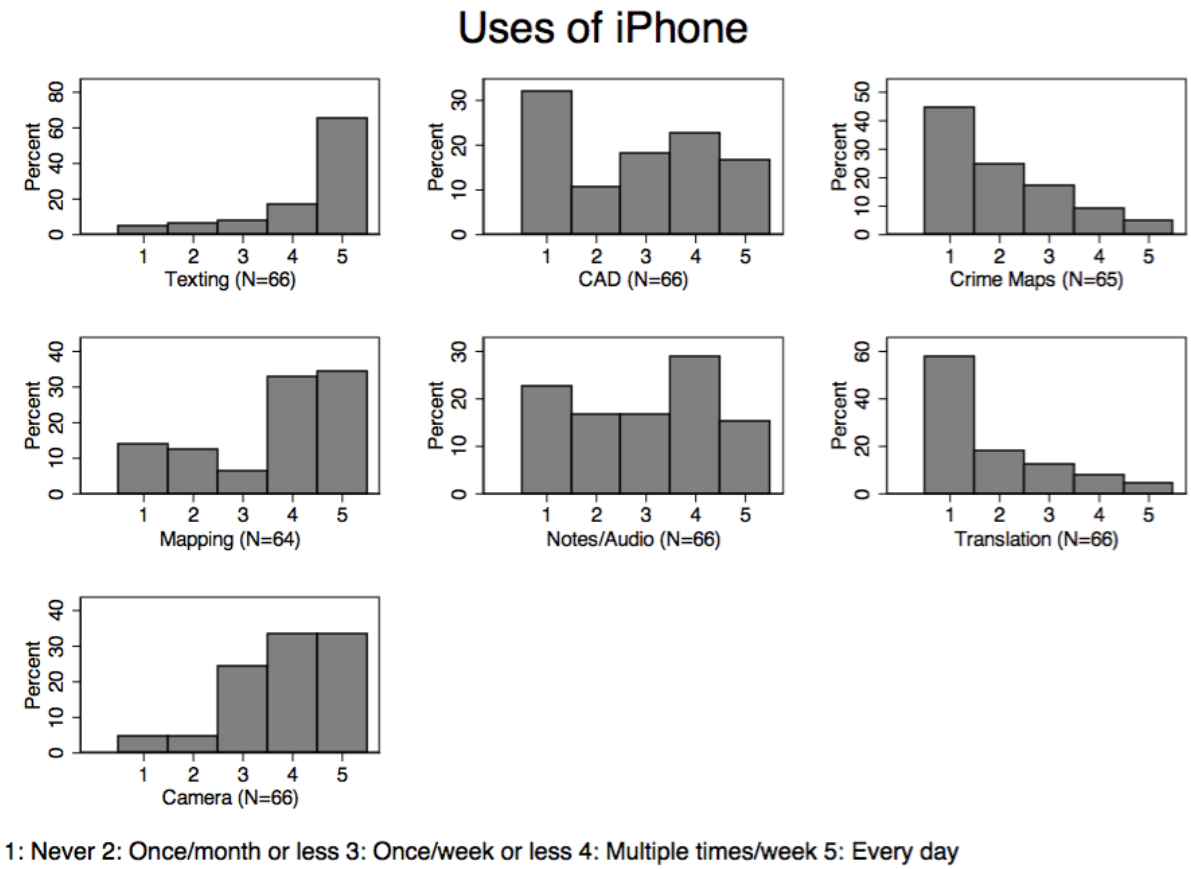
Only 18 of the 26 respondents who had downloaded an FI app indicated how long it took them to complete a typical FI on the iPhone. None of them reported that it took longer than 10 minutes; 12 stated that it took 5 minutes or less. Nearly 64% of those who had downloaded an app had attached a picture to an FI (one of the 26 did not answer the question). However, one respondent noted on the survey that attaching pictures lengthened the process.

Thirty-six respondents had not downloaded an FI app (four respondents did not answer the question). Those respondents were also asked whether they wanted to complete FIs on their phones. Sixteen (44.4%) said they did, 18 (50.0%) did not, and two (5.6%) did not answer the question (in addition, three respondents who did not state whether or not they had downloaded an FI app stated whether or not they wanted to complete FIs on the iPhone. One said yes and two said no).

Respondents were also asked about their other uses of the iPhone at work. Figure 13 indicates the popularity of other apps or functions, including texting, accessing CAD and crime maps, other forms of mapping (i.e., navigation), photography, audio and note-taking apps, and language translation. Texting was most frequently used, followed by the camera and mapping/navigation functions. In contrast, language translation and crime mapping capabilities were least popular, while use of audio/note-taking and CAD functions were popular with some users but not others. Frequent use of certain functions was significantly associated with frequent use of others. For example, respondents who texted more frequently also used the camera ($\gamma = .795$, $p < .0001$), note-taking or audio apps ($\gamma = .560$, $p < .0001$), maps/navigation ($\gamma = .463$, $p < .001$), and CAD ($\gamma = .296$, $p \leq .030$) more frequently. Conversely, frequent use of crime mapping was significantly associated with frequent use of all functions except texting.

It is interesting to note that in the needs assessment survey more than three-quarters of respondents identified officer information exchange and ability to access CAD information as important features for the iPhone, but while most officers text frequently, CAD functionality on the device appeared to be less widely used.

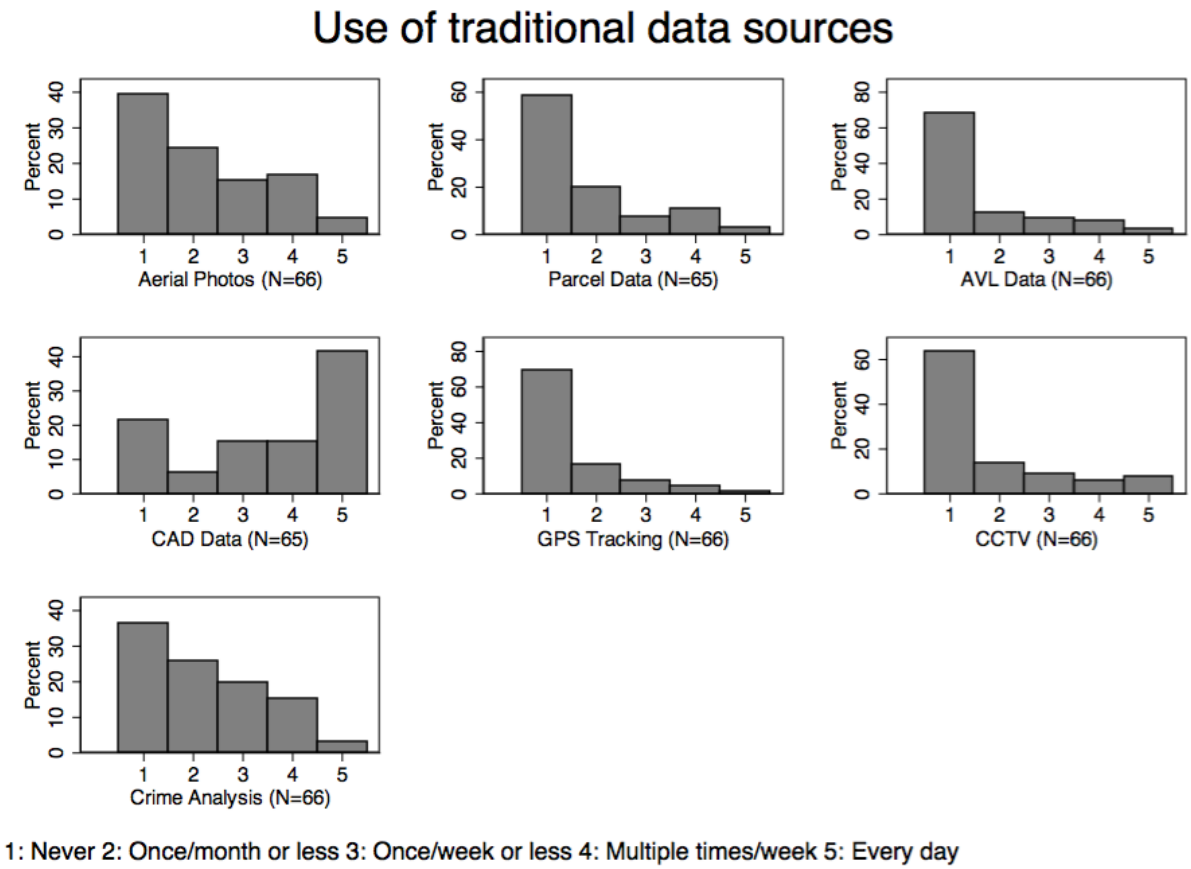
Figure 13: Uses of the iPhone



Use of Other Data Sources

Respondents were asked to indicate how frequently they used a range of other data sources on traditional, non-iPhone platforms (e.g., desktop, laptop, or in-car computers). According to Figure 14, CAD is the only data source used frequently by a majority of the sample. At least 60% of respondents had used aerial photographs and crime analysis data at least once, but only one-fifth of respondents reported using these sources multiple times per week. More than two-thirds of respondents had never used GPS offender tracking or Automatic Vehicle Locator (AVL) data, while almost as many had never used CCTV feeds or parcel data.

Figure 14: Use of Traditional Data Sources



There was a strong, significant association between use of CAD on the iPhone and use of CAD on traditional platforms ($\gamma = .593$, $p < .0001$). Respondents appear to use CAD on the iPhone as a supplement to traditional methods of accessing the CAD rather than as a replacement. A small group of respondents (N=5) continue to use the CAD only through traditional methods, while 10 respondents did not use CAD data at all (Table 4). Unfortunately, the survey did not explore reasons for non-adoption of the mobile CAD.

Table 4: Frequency of Use of CAD (Traditional vs. iPhone)

Frequency of CAD use (traditional)	**Frequency of CAD use (iPhone)**					Total
	Never	Once a month or less	Once a week or less	Multiple times a week	Every day	
Never	10	4	0	0	0	**14**
Once a month or less	1	1	2	0	0	**4**
Once a week or less	2	1	3	4	0	**10**
Multiple times a week	2	0	1	6	1	**10**
Every day	5	1	6	5	10	**27**
Total	*20*	*7*	*12*	*15*	*11*	*65*

Note: Table comparing the self-reported frequency of CAD use through traditional sources with the self-reported frequency of CAD use on the iPhone.

The majority of respondents (N=41, 65.1%) indicated that they would like to attach images to traditional paper FIs[14]. However, among those who had not tried completing FIs on their iPhones there was no relationship between wanting to attach pictures to paper FI cards and wanting to complete FIs on the iPhone, which would allow the officers to attach an image ($\chi^2 = 1.990$, $p \leq .158$, N=36).

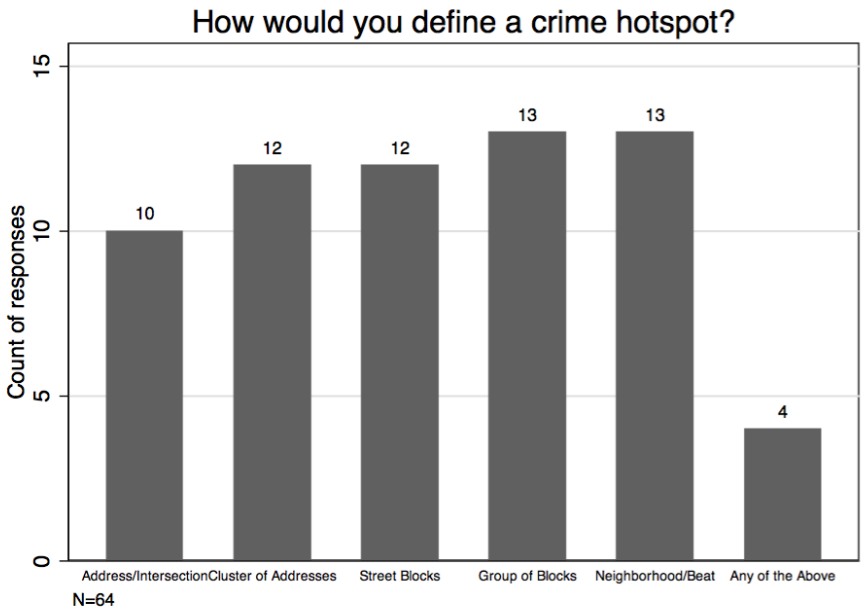
Crime and Place

Respondents were asked about their understanding of crime hot spots and the data they used to identify them. These questions were intended to provide a foundation for understanding officers' use of the NearMe crime mapping app. Overall, there was no agreement on how a hot spot should be defined. Responses were fairly evenly divided across the five main response categories (Figure 15): address/intersection (N=10, 15.6%), clusters of addresses (N=12, 18.8%), street blocks (N=12, 18.8%), groups of blocks (N=13, 20.3%), and an entire neighborhood or beat (N=13, 20.3%). Four respondents (6.3%) selected "any of the above." In a free text space these respondents noted that the definition depended on the circumstances. Another respondent

14. Three respondents did not answer this question.

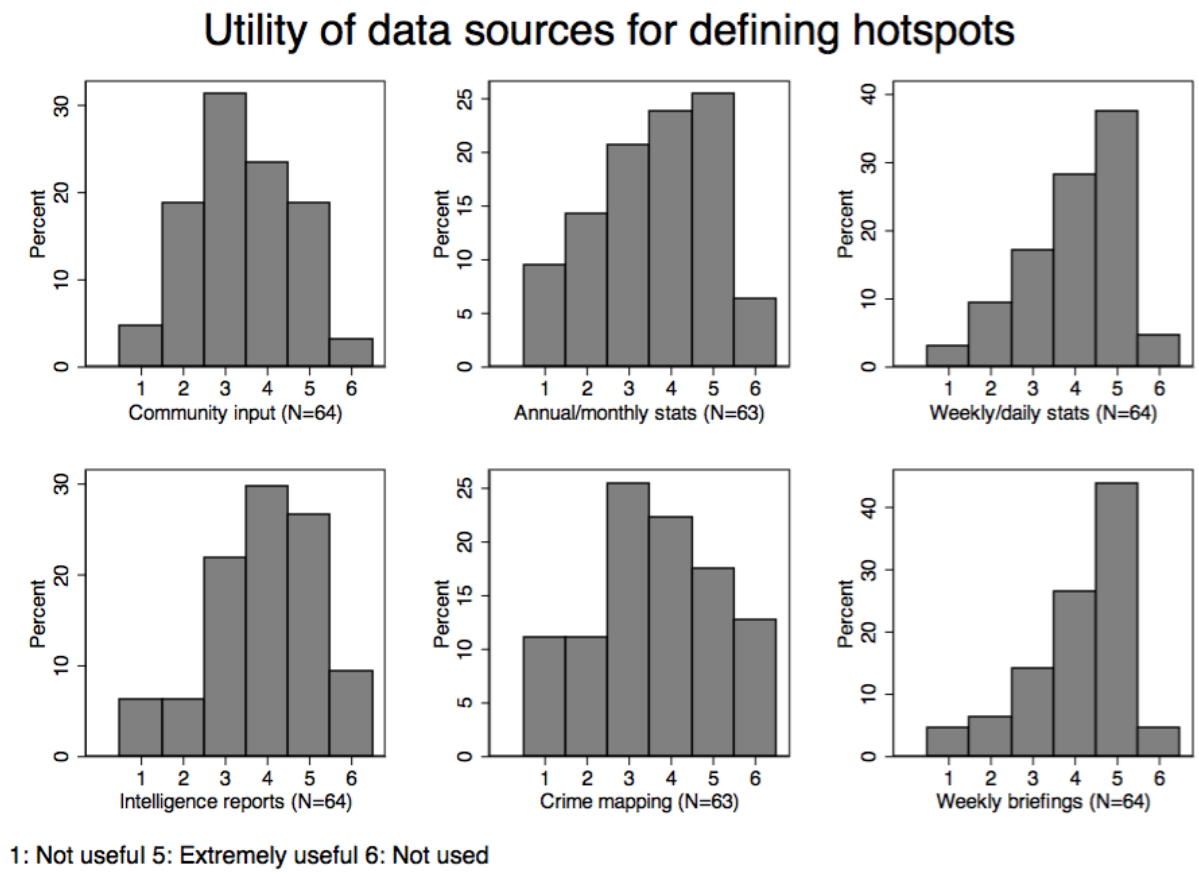
who selected "groups of blocks" as the definition noted that apartment complexes and shopping centers could also be considered hot spots. Two respondents did not answer the question.

Figure 15: Definition of a Crime Hot Spot



Finally, respondents indicated which data sources were most useful to them in identifying and dealing with crime hot spots (Figure 16). All the sources listed were rated as at least somewhat useful by a majority of respondents. Nearly 70% indicated that weekly team briefings were useful or extremely useful, and 65% felt that weekly or daily crime statistics were useful or extremely useful. About half of respondents rated intelligence reports and annual or monthly statistics highly, while a minority of respondents ranked community input (41%) and crime maps (39%) as useful or extremely useful. Crime maps were also most commonly rated "not useful" (13%) or "not used" (13%).

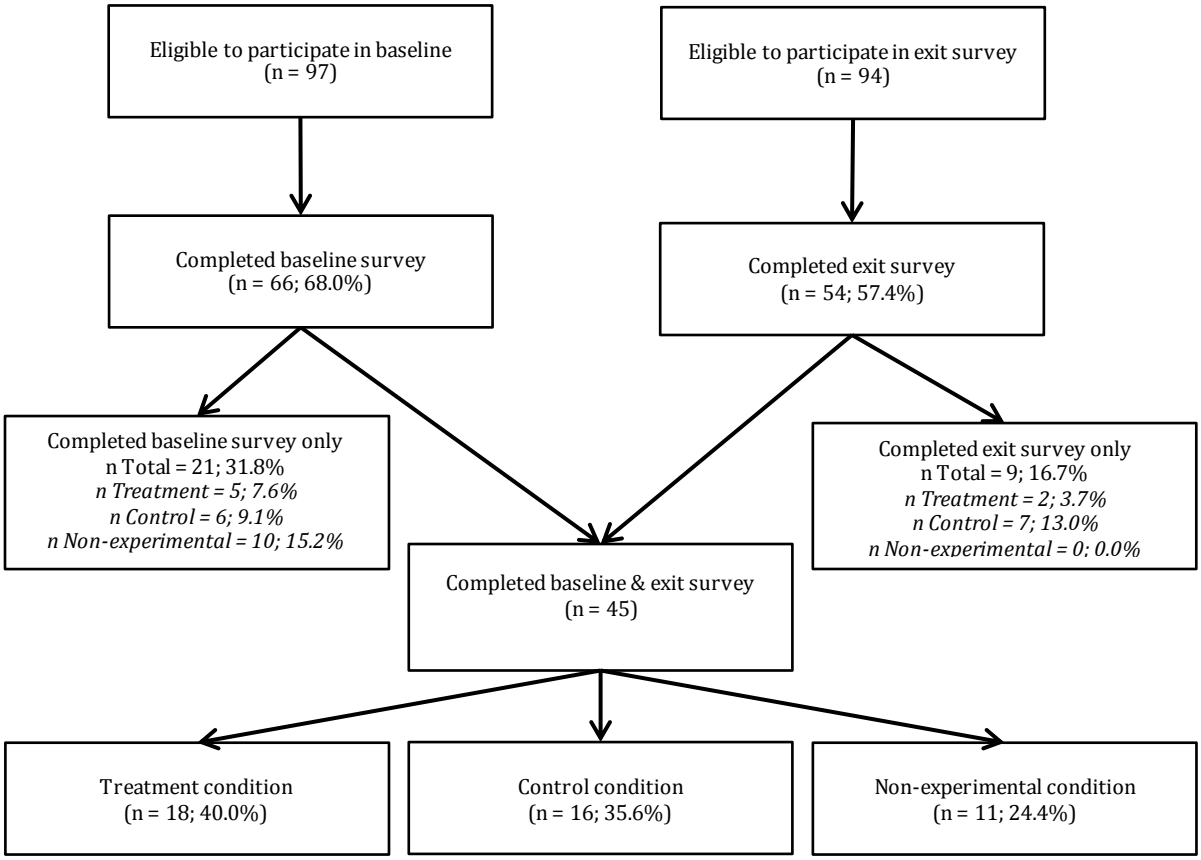
Figure 16: Utility of Data Sources in Defining Crime Hot Spots



Exit Survey Findings

Fifty-seven of the 94 participants entered the survey. Two respondents did not answer a single question, and one participant's responses were dropped from the analysis because she/he was a new employee that was not part of the original sample. The final sample size was 54 (total response rate 58.1%). Figure 17 provides a flow chart of participants through the entry and exit surveys.

Figure 17: Flow Chart of Participants through Baseline and Exit Surveys



Note: Users in the non-experimental group (not assigned to treatment or control) were included in the survey. Users were excluded from treatment or control randomization if they were non-field civilians and volunteers, executive staff, or part of the training team. The survey covered a number of topics that were of interest to the RPD and in the interest of providing a complete understanding of the mobile device usage these users were included in the survey. Their responses to the baseline and exit survey are not included in the discussion below.

Table 5 shows the profile of the exit survey respondents relative to the baseline survey, broken out by experimental condition. The 11 respondents who did not participate in the experiment are not included in the following discussion of results. Thus, the subsequent analyses are based on the 43 individuals who completed the exit survey and were randomly assigned (a response rate of 51.8% of the 83 participants who were randomly assigned). The control group's response rate was higher than that of the treatment group (54.8% vs. 48.8%).

Analyses of changes between the baseline and exit surveys are based on the 32 experimental participants who completed both waves.

Table 5: Demographics of Exit Survey Respondents

		Baseline Survey (N=66)		Exit Survey Treatment (N=20)		Exit Survey Control (N=23)	
		N	%	N	%	N	%
Gender	Male	49	74.2	16	80.0	12	52/2
	Female	16	24.2	2	10.0	4	17.4
	Refused/Missing	1	1.5	2	10.0	7	30.4
Sworn vs. Non-Sworn	Sworn	50	75.8	19	95.0	21	91.3
	Non-Sworn	11	16.6	1	5.0	1	4.0
	Refused/Missing	5	7.6	-	7.6	1[a]	4.0
Rank	*N*	*50*		*19*		*21*	
	Officer	26	52.0	5	26.3	10	47.6
	Corporal/Detective	14	28.0	10	52.6	6	28.6
	Sergeant	5	10.0	4	21.1	4	19.0
	Lieutenant & Above	5	10.0	-	-	1[b]	4.8

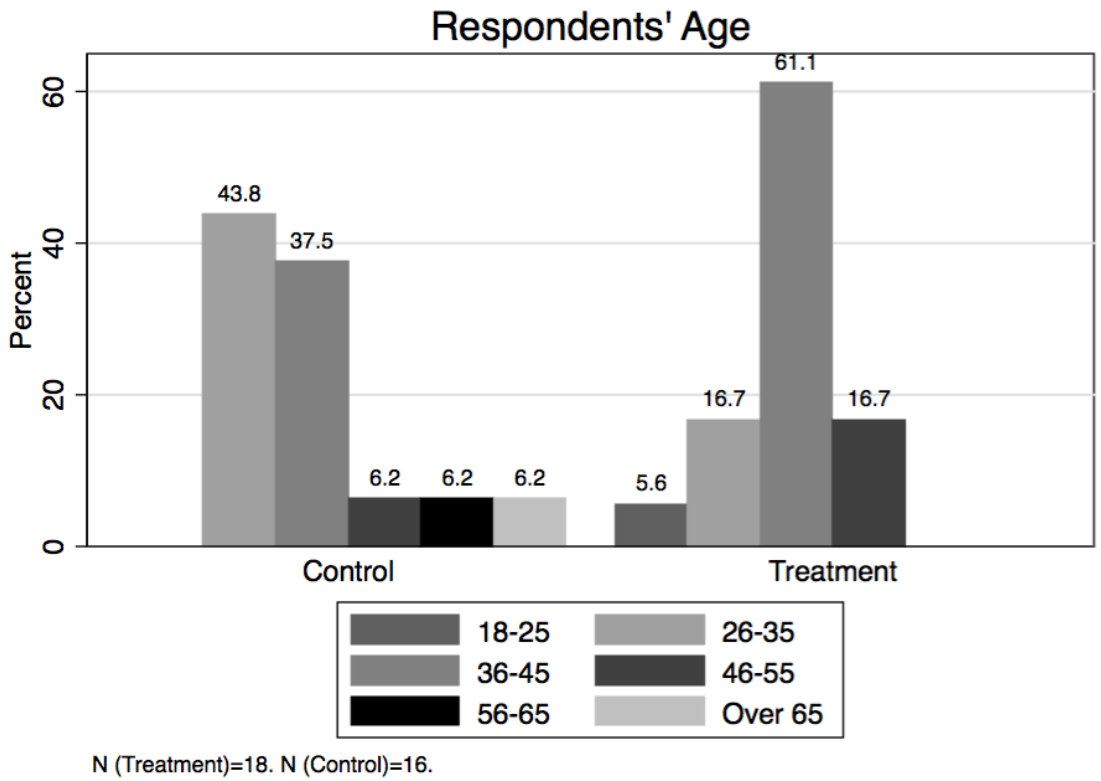
a. One respondent gave their rank as "other" and their assignment as "Investigations." Since it was not clear whether this was a sworn or non-sworn employee, this observation is counted as missing in Table 5.
b. Executive staff (lieutenants & chief; n = 5), were excluded from the experiment; this participant was promoted from sergeant to lieutenant during the experimental period.

Table 5 indicates some imbalance between the treatment and control groups, but none of these differences were significant. Males were overrepresented in the treatment group and underrepresented in the control group but the difference was not significant ($p \leq .387$, Fisher's exact test (FET)). Officers were underrepresented in the treatment group compared to the control group, while corporals and detectives were overrepresented, but once again the difference was not significant ($p \leq .528$, FET).

Fewer of the younger officers who participated in the baseline survey also completed the exit survey; the modal age category among those for whom data were available was 36-45. The treatment and control groups differed in terms of age—treatment group participants were slightly younger than those in the control group—but these differences were not significant ($p \leq$

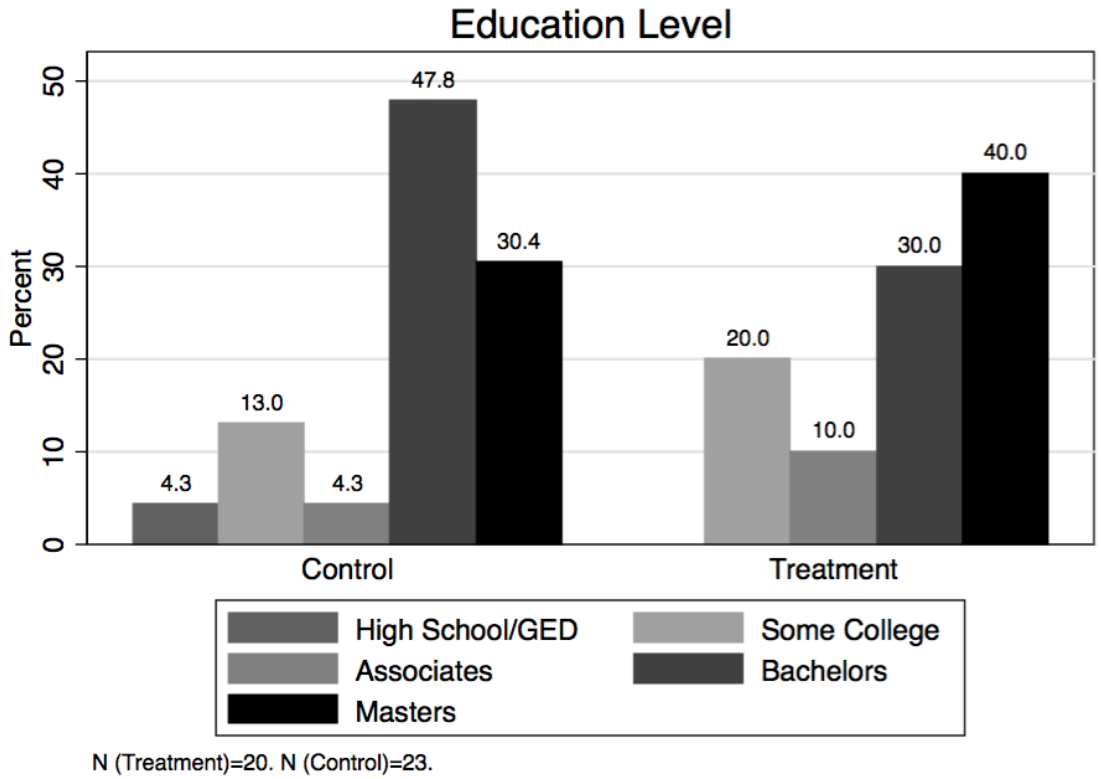
.188, FET). Figure 18 shows the age distribution of the experimental exit survey respondents (gender and age group data are drawn from the baseline survey from respondents who completed both waves).

Figure 18: Age of Respondents in Exit Survey by Experimental Condition (Baseline Data)



Survey respondents were highly educated; almost three-quarters (74.4%) of the experimental sample and 78.3% of the control group held a bachelor's degree or higher (Figure 19). This reflects the high standards of employment at RPD, but may also have been influenced by the over-representation of higher ranks. There were no significant differences between treatment and control groups ($p \leq .659$, FET).

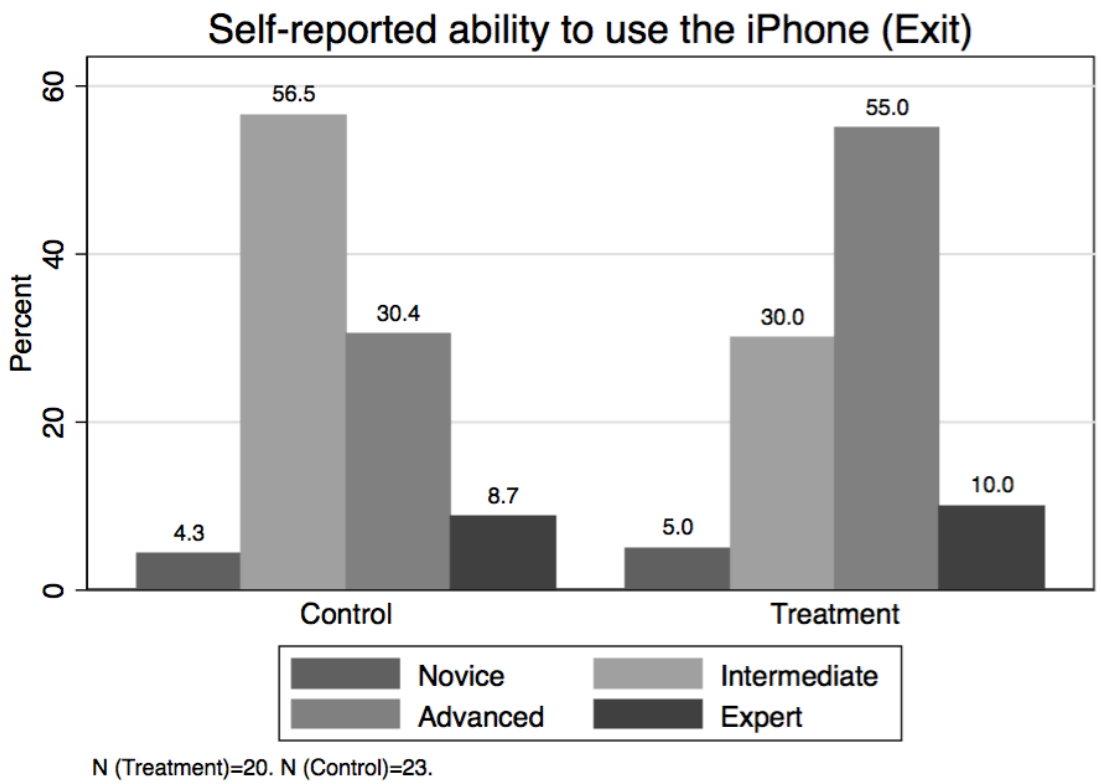
Figure 19: Education Level of Respondents by Experimental Condition (Exit Survey)



Use of the iPhone

Over 95% of experimental participants in the exit survey reported their ability to use the iPhone as intermediate or higher (Figure 20). This was a marked increase over the baseline survey, in which 82.2% of respondents who were subsequently randomly assigned selected these categories. The percentage of experimental participants indicating they were advanced or expert users also increased from 40.0% in the baseline survey to 51.2% in the exit survey. Nobody in the exit survey indicated that they were beginners. There were no significant differences in ability between treatment and control group participants in the exit survey ($p \leq .322$), although a substantially higher percentage of treatment group participants reported being advanced or expert users compared to control group participants (65% vs. 39.1%).

Figure 20: Self-Reported Ability to Use the iPhone by Experimental Condition



Although there were no significant differences between the experimental groups in the exit survey, an examination of the 34 participants who answered both waves of the survey suggests that assignment to the treatment group (i.e. having access to the FI and NearMe apps) was associated with an improvement in ability between survey waves. There was a significant association between self-reported ability at baseline and exit among both treatment and control groups, as we would expect given that past ability likely predicts future ability, but the magnitude of the association was 32% greater in the treatment group (treatment: $\gamma = .796$, $p < .0001$, N=18; control: $\gamma = .600$, $p \leq .033$, N=16).[15]

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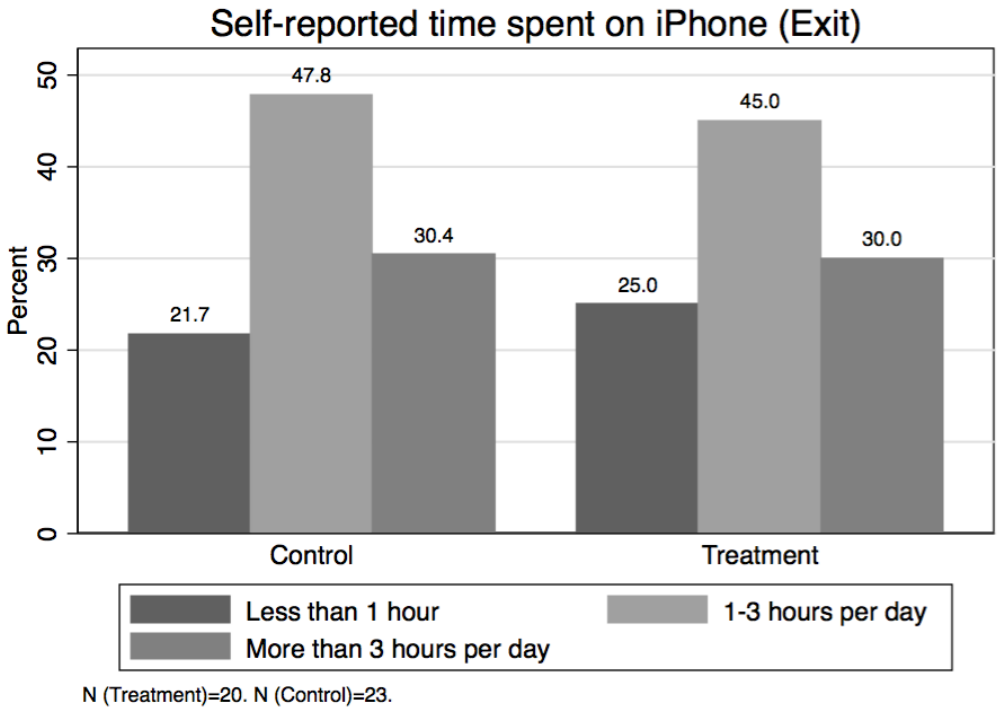
15. Self-reported ability was a sufficiently strong independent predictor of outcomes and perceptions that it was not necessary to examine the impact of other factors, such as

There was a very slight increase in usage of the iPhone in a typical workday between the two surveys (Figure 21). Just over 30% of respondents indicated that they used the iPhone for more than three hours per day, up from 26.7% in the baseline survey. There was no difference in the amount of time spent using the iPhone between the treatment and control groups in the exit survey (χ^2=.068, p ≤ .967).

Figure 21: Self-Reported Time Spent Using the iPhone by Experimental Condition



However, as in the analysis of the ability, treatment group participants were more likely than control group participants to increase the time they spent on their iPhone between waves. Usage at baseline was a significant predictor of usage at exit in both groups but the magnitude of the association was 35% greater in the treatment group, suggesting that access to the apps

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demographic characteristics. However, the small sample size meant that cell frequencies were usually too small to model multiple measures of association.

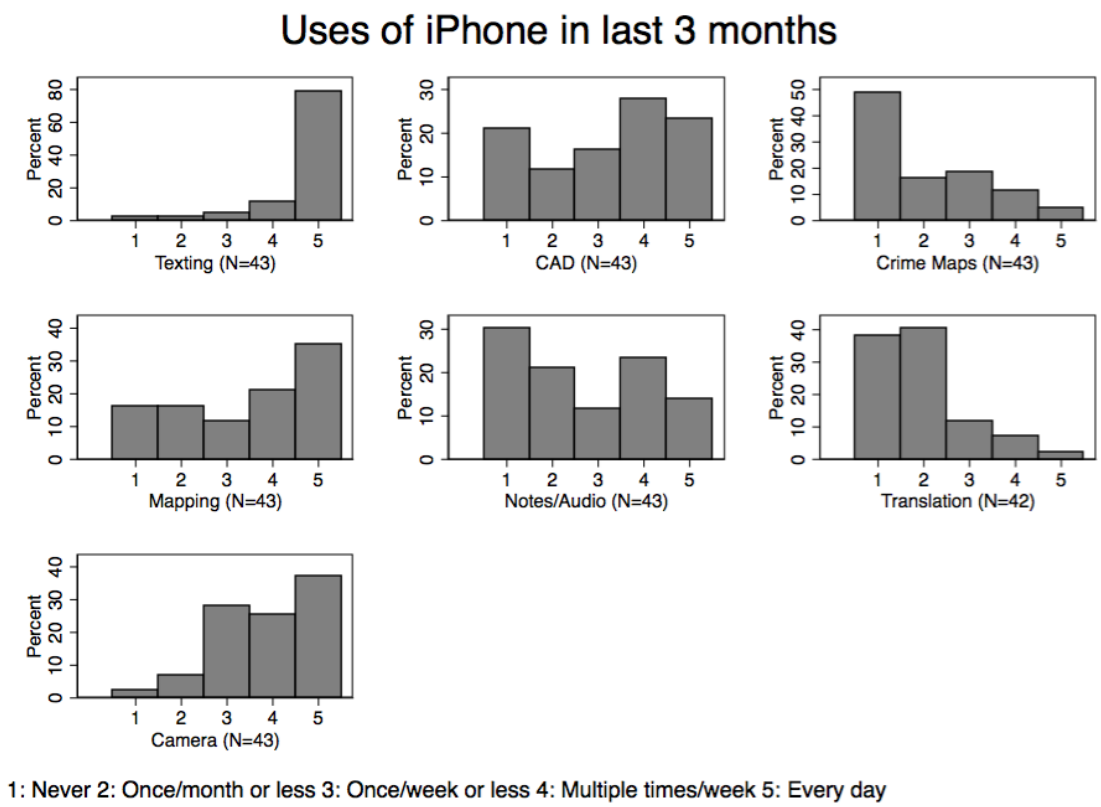
was associated with increased usage (treatment: $\gamma = .900$, $p < .0001$, N=18; control: $\gamma = .667$, $p \leq .007$, N=16). Conversely, three control group participants reported decreased use between waves.

Over 95% of the experimental respondents stated that they had downloaded new apps to their iPhones at least once (one control group participant did not answer the question). As in the baseline survey, the majority of participants in both groups (treatment: 70.0%, N=18; control: 81.8%, N=14) only did so once per month or less, but across both groups slightly more respondents than in the baseline survey (N=8, 19.1%) downloaded new apps at least once per week. There was no difference between the treatment and control groups in terms of frequency of new downloads in the exit survey ($p \leq .693$, FET), but there were substantial differences between the baseline and exit surveys between groups. In the treatment group, there was a strong positive association between frequency of downloads at baseline and exit ($\gamma = .840$, $p < .0001$, N=18) but in the control group the association was strongly negative ($\gamma = -1.0$, $p = .000$, N=15). Treatment group participants thus increased their downloads between the two waves while control group participants downloaded apps less frequently. Of course, given the nature of the treatment this could reflect treatment groups downloading the experimental apps. However, it is interesting to note that among the experimental sample in the exit survey, the two participants who stated they never downloaded apps were members of the treatment group.

Respondents also indicated the activities for which they had used their iPhones during the three months of the experimental period (Figure 22). The usage pattern largely followed those in the baseline survey: for example, 79.1% of the experimental sample stated that they exchanged text messages every day, while crime mapping and translation functions were less

popular. Figure 22 shows combined results from the treatment and control groups because there were no significant differences in types of activity between groups in the exit survey. However, this is an interesting finding because we would have expected to see differences in some activities, such as crime mapping. This suggests that these experimental apps may not be driving the differences seen earlier in improved ability and more frequent use of the devices among the treatment group.

Figure 22: Uses of the iPhone (Treatment & Control Groups)



However, there were some interesting changes over time among experiment participants who completed both waves of the survey, with participants in both groups reporting significantly more frequent use of the iPhone for policing-specific activities such as CAD and crime mapping. Prior use of CAD was moderately associated with CAD use in the exit

survey in both groups, but the magnitude of the association was greater in the control group, suggesting that control group members were more likely to increase their CAD use between wave than treatment group participants (treatment: $\gamma = .558$, $p \leq .002$, N=18; control: $\gamma = .683$, $p < .001$, N=16). The control group may have used CAD functionality on their phone as an alternative to some of the information features provided to the treatment group in the experimental apps.

The relationship between the use of crime mapping at each wave was fairly weak in each group, but statistically significant in the treatment group and marginally significant in the control group (treatment: $\gamma = .489$, $p \leq .018$, N=18; control: $\gamma = .385$, $p \leq .079$, N=16). There are two interesting points here. First, there was also an increase in the use of crime mapping among the control group, which should not have had access to the NearMe app, suggesting treatment crossover or that some control group participants used alternative crime mapping apps. Alternatively this could have been caused by organizational changes in the RPD that saw the enhancement of the crime analyst division. Second, prior use was a weak predictor of later use in both groups, suggesting limited use of the NearMe app among the treatment group (although note that this question did not measure use of the NearMe app specifically).

While translation capabilities on the iPhone were not widely used in either wave, both groups significantly increased their use of this feature between the baseline and exit surveys. There was a moderate increase in the treatment group and a substantial increase in the control group (treatment: $\gamma = .533$, $p < .001$, N=18; control: $\gamma = .746$, $p < .0001$, N=15). Control group participants also slightly increased their use of other mapping features (e.g. navigation), while there was no such increase in the treatment group (treatment: $\gamma = .052$, $p \leq .425$, N=18; control: $\gamma = .477$, $p \leq .028$, N=16).

Use of the FI/NearMe apps

A number of questions in the exit survey were intended to capture participants' use and perceptions of the RPD FI and NearMe apps. Findings in this section are therefore based on the 20 respondents in the exit survey who were assigned to the treatment group, unless otherwise noted.

Interestingly, 13 individuals in the control group indicated that they had installed one or both of the experimental apps on their iPhones at the time of the exit survey (Table 6). This is most likely because control group participants had their access privileges to the apps revoked after the training period, and the survey did not capture whether the apps were installed *and* functional at the time of the survey[16]. Similarly, the fact that all 20 treatment group participants reported installing the app does not indicate that all of them used it. The majority of treatment group participants (N=16, 80.0%) installed both the FI and NearMe apps, while 4 (20%) only installed the FI app. Most of the thirteen control group participants who reported installing apps had also installed both (N=10, 76.9%). Some control group participants responded to the following questions about their impressions of the apps, but their responses are not included here. It is possible that they had an opportunity to try the apps before the experimental period started, but this means that their responses are not based on experiences during the experimental period so they are not comparable with the treatment group. They may also be basing their responses on other commercial off the shelf apps they have tried rather than the experimental Redlands apps.

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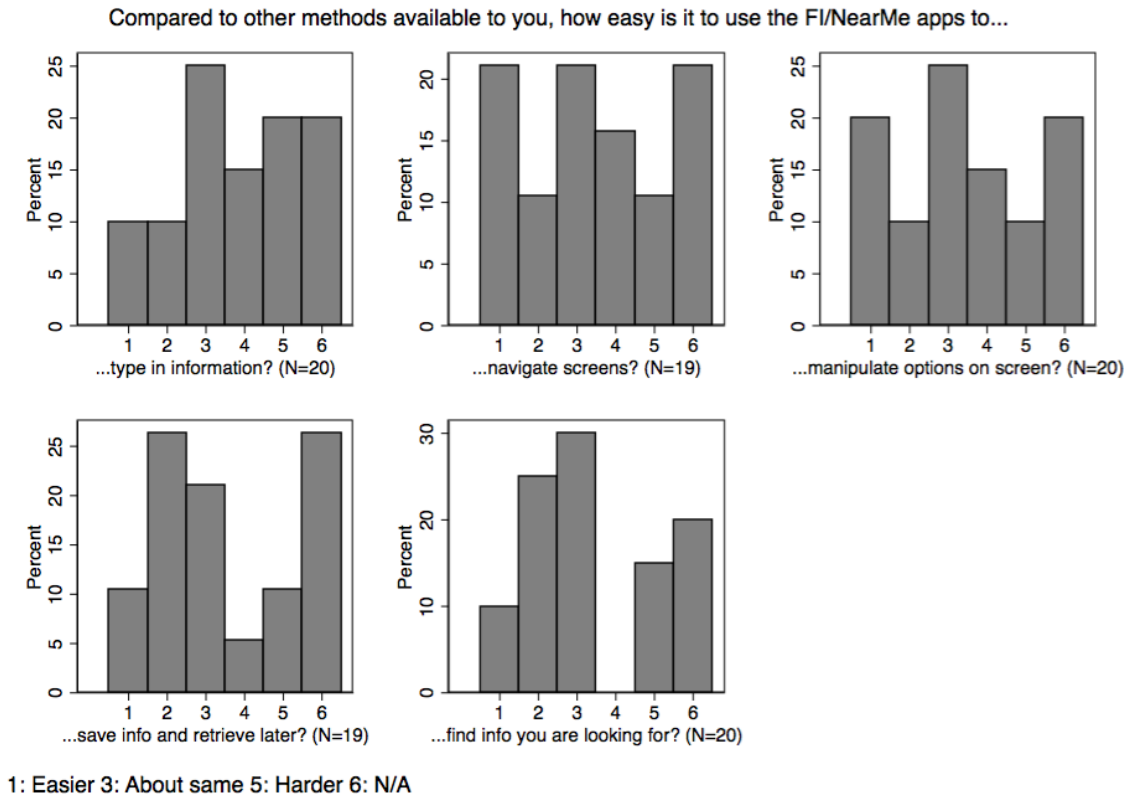
16. Regardless of users' perceptions, individuals in the control group did not have access to the apps during the experimental phase. Their access to the apps was de-authorized at a system level; they would not have been able to bypass these restrictions. The apps may have appeared installed on the device but any attempt to use them would have resulted in the apps force closing.

Table 6: Installation of apps among experimental participants

	Apps installed	Apps not installed	Total
Treatment	20	0	20
Control	13	10	23
Total	33	10	43

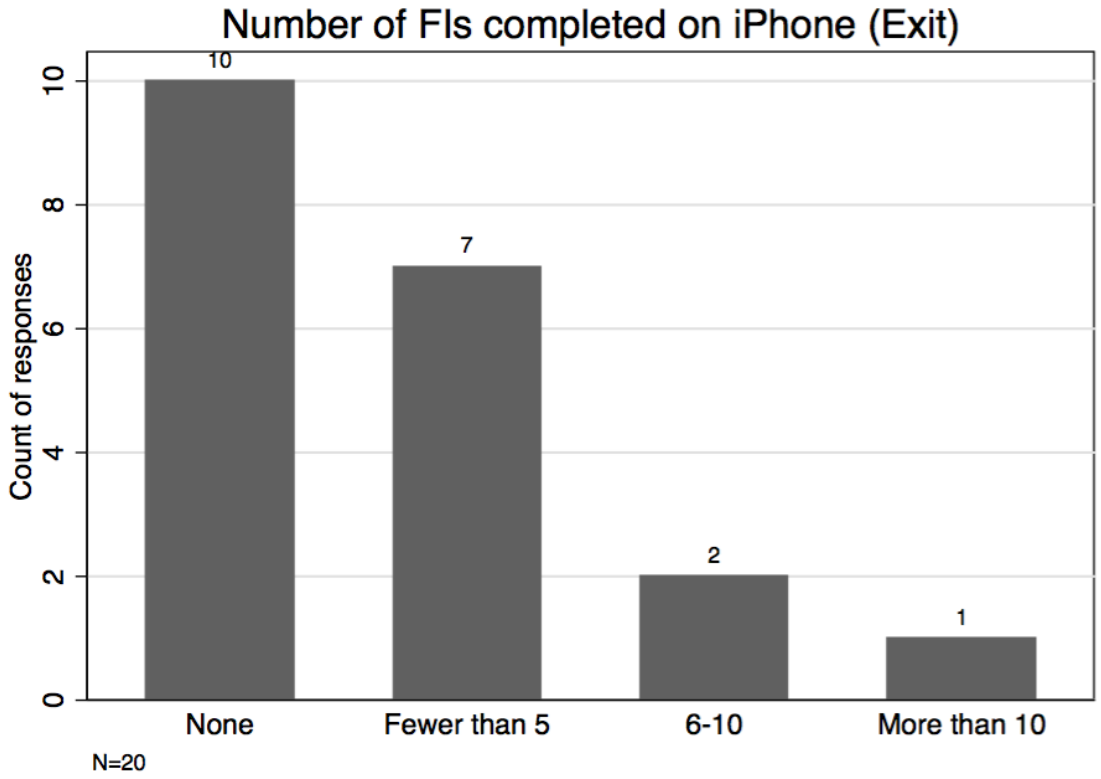
Participants were asked to rate the usability of the FI and NearMe apps compared to other functions and systems available to them. Figure 23 indicates that a slight majority of treatment group respondents who had installed the apps found them about the same or easier than other technologies in terms of navigating screens (52.6%), manipulating options on screen (55.0%), saving and retrieving information (57.9%), and finding the information they were looking for (65.0%). However, a slight minority (45.0%) of respondents found data entry the same or easier, and between 20% and 26% selected "not applicable" for each question, suggesting that some respondents had not tried the apps at all or had not used them long enough to form opinions about usability (but because of the small sample size this only represents 4-5 people). There was a weak but statistically significant association between reported ease of finding information in the apps and respondents' self-reported ability to use the iPhone in general ($\gamma = .458$, $p \leq .032$, N=20). Other aspects of usability were not related to ability to use the iPhone.

Figure 23: Usability of the RPD FI/NearMe apps (Treatment Group)



Actual usage of the FI app was low (Figure 24). Fifty percent of the treatment group never completed an FI using the app. Of the ten respondents who did complete FIs, seven (70%) completed fewer than five during the three-month experimental period and only one completed more than ten.

Figure 24: Number of FIs Completed Using the RPD FI App (Treatment Group)



Nine of the 10 respondents who used the FI app provided an estimate of how long it takes to complete an FI in the app. Three (33.3%) stated that it took less than 5 minutes, four (44.4%) estimated five to ten minutes, and two respondents (22.2%) reported that it took more than ten minutes. While the numbers are very small, they do contrast with the baseline survey, in which nobody who had used other FI apps reported taking longer than ten minutes.

The length of time it took respondents who provided a time estimate to complete the FI in the app was moderately inversely related to their ability to use the iPhone in general ($\gamma = -.692$, $p \leq .016$, N=9). Interestingly, the majority of respondents said that filling out the FI in the app took more time than filling out a paper FI (N=11, 57.9%) and the remainder believed that it took the same amount of time (N=8, 42.1%). Nobody indicated that FIs could be completed

more quickly through the app. It is worth noting that the FI app can capture additional information previously impossible by traditional paper based FIs. Unfortunately the survey did not explore if the additional time taken to complete the FI was a result of capturing new information (such as detailed information on scars, marks, and tattoos) or a result of sub-optimal workflows.

Note that most treatment group participants who did not complete any FIs also answered this question. However, there was no relationship between whether or not the respondent used the app and the length of time it took to complete an FI, suggesting that those who did not complete any FIs were not put off by the amount of time it took. Time to complete an FI was also inversely related to ability: those with less experience were more likely to say filling out FIs in the app took longer than on paper ($\gamma = -.774$, $p < .001$, N=19). Only 35% of respondents (7 of 20) stated that they had attached a picture to an FI in the app, even though 64% of respondents in the baseline survey who had tried other FI apps stated that they had attached pictures and 65% of the full baseline sample wanted to attach pictures to traditional paper FIs. However, most of those who said they had not attached a picture also said they had not completed any FIs in the app.

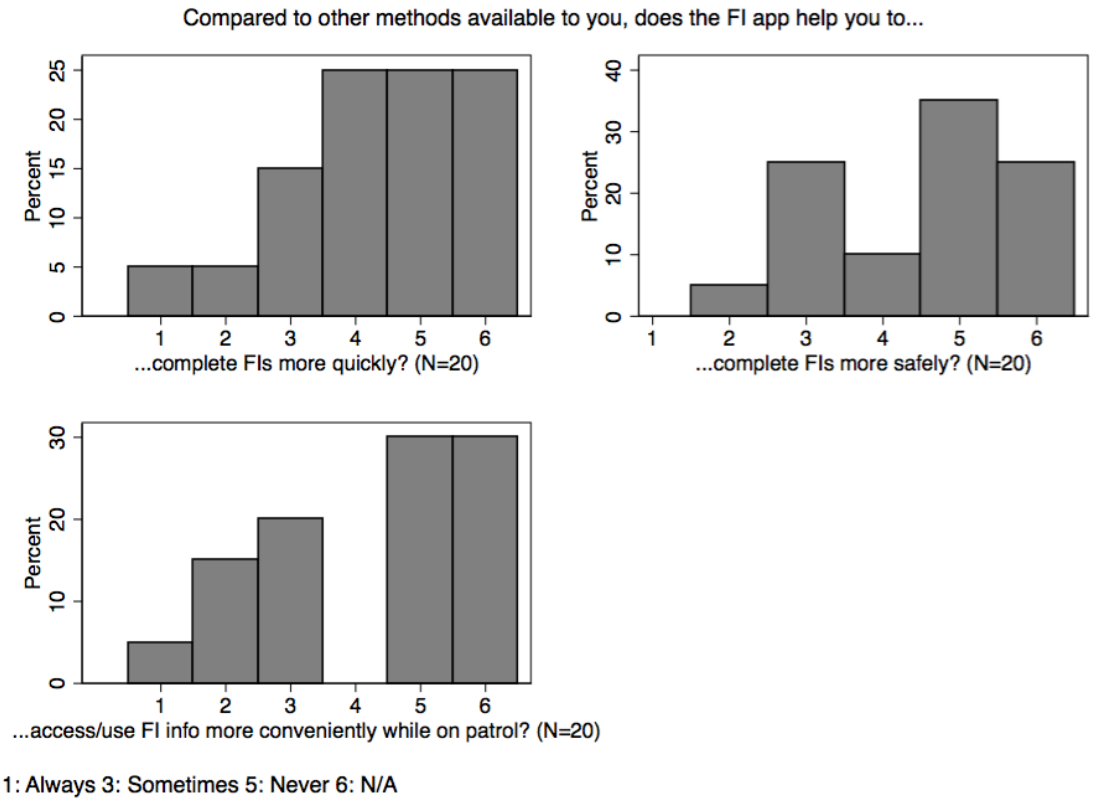
As noted above, there was some treatment crossover in the use of the FI app. Six of the 13 control group participants who reported downloading the app indicated that they had completed an FI in the app. It was not possible to ascertain why this might have occurred from the survey alone. These participants may have used another FI app (at least one of which is available to the general public through the official Apple App Store) and reported on that usage rather than usage of the RPD app. Alternatively, users in the control group may have completed an FI during the training period and their responses represent a 'telescoping' effect. Only two of

the six had also completed the baseline survey, but both reported there that they had downloaded another app for completing FIs on their device.

In addition to treatment crossover, the above analysis indicates a lack of take-up of the FI app among the treatment group, with only 50% actually using the app to complete FIs and low usage even among that group. This lack of take-up did not appear to be related to ability: 65% of the treatment group described themselves as advanced or expert users. Only nine respondents who were assigned to the treatment group had answered both the baseline survey question about whether they wanted to complete FIs (note that this question was only asked of participants who had not tried another FI app at baseline, hence the small numbers) and the question of how many FIs they had completed in the RPD app. This number is too small to draw any meaningful conclusions, although it is interesting to note that six of those nine had previously stated that they were not interested in completing FIs on their phone.

Respondents were asked several questions about whether the FI app helped them to complete FIs more quickly and safely, and to access and use FI information more conveniently while on patrol. Unsurprisingly given the preceding discussion, Figure 25 shows that half of the treatment group participants stated that the FI app never or almost never helped them complete FIs quickly. Interestingly, almost half of respondents (45.0%) also felt the app never or almost never helped them complete FIs *safely*. This finding is explored in more detail in the focus group discussion below. Feelings about whether the app provided convenient access to information were more mixed. A substantial proportion of the group also stated 'not applicable' for these questions, again reflecting the limited take-up of the experimental app.

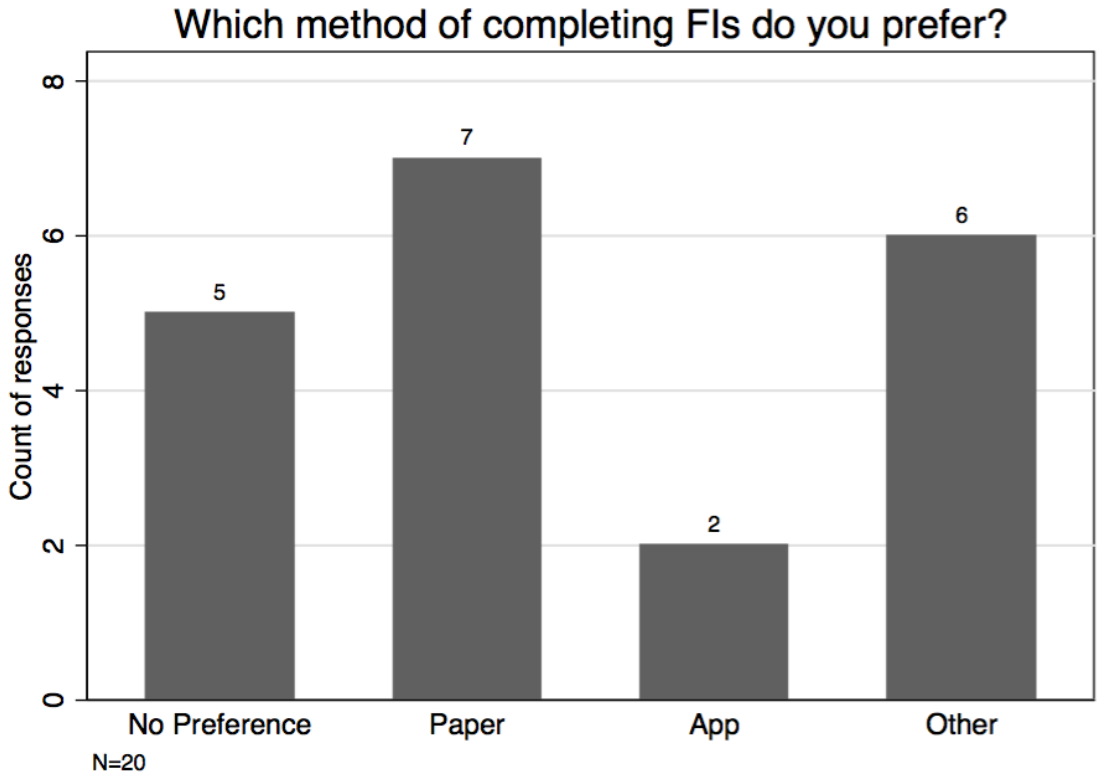
Figure 25: Perceived Benefits of the FI App (Treatment Group)



Overall, there was a range of responses to the general question of whether respondents preferred the FI app, paper FIs, or some other method to complete FIs (Figure 26). A majority of treatment group respondents (N=7, 35.0%) preferred paper, 5 (25.0%) had no preference, 2 (10.0%) preferred the RPD FI app and six (30.0%) preferred another method (usually an alternative commercially available app). One participant specifically named the Field Contact app, which they perceived as being more user-friendly and having the ability to store FIs on the device[17].

17. The development team originally considered storing FI data locally on the device. However, doing so was deemed to be an unacceptable risk if the device were ever to become compromised. Recent changes and certifications of iOS devices may mean that local data

Figure 26: Which Method of Completing FIs do you Prefer? (Treatment Group)



Results regarding the installation, use, and adoption of the NearMe application were similarly underwhelming. Sixteen of the 20 members of the treatment group downloaded the app, indicating that even as the experiment started a few participants were not sufficiently interested in installing it on their phones. As with the FI app, fully half of the treatment group reported that they had never used the NearMe app during the experimental period (Figure 24). This was not necessarily the same ten people. Six respondents never used either app, but four of those who did not complete any FIs in the app did try NearMe and vice versa (Figure 27).

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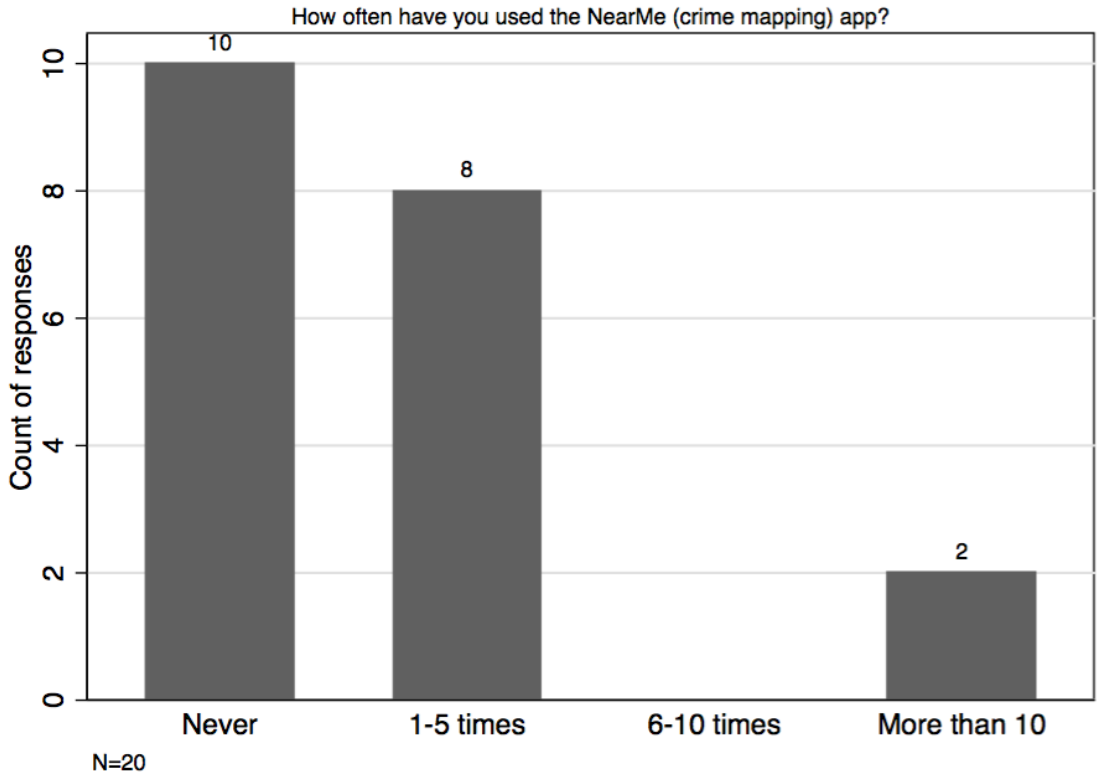
storage is now feasible. The desire to store FI data directly on the device is discussed in greater detail in later sections of this document.

Figure 27: How Often Have You Used the NearMe App? (Treatment Group)



Interestingly, unlike the FI app, there was no relationship between frequency of use of the NearMe app and self-reported ability to use the iPhone ($\gamma = -.114$, $p \leq .633$, N=20). However, more frequent use of NearMe during the 3-month experimental period was strongly associated with reported frequent use of crime mapping capabilities on the iPhone during the same period ($\gamma = .860$, $p < .0001$, N=20). It is not clear from this association whether those who answered the general question about crime mapping were thinking specifically about the NearMe app, but this is possible since there was no relationship between use of the app and general use of crime mapping on the iPhone at baseline ($\gamma = .224$, $p \leq .255$, N=18). Use of NearMe was also moderately associated with use of crime analysis data from non-mobile formats, both at baseline ($\gamma = .610$, $p \leq .004$, N=18) and in the last year as reported in the exit survey ($\gamma = .510$, $p \leq$

.016, N=20). Finally, there was no relationship between frequency of use of the app and reported utility of crime mapping as a tool for identifying hot spots at baseline. In fact, the direction of this association was negative, though very small and non-significant: $\gamma = -.200$, $p \leq .272$, N=17).

As with the FI app, there was some treatment crossover among the experimental participants. Only three members of the control group stated that they had never used the NearMe app; the remaining ten indicated that they had used it up to 10 times. It is more difficult to explain why this might have been the case since no questions in the baseline survey asked about officers' experiences of other crime mapping apps[18]. Given that RPD is a small department and officers work closely with each other, it is possible that the control group experienced contamination through device sharing. Alternatively the contamination may have come from the release of the public-facing crime mapping application that was developed concurrently with the RPD's NearMe app. The public app, also named NearMe, was released in the public Apple App Store about the same time as the RPD's enterprise NearMe app. While the public NearMe app only accessed non-specific crime information[19] users may have been confused by the identical name and nearly identical UI.

Respondents were asked to rate the NearMe app on several dimensions of effectiveness: did the app help them to view information about incidents more quickly, investigate incidents, communicate with the public/residents/businesses on their beats, and

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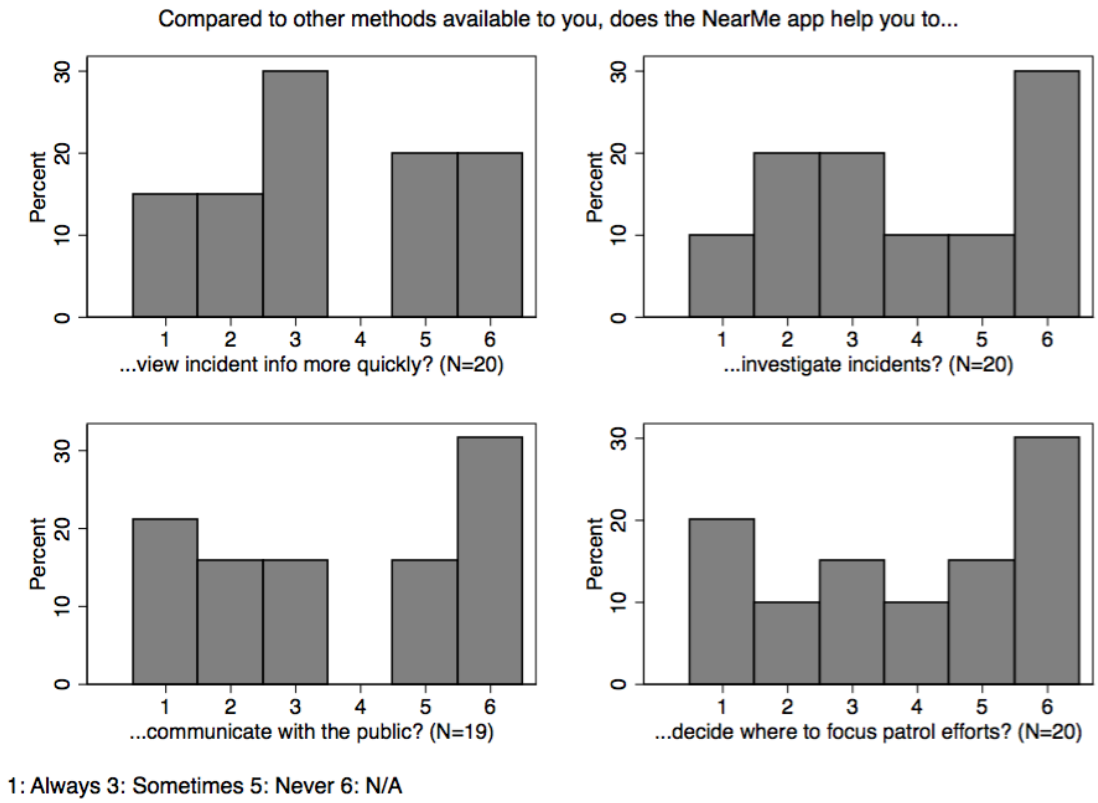
18. No questions were asked about this topic because no crime-mapping app was available at the time of the initial survey.
19. Crime data displayed in the public version of the app are the same as those available through www.crimemapping.com. The public crime data displays only incident data (omitting arrests, FIs, citations, and other types of police activity) with addresses aggregated to the street 100-block.

decide where to focus efforts during patrol time. Figure 28 shows treatment group participants' responses to these questions. There appears to be a lack of consensus about the utility of the NearMe app. Sixty percent of respondents stated that the app helps them view information more quickly at least sometimes, but 20% expressed no opinion. Similarly, 50% stated that the app helped them investigate incidents more quickly at least sometimes, 52.6% could communicate better with the public at least sometimes, and 45% found it at least sometimes helpful in focusing their patrol efforts. However, in all these cases between 20 and 32% of respondents did not express an opinion.

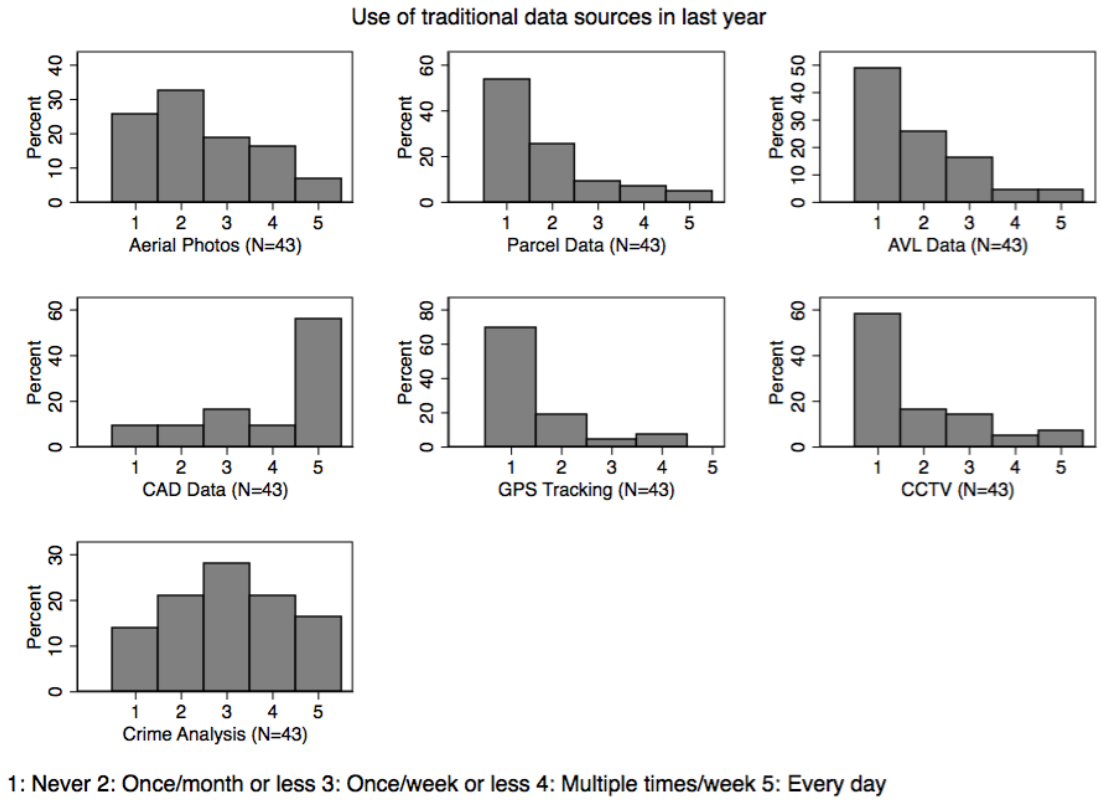
Figure 28: Perceived benefits of the NearMe app (Treatment Group)



Use of Other Data Sources

Finally, respondents were asked to identify traditional data sources they had used in the last year (Figure 29). Treatment and control participants' responses are combined in Figure 26 because there were no significant differences between the groups. As in the baseline survey, CAD was the most frequently used source, with 55.8% of the 43 respondents reporting that they used it every day (N=24). Aerial photographs and crime analysis data were also used, although not as frequently, while most respondents never used parcel data, AVL, GPS tracking, or CCTV.

Figure 29: Use of Traditional Data Sources in Past Year (Treatment/Control Groups)



While there were no significant differences between groups in the exit survey, the use of most of these data sources appeared to have increased since the baseline survey and there were some differences between groups in terms of these increases (Table 7). For example, there

was a moderate, significant increase in the use of aerial photographs among the treatment group, compared to a small increase in the control group. There were also small to moderate, statistically significant increases in the use of AVL, CAD, and GPS in the treatment group, while the corresponding increases in the control group were non-significant. The use of CCTV substantially increased between waves, but only in the treatment group. Most interestingly, while the use of crime analysis increased in both groups, the magnitude of the association was larger in the control group. While this could be attributed to the treatment group having access to NearMe in addition to traditional analysis (thus reducing their reliance on crime analysis from other sources), the take-up of NearMe was so low that we cannot be certain about this conclusion[20].

Table 7: Measures of association (gamma) for use of data sources at baseline and exit

	Treatment (N=18)		Control (N=16[a])	
	γ	*p* ≤	γ	*p* ≤
Aerial photos	.670	< .0001***	.480	.072†
Parcel data	.279	.119	-1.000	-
AVL data	.487	.032*	.400	.238
CAD data	.482	.019*	.308	.176
GPS tracking	.579	.012*	.500	.135
CCTV	.818	< .0001***	.310	.231
Crime analysis	.396	.013*	.478	.010**

[a] N=15 for parcel data and CAD data.
† α = .10 * α = .05 ** α = .01 *** α = .001

Concluding Questions

At the end of the exit survey, respondents were asked to indicate whether RPD should continue to provide smartphones to officers and field personnel. The responses to this question

20. Instead, this increase in use of crime mapping may have been a result of significant changes to the RPD's crime analysis unit. New personnel as well as additional, easy-to-use technological products were implemented during this time.

were overwhelmingly positive: no respondents disagreed and only 3 (7.0%) were undecided. Four participants (9.3%) agreed and 36 (83.7%) strongly agreed. There was no significant difference between the treatment and control groups ($p \leq .481$, FET), although with so little variation in responses this is unsurprising. However, control group participants were slightly more likely to strongly agree (87.0% vs. 80.0% in the treatment group) and slightly more likely to be undecided (8.7% vs. 5.0%, although as noted above this is only based on three respondents).

A free text field was provided for officers to state ideas for new capabilities and improvements to existing products.[21] Suggestions for new functions included a daily vehicle inspection app, an informational flyer creation app and flyer library to view flyers by date or crime, an app that lists previous history at an address (including subjects, vehicles and Google images of the location), dictation for report writing, ability to conduct computer checks on suspects or vehicles via iPhone or iPad, and local school and business apps.

Suggestions for improvement to the FI app and other existing capabilities included improving the CAD function to add involvements, photographs or other information while on the scene, making it easier to log in to Spillman[22], making FI app more user-friendly and efficient (see focus group discussion below), and including the ability to store FIs on the device so that they can be accessed again. One individual noted that the alternative Field Contact app should be used, and another pointed out that the additional time it took to fill out FIs on the phone could lead to extended detention times, potentially causing legal problems. Finally, two respondents noted a need for new hardware. One stated that older phones were struggling to

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21. Some of the suggestions listed here came from non-experimental participants in the survey.
22. Spillman is the RPD's combined computer aided dispatch (CAD) and records management system (RMS).

keep up with continued updates to iOS. The other felt that hardware should be upgraded to at least the iPhone 4S, if not the 5, so they could get the most out of their phones.

Qualitative findings from the focus groups

Focus groups were conducted shortly after the exit survey in order to develop a better understanding of the limited take-up of the RPD FI and NearMe apps, which had become evident as the random assignment period progressed. As described above, interviews with two small groups of sworn officers were conducted: one consisted of officers who were not strongly engaged with technology (N=3) and one consisted of more "tech-savvy" participants (N=3). Although it was expected that the officers who were more experienced with using technology would have more favorable views about the apps, it was discovered that there were few differences between the groups in terms of concerns about the apps and suggestions for alternatives.

Officers in both groups had been using the department-issued iPhone for three to four years. Some had prior experience with Blackberries, and one or two had personal smartphones in addition to their work-issued iPhone (one participant had a personal iPhone and one used a an Android based device). The consensus among all the officers was that the phone was crucial on the job for communication (via email, text, or phone), exchanging information (contacts, photographs, and notes), and as a remote office to work 'on the go'—as one officer noted, "I have a bunch of office stuff to do and no office"—or if the CAD system is down.

One officer described the communication elements of the phone as "invaluable." One stated, "Communication without having to go find a phone [go back to the station] and not have to pay for it personally is priceless. Before there were phones there were all kinds of arrangements to make in order to get a line... I don't think I could live without [my iPhone] now,

it's just as important as anything else on my belt." Confirming the place of the iPhone in the officer's toolkit, another participant stated "I have one person on my team that doesn't have a phone. The team texts, calls, emails each other so that we're all on the same page... it's very difficult to remember that he doesn't stay automatically connected with what we're doing."

Some officers highlighted being able to take and transmit photographs as particularly important, especially for taking photographs at crime scenes to record crucial information before the forensic team arrives and to record and report graffiti and other issues. Officers also appreciated the ability to contact suspects and street contacts without having to give out a personal cellphone number, and noted street contacts "think it's cool that they have a police cellphone [number]." The only downside of the technology in general, which reflected comments in the survey, was that the phones were now too old to take full advantage of all the technology that is available.

FI App

There were differences between the two groups of officers in terms of their desire to use the FI app. The officers who were generally more interested in technology said they had been excited about the new app and wanted to use it, but there were problems with it (the researchers believed that some of the 'problems' stemmed from participants being in the control group and unable to use the features; however, officers also discussed usability issues, which are described in more detail below). The less technology-focused officers simply said they downloaded the app "because it was mandatory."[23]

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23. It should be noted that, consistent with regulations protecting human subjects research, participation in the surveys and focus groups, and even assignment of the iPhone was optional for all participants. However, if a user did elect to receive a department issued iPhone it was

Reasons for not using the app could be divided into two categories: usability issues and safety issues. The comments from the focus groups lend richer detail to the findings from the survey about officers' beliefs that it was difficult to complete FIs quickly and safely on the iPhone.

One officer in a supervisory role stated that the team had tried it, but "it wasn't really for them. It didn't work correctly and was too slow." Some officers mentioned the Field Contact app, which was also named in the survey. The key feature of Field Contact that they found lacking in the RPD app was the ability to store FIs and then pull them up and share them with other officers[24]. In contrast, with the RPD app, "you put in the information and it disappears into the system... there was no point in trying to use it." It seems, then, that officers value FI capabilities on the smartphone as a personal tool for their everyday activities rather than as a recording tool for the department, although they did recognize the importance of this — Field Contact does not automatically upload FIs into the department's system. Other features of Field Contact that the officers liked included being able to input only the information they had available and having all the fillable fields on one page (see below) and the ability to attach multiple pictures that stay in the app rather than being saved on the phone (see below).

Overall officers felt the FI app was not user-friendly. For example, there appeared to be a bug in the data entry screen for birthdates that required officers to add the year first or the day and month would be rejected if it was past today's date (since the default birth year was 2013). However, most interviewees give the day and month first, and the scrollbar is set up so that one would intuitively enter days and months before years. One "tech-savvy" officer stated,

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subject to administrative oversight consistent with the RPD's mobile device usage policy. This policy included regulations regarding apps that must be installed on the device at all times.
24. The issues with storing FI data on individual devices are discussed later in this document.

"I've changed my script to adapt to the bugs... I ask for birth year first then the month and day." The app also records the incident time by default as the time the FI was submitted, but this is not always the case. The officers could not find a way to change the recorded time. Another officer felt there were too many options for race and ethnicity that were not general enough and not consistent with other technologies and databases they used[25]. Finally, one user pointed out that the app continues to create new name files rather than linking new or changed information on an established contact[26].

One key functionality issue raised by the groups was the number of screens required to enter information (eight in all) and the inability to navigate between them easily. Some officers felt the order of the screens did not align with the way they collected information: for example, it takes six screens to get to the field for driver's license number, but this is usually one of the first pieces of information collected. It was also not possible to put in vehicle information alone unless sufficient details about the person had been entered. However, one officer noted that "sometimes all you have is vehicle information, or partial information on a person. You can't submit the form unless certain items are filled in, and we don't always have everything that's required." The FI cannot be saved if it is incomplete, so it is not possible to reopen and continue the data entry later if necessary. Additional contacts cannot be added until the first one is completed. An officer said, "We just ended up deleting the partials instead—and even that's a pain." Overall, one officer stated, "There are many fields and pages that needed attention, even

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25. It is worth noting that these data fields were enumerated with data drawn directly from the RPD's master records system. The issue perceived by the user may reflect the disconnect between officers collecting data and dispatchers/records clerks entering data into the RMS.
26. From a technical perspective this is only true if the user failed to search for the person before creating the FI. If a user searched for the person and began the FI after finding the user already existed, the FI data would be linked in the names table. Unfortunately a two-step process of first searching for a name, then creating an entry was unavoidable.

if they weren't necessary [but apparently could not be skipped in order to go to the next screen or submit the FI]... you had to push to get the drop down menu and pay lots of attention."[27]

Every officer who participated in the two focus groups raised the issue of officer safety. They felt it was difficult to look down at the phone while interacting with suspects because it reduced their situational awareness. One officer raised a potential legal complication with the FI app. When a photograph is taken in the app, the picture is saved to the iPhone's photo gallery rather than just staying in the app. The officers were concerned that there could be legal implications of them having photographs of suspects stored in a non-secure area of the phone.

Despite the problems the officers reported experiencing with the app, those who were favorably disposed to technology strongly agreed that they would use it if the issues related to the user interface were addressed. One officer stated that he had "tried to adapt to it, because I feel it's so important." Another noted that some of the complaints and problems could be attributed to inexperience and that it always takes time to get used to new technology, which was borne out in the survey findings where perceptions were strongly related to self-reported ability. "Some of what these guys [fellow officers] complain about are just a matter of getting used to the app... the paper card took effort when they first learned it too, they just don't remember that... it is just a matter of learning something new." One officer did acknowledge that the paper FI was "so familiar that we don't even need to look at it." However, others discussed advantages of paper FIs that would be much harder to replicate on a smartphone.

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27. Only two pieces of information needed to be added for an FI to be complete: person comments and location information. However, users would have needed to read the user manual in order to learn of this fact suggesting that greater clarity during the training phase would have been beneficial.

"We sometimes ask gang members to draw something or sign a report... they can't do that on the app."

NearMe App

The officers all reported that they did not use NearMe. Unlike the FI app, officers perceived fewer technical challenges with this app, although several did say they might be inclined to use it more if it were more efficient, faster, and searchable with more details included. The reasons for low take-up of this app were more consistently linked to the officers' perception that they did not need this type of functionality.

One reason given by a number of officers for not needing a crime mapping app was "we know where the crime is." This feeling was particularly common among the officers who were less interested in technology, but was heard from the more technically savvy group as well. One officer said, "We know where the crime is, because we're taking the reports and making the arrests. It is good to have this information—the stats—for grant applications and reports, but there is not any use for it in the field." Another added, "This area also isn't a big crime area... maybe something like this would be useful on the streets of Los Angeles, but it's not necessary here." In essence, the officers believed that as part of a small department in a relatively small town, they already knew what was going on.

The more technically-minded officers were slightly more sympathetic to the purpose of the app, but still felt it did not deliver in its current form. One example given by several officers was the lack of specificity in crime types, particularly burglaries[28]. "It doesn't tell me anything...

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28. From a technical perspective, this is a limitation of the RPD's RMS. Addressing this concern, while technically feasible, would have required a rather extensive, and consequently expensive, reworking of the agency's RMS. Other agencies may be able to more easily incorporate this type of information depending on the data schema maintained within the RMS.

only burglary. Burglaries are very, very different [i.e. commercial burglaries differ from residential burglaries, etc.] so geographic proximity isn't everything." Another clarified that you could search for types of burglaries, "auto burglaries, for example, but it's not specific enough." An officer in the non-technical group made a similar comment, noting that "[individual] burglars tend to use the same method and steal the same things... this information isn't available on the system." In other words, knowledge about the *modus operandi* of specific offenders and the ability to identify patterns beyond geographic location would have made the app more useful. "If I'm at a burglary, I can search the area and see what other *types of* burglaries have happened on that block [emphasis added]. I pull someone over and see something in their car—well, has that item been reported missing? Are there patterns we could search on?"

Several officers commented that the app was slow in the field. "Too slow, way too long... we have to get to the next call. It's not something you can wait for while talking to people, suspects..." Network coverage was cited as a possible reason for this, although it has improved. However, the officers who raised this recognized that this is not an app-specific problem and is beyond the department's control.

Overall, most officers felt the app did not add to the information they already receive via other modes of communication, such as weekly briefings and desktop or email-based follow-ups. This reflects the survey findings, which indicated that officers found briefings useful. Crime locations and intelligence appeared to be shared between officers more informally at briefings, roll call and so on. One officer said "Crime mapping is a briefing thing... there's no reason to have it on the phone." Another added, "the sharing of [crime] information happens on logs, when we're checking in and out, and from our own experience… we don't need it on the maps."

This is an interesting finding in light of the results from the baseline survey where many respondents indicated that they drew information about crime hot spots from a variety of sources including crime mapping and crime analysis products. The reason for the disconnect between survey findings and focus group findings is unknown and represents an interesting avenue for future research.

Apps and Features the Officers Considered Useful

Officers were asked to share information about other commercially available apps they found useful in their work. Interestingly, the officers had creatively integrated a number of popular, non-law enforcement specific apps into their daily activities. These included conversion apps (for measurements); Pill Finder and iPharmacy for identifying drugs and medications; Tango, a video conference app, which one officer had used to deal with a stolen bike situation; Google Translate, which allows users to speak into the phone in one language and translate to another using voice recognition, and other translation apps; Find My iPhone, to help search for lost devices; the built-in note-taking app; Facebook, to search for subjects; group texting; Internet; and sharable document storage for flyers and other documents, including Good Reader, iCloud, and Evernote.

More law-enforcement specific app choices included the California Penal Code and Vehicle Law apps, Crime Finder, a reference for California criminal statutes, and links to municipal codes, which all provided easy reference on the go and reduced the need for large books; Redlands 311 for reporting disorder issues; CAD access; the California Highway Patrol real-time traffic incident app; and Field Contact, as described above. The tech-savvy officers were also very keen on a piece of equipment called the Citation Writer, which they brought to show the researchers. They felt the interface, scanning capabilities and ability to connect the

program to an iPhone with a card reader (removing the need for the larger piece of equipment) made the work of writing a ticket much faster.

The officers stated they learned about these apps from talking to each other, and that this was their usual way of learning—for example, they stated they hadn't received much training on the experimental apps but "that's not necessarily a bad thing, training often makes [the technology] more confusing. We learn from each other... if we have a question, we go to the officers that we know how to use it and they show us how."

Perceptions of the Experiment

Most of the officers did not realize they had taken part in an experiment, although two of the more technologically-oriented officers had a notion because the app appeared but some people did not have access to it. The less technologically oriented officers said they did not feel that the random assignment affected their work because they did not really use the apps anyway. However, those who were more interested in technology did feel the experiment interfered with their work. "Our team was trying to use it, and then it disappeared for some of them... then some people couldn't and none of us used it. We kinda figured that we weren't supposed to use it because otherwise everyone would have it." Another added, "Keep in mind that we work on teams: if only some of our team has it, it's not going to work, because we all need to work together and because of personalities. If we had a better understanding of why it disappeared for some people and not others then we would've felt better about it."

These views have important implications for future research in the study of police technology (and other research in police departments). Blind testing is extremely difficult in social settings. The research team originally opted not to discuss the experiment out of concerns for contamination, because it was felt that treatment group participants might discuss and use

the apps with control group colleagues, but instead treatment group participants may have stopped using the app because their colleagues could not use it—contamination in the other direction. The officers in the focus groups understood the purpose and concept of random assignment, so by explaining the methods to the users at the outset and making sure they understood the importance of fidelity to conditions the experiment may have been more successful.

Another challenge, which was partly a function of working in a small agency, was that the needs assessment, app development, and app testing were all conducted in collaboration with the same small group of staff. Ideally, the needs assessment would have been conducted with a different group and implementation of the experiment would have occurred with users who knew less about the innovations.

On the subject of research design, one officer also raised the issue of pilot testing. "We didn't use the app because it didn't work. If we had really wanted to do this right, we could've made the technology, field tested it, put up version two, tested it again. If we had fixed the bugs, more cops would've used it." Some of the officers felt that there could have been more consultation with officers in the field during the app design phase, which might have resolved some of the usability issues they raised.

Concluding remarks from the focus groups helped to explain why the surveys revealed little enthusiasm for the apps but increased use of the iPhone over time and a strong desire that the department should continue to provide them. The officers were extremely keen on having cellphones for communications and operations. However, at least at the present level of technological development, their enthusiasm for apps was more limited. It appeared that using workarounds drawn from publicly available apps allowed them to craft their own workflow. As

some of the findings from the surveys showed, technological advancements may not always be incremental—the officers were keen to find ways to integrate the old with the new. As one focus group participant put it: "The advancement of the cellphone in law enforcement is amazing... the ease of communication today has sped up our investigation and our ability to catch suspects. But that doesn't extend to apps."

Administrative Data

One of the key reasons for the construction of the FI app was to reduce the amount of time between when FI data are collected and when FI data are entered into the RPD's RMS. Data from January 1, 2013 through May 30, 2013 were analyzed. For all FIs that were completed in some method other than the FI app, the mean time between when data were collected and when data were entered into the RMS was 235 hours (nearly 10 days). FIs that were collected through the FI app were entered into the system within 72 hours on average[29], a 70% reduction between data acquisition and system-wide data availability[30]. This reduction in time between data collection and data dissemination means that the data are available for all users more quickly.

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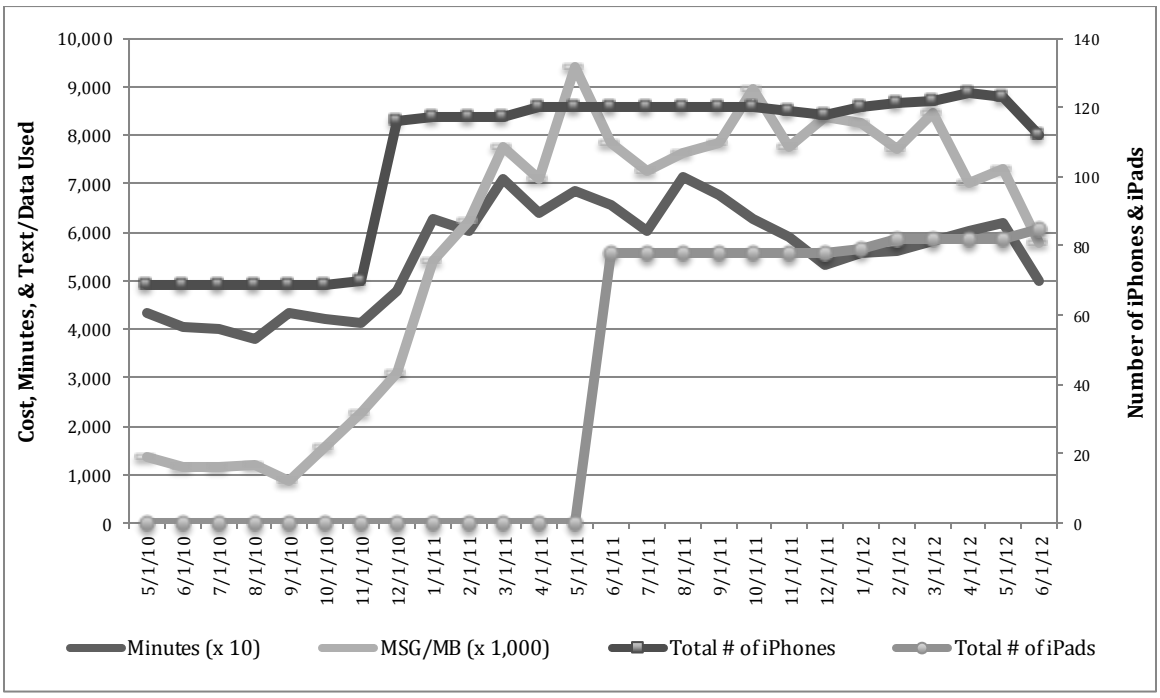
29. The import process for the app generated FIs has been semi-automated. Under the current system the database administrator checks the mobile FI app database for new entries. If new entries are present an export process is run. This process creates an XML file with the new records. The XML file is then uploaded to Spillman through a data import wizard. The RPD continues to refine the import process and a direct, intervention free import process seems achievable which will further reduce the time between data acquisition and data usability.
30. Time between data acquisition and data entry for the FI app was calculated on app-created FIs occurring between January 2013 and May 2013. Although the app was active before this time the semi-automated bridge between the FI database and the master RMS had not been completed. The time reported here represents the average time between data collection and data upload with the data import process fully established.

Device Usage & Cost

Device usage was tracked over time. Usage statistics includes grant- and non-grant funded devices as well as devices for users that were involved with the project as well as users that were excluded from the official evaluation. Figure 30 displays device usage over time relative to the number of devices in use by the RPD[31].

Figure 30: Device Usage over Time

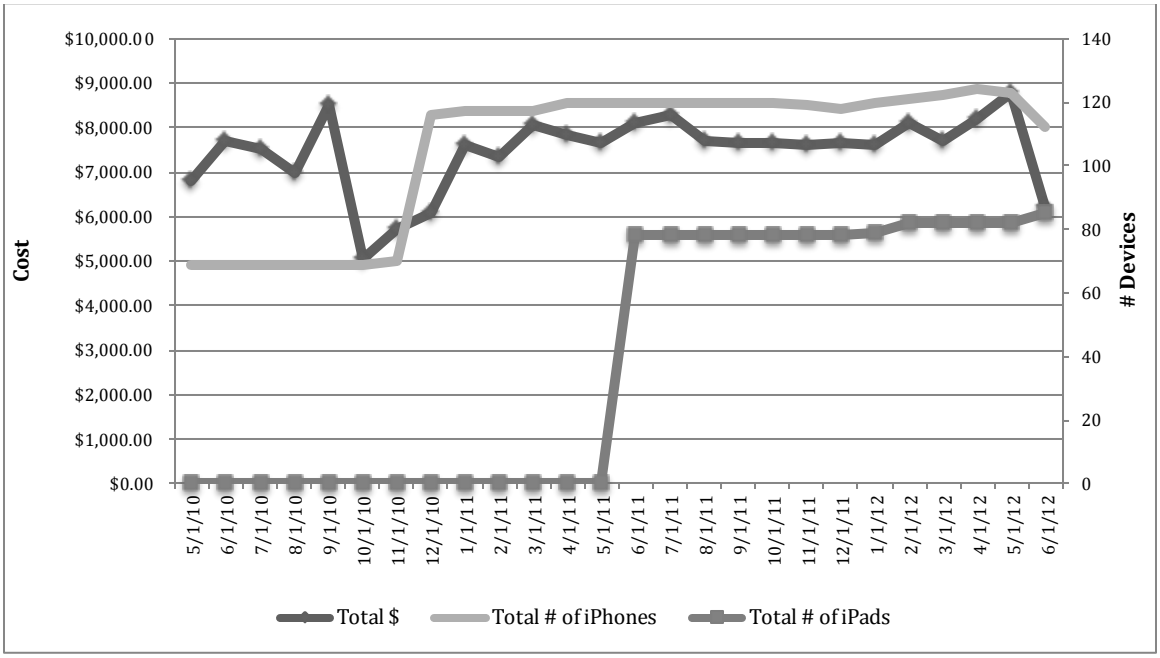


The overall monthly cost of cellular voice and data service was also a concern given limited financial resources[32]. Although the number of devices generally increased over time, there is not

31. Usage as reported by the monthly service bill. Data use includes both data and text messaging. Due to limitations in the billing information it is not possible to separate text message counts from actual data used.
32. The RPD had the capacity to review cell phone usage to identify users with atypical usage. To prevent overages, a few individuals were warned to scale back their data usage. Unusually low usage may have been another concern because it would indicate that the user was perhaps not

a consistent relationship to increasing costs. As time progressed the department became better at controlling overages and ancillary fees. Device adoption compared to the total cost over time can be found in Figure 31.

Figure 31: Device Adoption versus Cost over Time



Note: iPads were added to monthly billing in June 2011. Prior to this change iPad data plans had been billed individually to department credit cards.

Evaluation Summary

The evaluation of the RPD's mobile device initiative was thorough and encompassed multiple surveys, focus groups, panels of experts, and collection of administrative data. The lessons learned from this process provide a great deal of information on what worked, and what didn't work, throughout the process. Results suggest that the apps, in general, were not well received by users. Perhaps even more surprisingly the quantitative finds suggest a level of apathy

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taking full advantage of the device. Although the Department had the option of re-assigning devices because of under-utilization, the research team is unaware of this ever happening.

regarding the apps that was unexpected. For many measures there were as many people that had no opinion regarding the use or implementation of the FI and NearMe apps as there were those that had positive or negative opinions. Nevertheless, several findings taken together provide reason for cautious optimism about the wider ability to integrate these technologies into law enforcement agencies.

Results of the FI app suggested that several key goals were not met. Users did not find completing an FI through the app to be any faster, safer, or more convenient. Although results of questions regarding safety and convenience show a fairly even split: there were as many respondents that thought the app was safer to use or more convenient as there were that thought the opposite. Qualitative findings suggested that these difficulties were the result of a complicated user interface that did not conform to the realities of field data collection. However, half of the respondents indicated that they had no preference for paper vs. electronic FI or preferred electronic FIs. This suggests that if the issues with the current FI user interface were addressed uptake may be significantly higher. Furthermore, the administrative data suggests that meaningful reductions in time between data acquisition and data availability can be achieved through the use of the FI app.

Although adoption of the NearMe app was not high, several indicators suggested that there were positive outcomes associated with its use. Sixty percent of respondents stated that the app helps them view information more quickly at least sometimes, 50% stated that the app helped them investigate incidents more quickly at least sometimes, 52% could communicate better with the public at least sometimes, and 45% found it at least sometimes helpful in focusing their patrol efforts. The qualitative findings from the focus groups provided useful

context to these findings and suggested that if more relevant data were made available perceived utility would have been higher and adoption more widespread.

Apps

Three apps were developed under this project: (1) Field Interview, (2) NearMe, and (3) Flyers. These apps are discussed individually below. Each app discussion begins by discussing background on the need fulfilled by the app and is followed by an explanation of the apps architecture. A description of the app's workflow completes the discussion of individual apps.

Field Interview

Creating actionable intelligence information requires a two-way flow of data; users should be able to retrieve data but they should also be able to generate new data. The FI app facilitates data collection by allowing the user to complete field interview cards via their iPhone. This app uploads data to a server that is then imported into the RPD's records management system. Users first authenticate with their network login credentials. After that they are prompted to enter their name and identification number. These fields then persist in the app for as long as it is installed on the device. Name and identification number are sent with the FI and populate the officer information field in the Department's RMS. The user is then prompted to enter a passcode. This passcode is used to re-authenticate the user if the app has been idle for more than 15 minutes. The Field Interview splash screen can be seen in Figure 32.

Figure 32: Field Interview Splash Screen

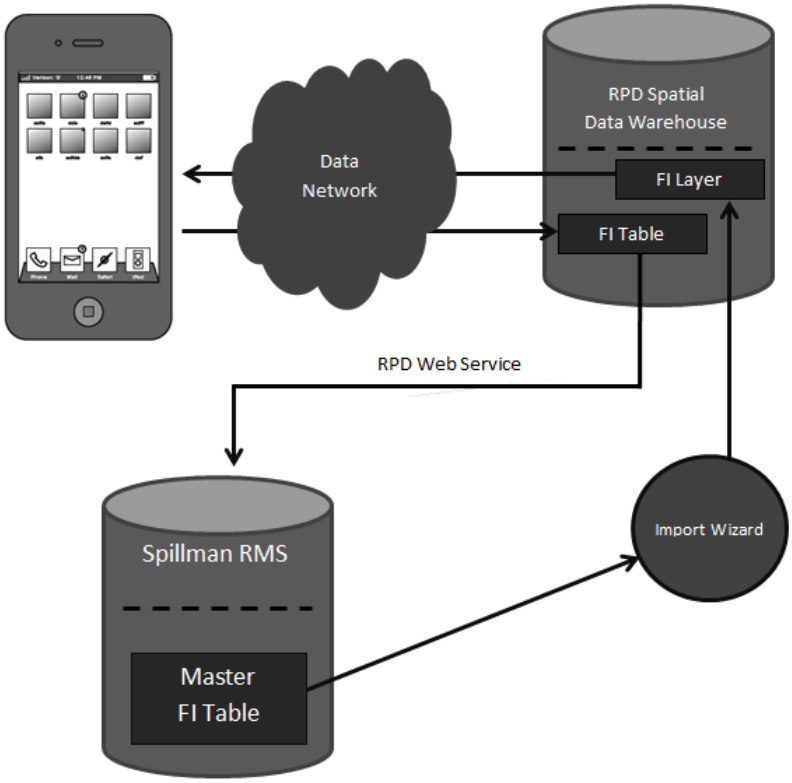
Data Architecture

The Field Interview app is a two-way data transferring app. Data is entered into the app and sent through a secured connection to a table in the RPD's spatial data warehouse. Secure sockets layer (SSL), a cryptographic protocol designed to secure data transit over the Internet, secures data transmissions to and from the app. FI data in the spatial data warehouse are imported to the master field interview table located within the Spillman records management system. The master field interview table is the primary database containing field interview data from all sources. Field interviews completed via paper form, and entered manually, are collected in this records system.

Data from the Spillman RMS are exported back to the RPD spatial data warehouse. Field interview data, both paper based and electronically captured FIs, can now be queried through the app. Data sent back to the device are used for the person query. These data are intended to assist the user in selecting the correct person in the master database (preventing duplicate entries) and reduce the amount of time it takes to enter information by pre-populating time-

invariant data fields (Figure 42 below). Figure 33 describes the data architecture for the Field Interview app.

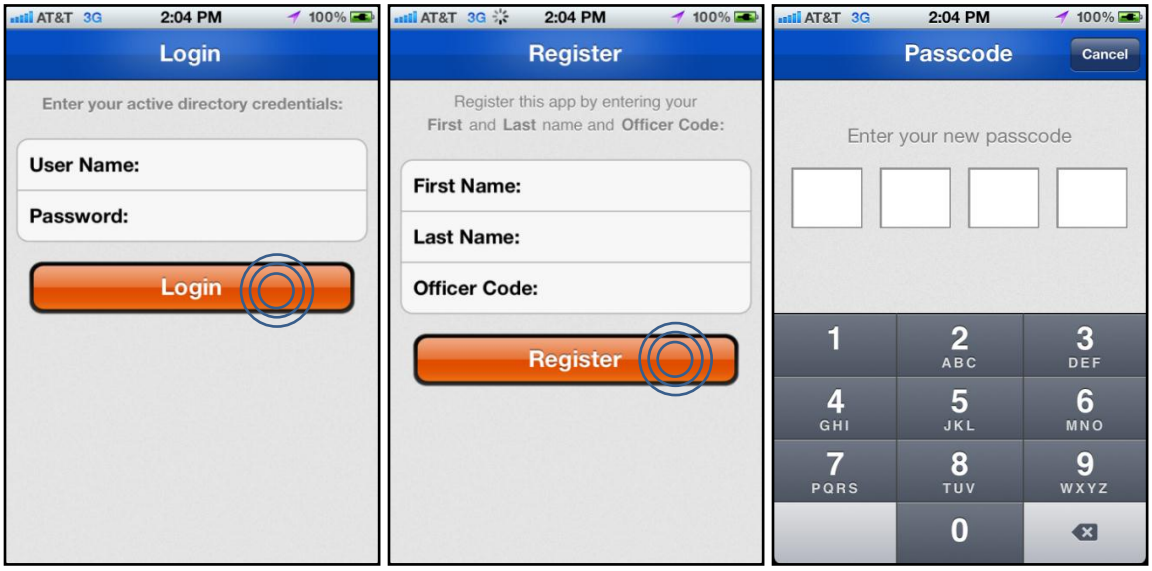
Figure 33: Data Architecture for Field Interviews App



Workflow

Once the app is launched and the user is authenticated, the user is presented with three options for entering data: person information, vehicle information, and location information. Users select each option in turn. When they are done entering data for that category they are returned to this screen. Figure 34 demonstrates the data entry home screen.

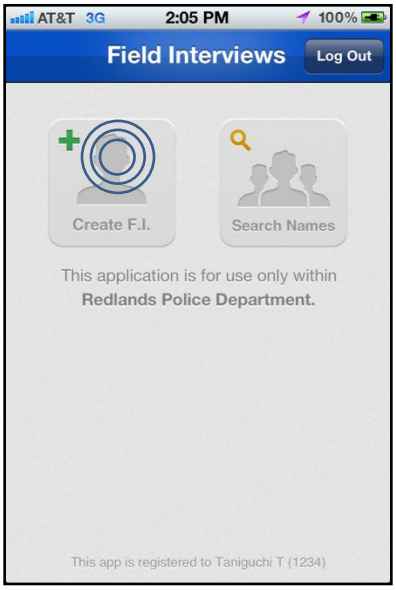
Figure 34: FI Login



Once users have authenticated against the system and registered their device they are provided with two options: Create FI and Search Names. Create FI allows the user to enter a new FI while the Search Name function allows the user to search the existing name s database. If an existing person is found they can save time entering data by copying over relevant details.

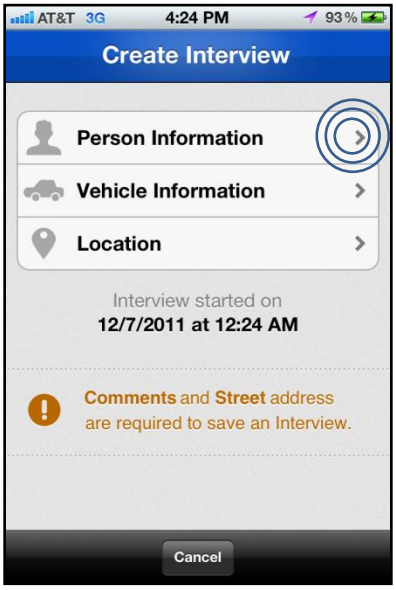
Figure 35 displays the home screen.

Figure 35: FI Home Screen



The needs assessment determined that there were three primary categories of data needed to complete an FI: person information, vehicle information, and location information. Figure 36 displays organization for data entry.

Figure 36: FI Data Entry

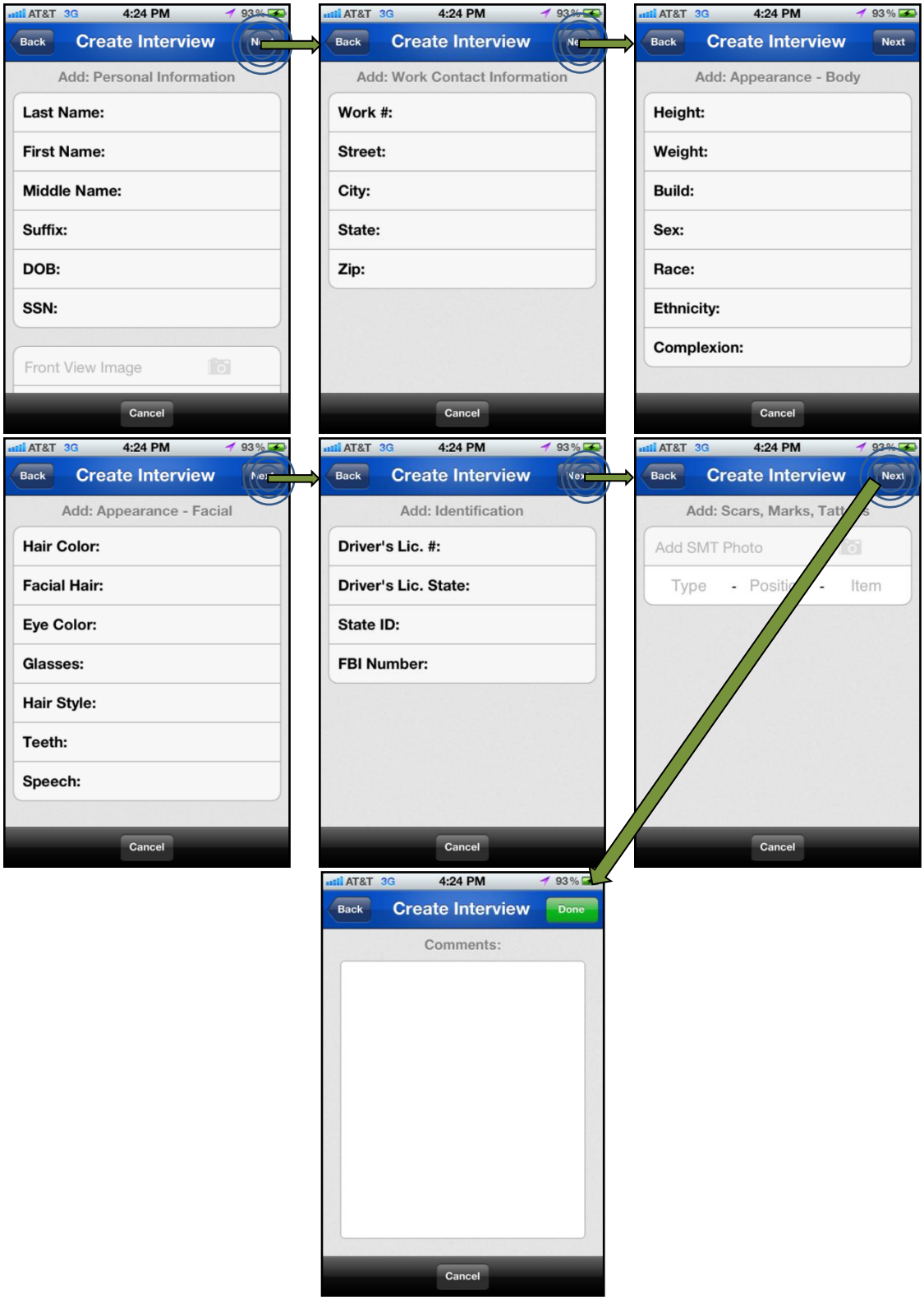


Personal information is collected in the first data entry option. This includes fields such as name, contact information, appearance information, and identification. Data fields were based on the existing FI data card and the master records database maintained by the RPD. Additional fields were added to take advantage of the features of the technology platform (e.g., the ability to capture photos of scars, marks, and tattoos). Enumerated data fields and constrained data entry fields were used wherever possible. For example, fields such as race, ethnicity, and complexion were prepopulated with the options based on the information in the master database. Interestingly, this seemed to cause confusion for users, a problem that is

discussed in Footnote 25. Figure 37 displays the various data entry fields that users will be able to complete[33].

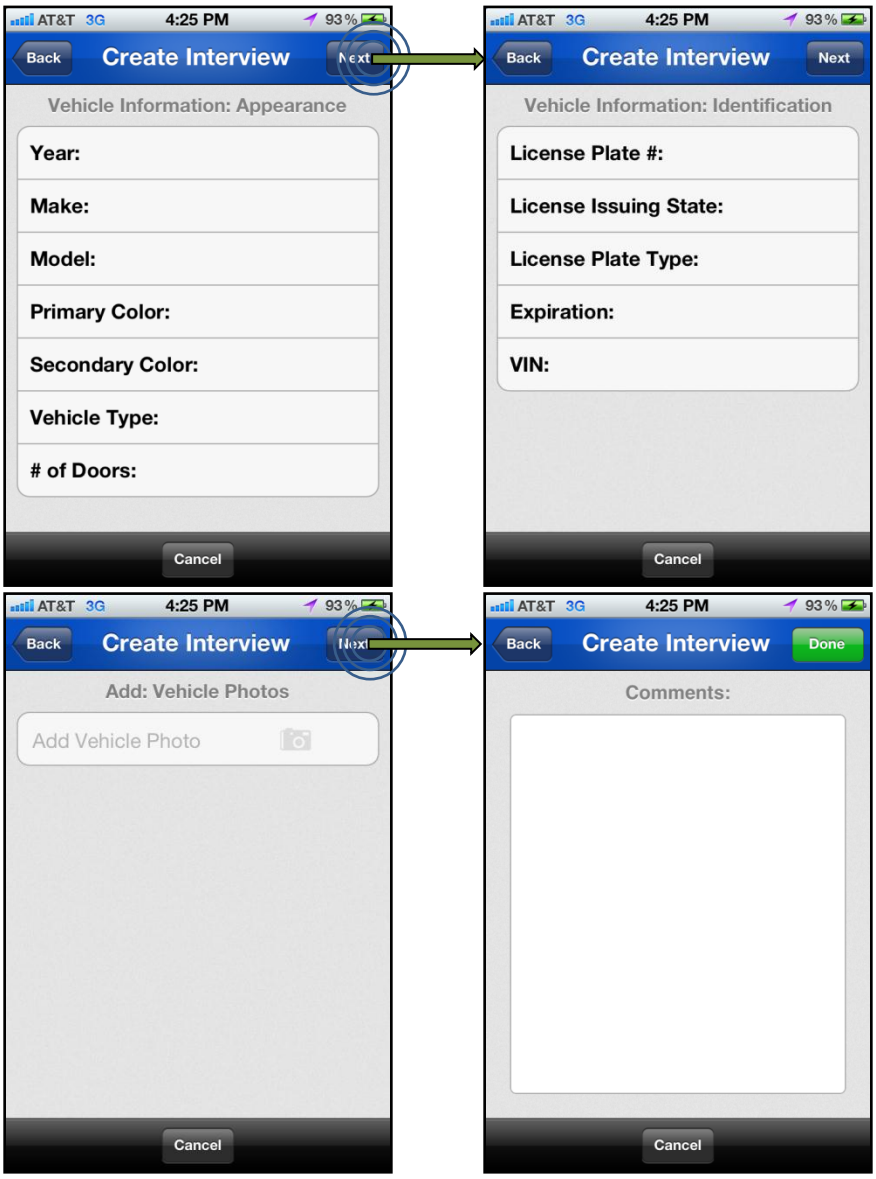
33. The free form comments field is limited to 800 characters, roughly one long paragraph of text.

Figure 37: FI Person Information Field



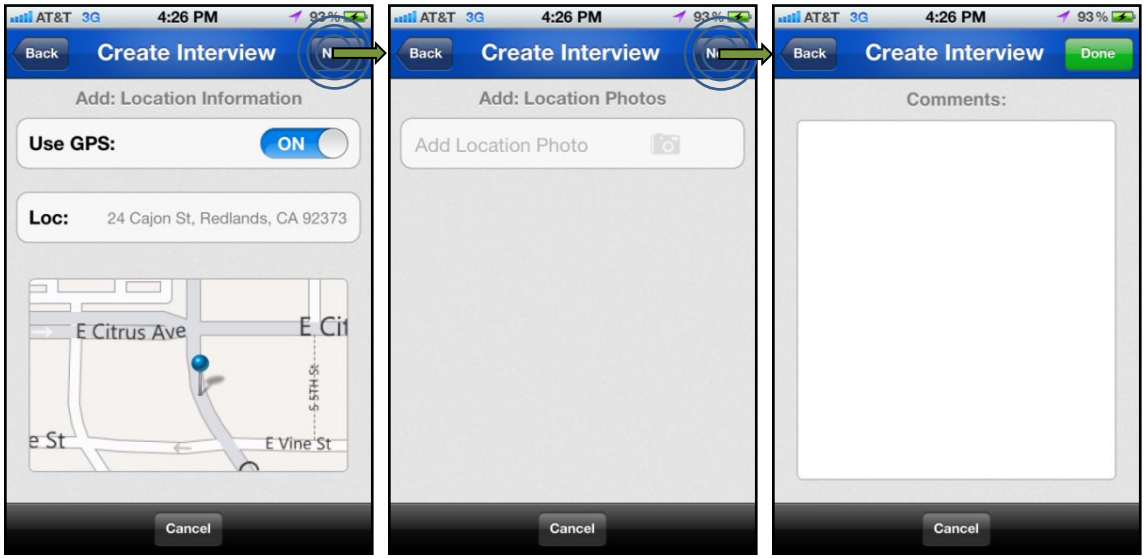
Data about vehicles is captured under the Vehicle Information section. This allows users to enter information about the type of vehicle associated with the stop. Figure 38 displays the data fields associated with vehicle information fields. It is possible to capture photos of the vehicle associated with the FI.

Figure 38: FI Vehicle Entry Fields



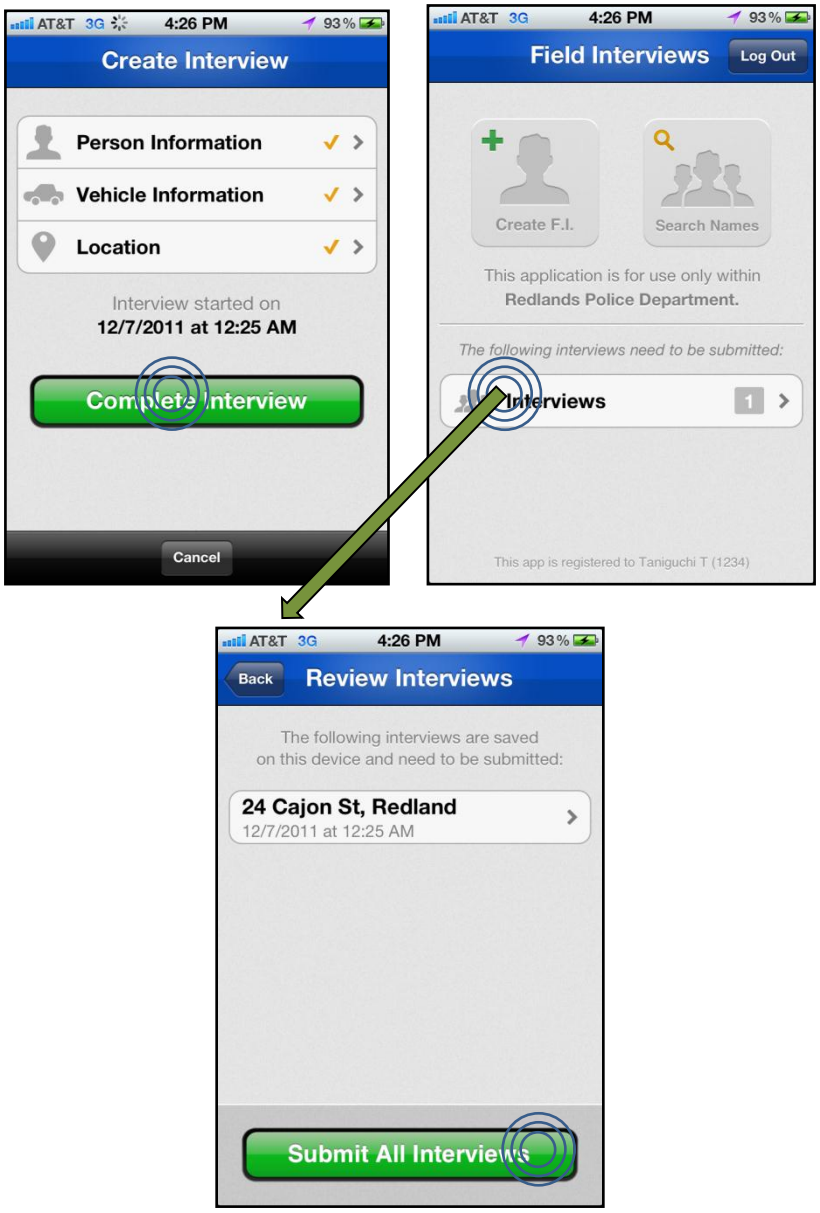
Finally, users enter data about the location of the field interview. The device's GPS is used to provide an estimate of the user's location. Reverse geocoding is conducted using the City of Redlands streets data layer. The user has the ability to override this position if necessary. Users can take a photo and add any final comments about the location. Figure 39 demonstrates the mapping component of the FI app.

Figure 39: FI Location Information Field



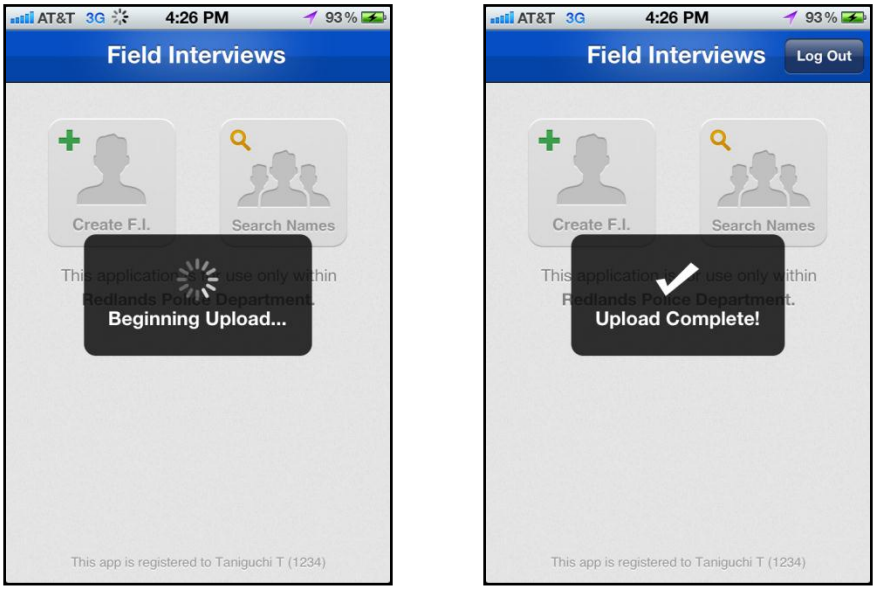
When sufficient information has been filled in, the user is presented with the screen in Figure 40. Taping on "Complete Interview" sends the FI to the "Stack", a temporary repository where completed but un-submitted FIs are stored. Users then tap on the "Interviews" button that takes them to a list of all completed and un-submitted interviews. If necessary, users can edit an FI or they can tap on "Submit All Interviews" to initiate the upload process. There is no time limit for FIs residing in the stack. Uploading the FI is at the discretion of the user.

Figure 40: FI Completed Interview



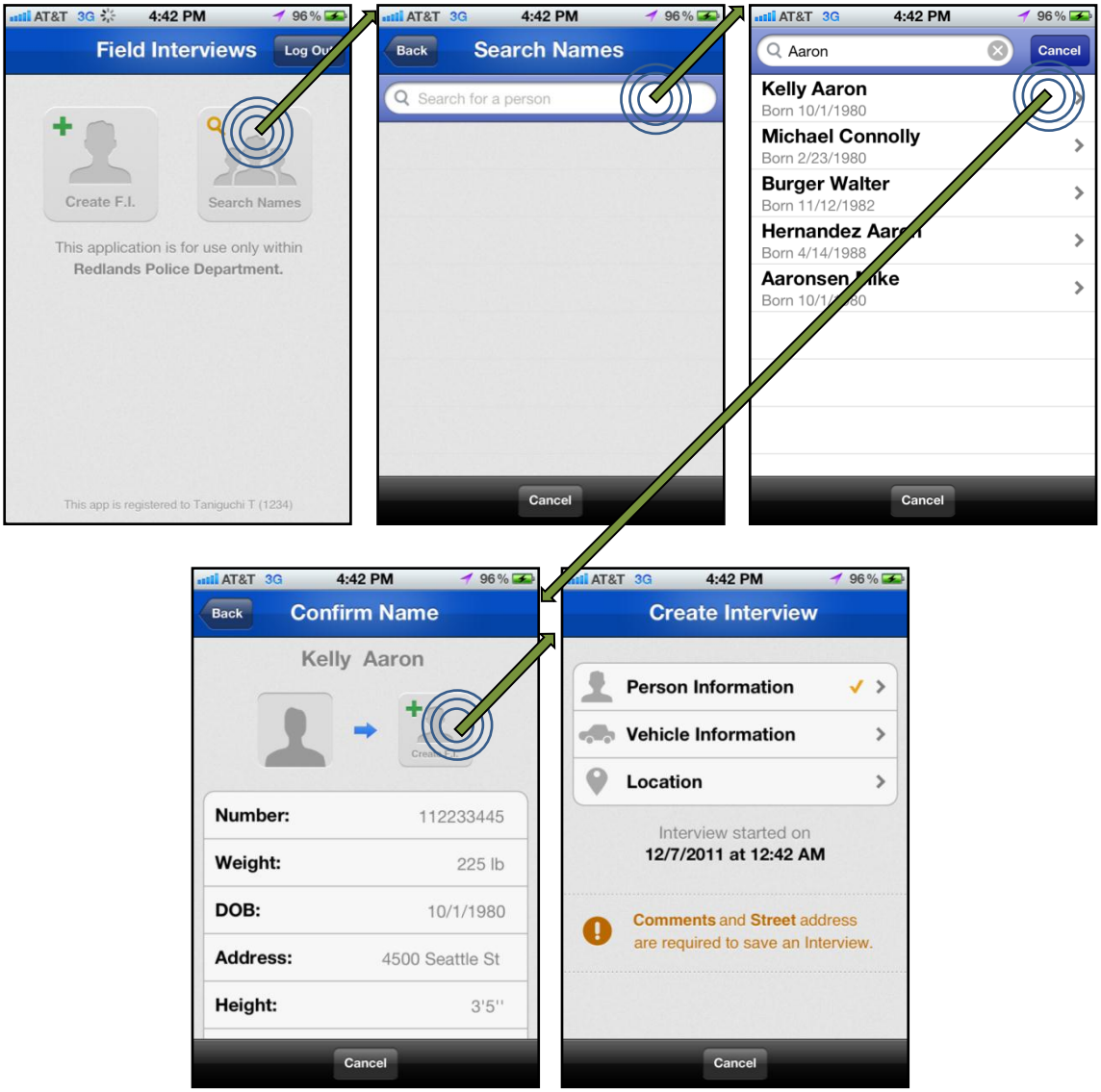
Tapping "Submit All Interviews" begins the upload process. Depending upon the number of FIs and the number of photos attached to each FI this process may take several minutes. The app must remain open in the foreground for the upload process to continue. Figure 41 demonstrates the messages displayed to users during the upload process.

Figure 41: FI Upload Interface



A person search function was included with the FI app. This allows the user to search the RPD's RMS to determine if the person has had previous contact with the Department. The search function will allow the user to clone over information from existing records. This is important because it allows the system to copy the unique identifier associated with the individual. If a person is found during the search then data fields that do not frequently change, such as eye color and height, is cloned over to the new FI. This saves the user time and helps to maintain the quality of the RMS database. Figure 42 demonstrates the process of searching for names through the Department's RMS.

Figure 42: FI Name Search Sequence



Completing the remainder of the FI is the same as previously described. The user enters any additional person, vehicle, and location information necessary. The FI is then submitted as described above. Data transferred over included:

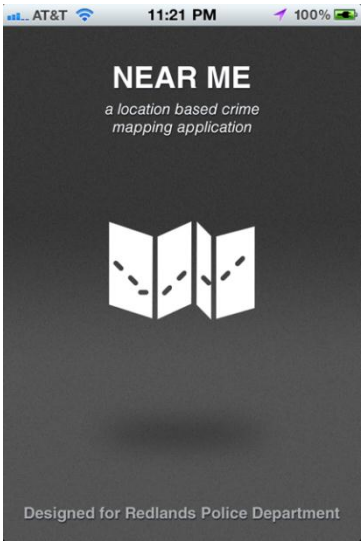
1. Number (record number as maintained in the RPD master database)
2. Address (last recorded residential address)
3. Driver's license number

4. Date of birth
5. Weight
6. Height

NearMe

The NearMe app provides users access to geocoded crime data, operational layers, and other spatially referenced data. Users are able to locate crimes spatially and filter events temporally. Users are also able to access details about the case such as the officer that handled the event, the type of crime, as well as many other attributes that may be available. Users can access underlying map data such as information about the land parcel. Figure 43 displays the NearMe splash screen.

Figure 43: NearMe Splash Screen



NearMe was a custom developed for this project. Later versions of this app were commercialized by The Omega Group as part of the CrimeView suite of crime analysis software, a version of which is now available through the Apple App store. The version available in the app store has a public side with incidents that have been de-identified and generalized (addresses

attributed to the closest 100 block). The app also has a private agency login for authorized users that includes more detailed information about the incident without the de-identification or address generalization.

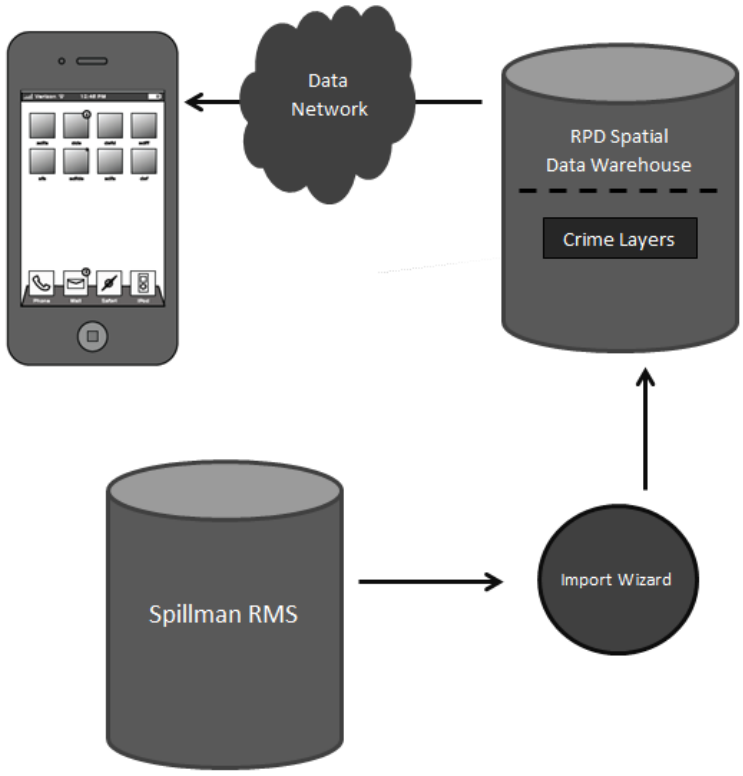
Data Architecture

The NearMe application is a one-way, read-only app. The Spillman RMS system acts as the master records database. An import process moves data from the Spillman RMS system into the Omega Spatial Data Warehouse, an automated process that occurs every 24 hours. Within the Spatial Data Warehouse sits the Omega GeoEngine, an ASP.NET web application that is used to set database table locations, geocoding services, available base map layers, operational layers, authentication services, LDAP servers, and more. The GeoEngine exposes web services for the following functions:

- Search map extent for records
- Get record details
- Search for address
- Get map layers
- Authenticate User
- Kill User's Session
- Validate User's Session

More details about the GeoEngine can be found in the Appendix IX. Figure 44 provides a diagram of data flow for the NearMe application.

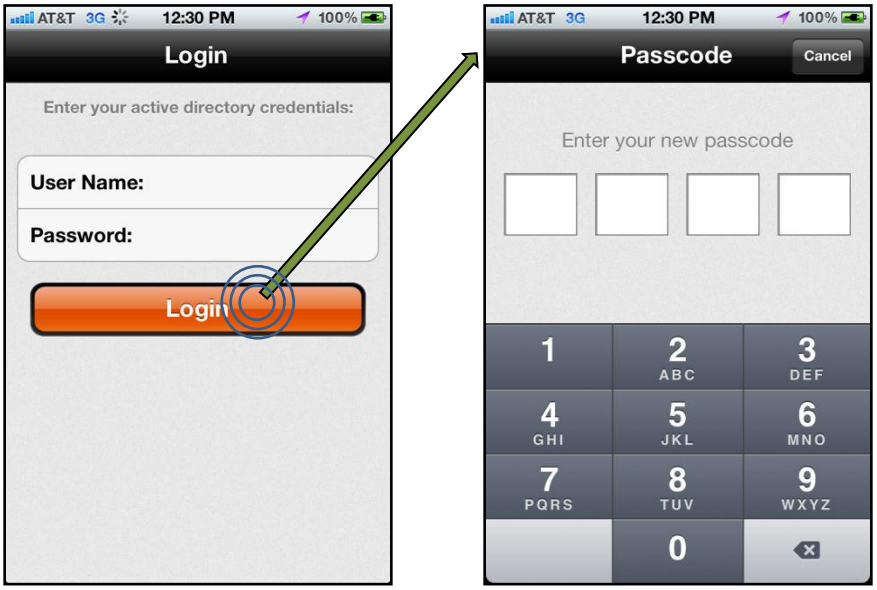
Figure 44: Data Architecture for NearMe Application



Workflow

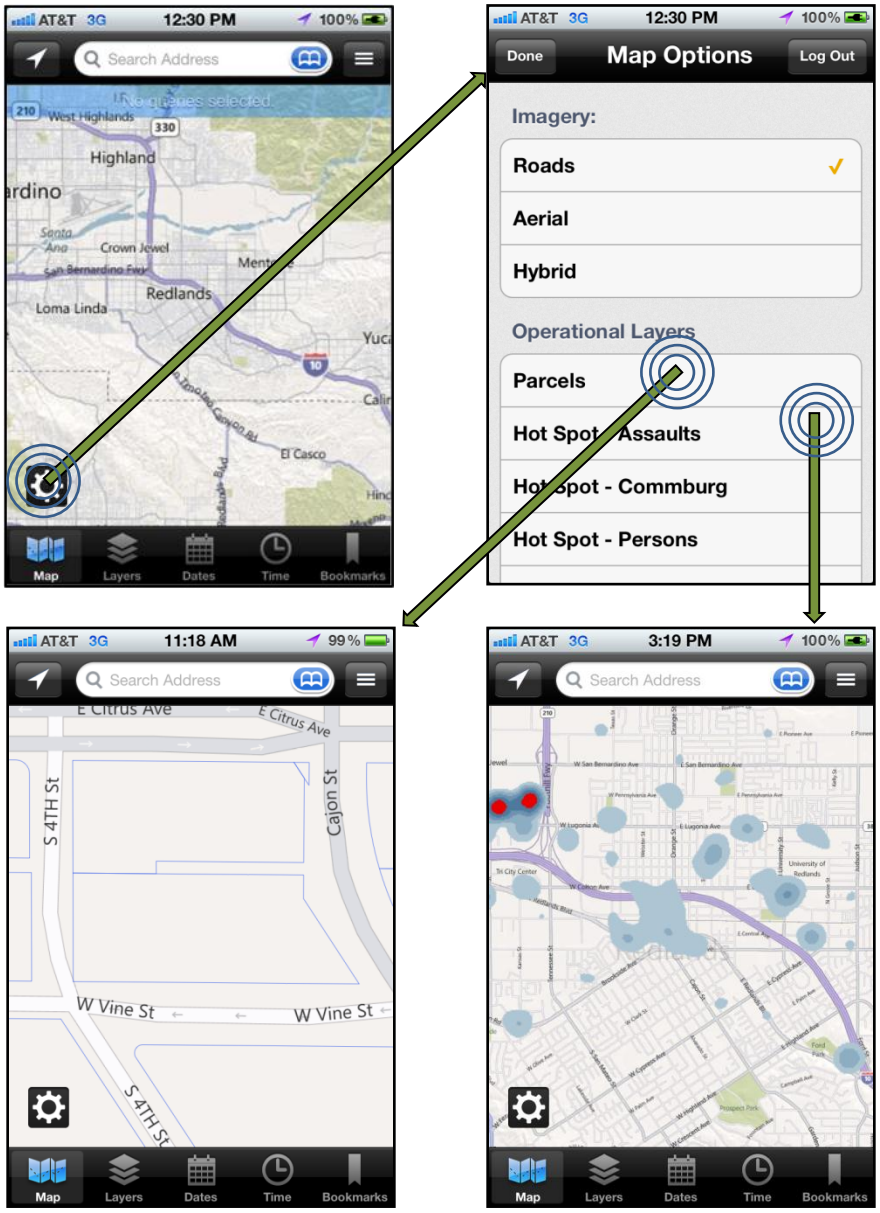
Using a lightweight directory access protocol (LDAP), users are able to access the app using their standard network credentials. The first time they do so they will be prompted to enter a personal identification number (PIN). The PIN is then used to authenticate the user for subsequent logins. This reduces the amount of time users have to enter their full credentials while still providing app security. Figure 45 demonstrates the initial login procedure.

Figure 45: NearMe Authentication



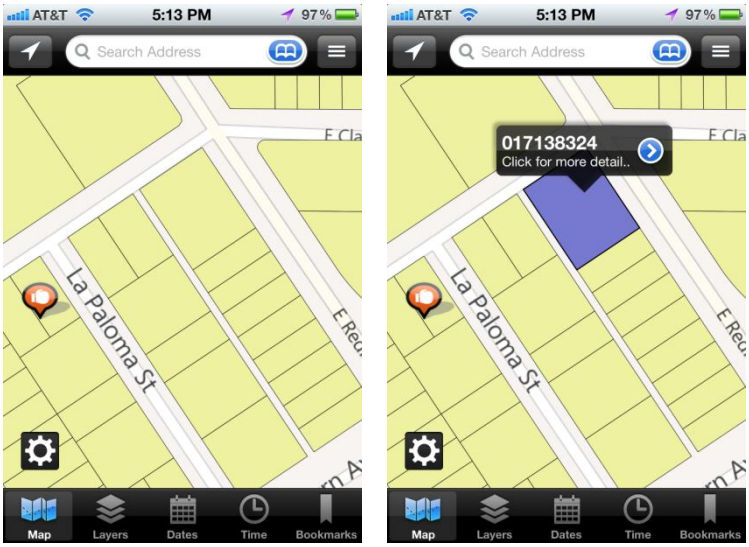
Once the user has successfully completed the login, they are taken to the mapping home screen (Figure 46). Tapping on the gear icon in the lower left corner of the map display takes the user to several options for the map background. The user is able to select "Operational Layers" which includes several pre-defined hotspot maps and the parcel data layer for the City. Geoprocessing was used to automatically create the pre-defined hotspot layers. Users will also be able to access the parcel dataset maintained by the City. This will provide information about property owners and building schematics, if available.

Figure 46: NearMe Mapping Screen



The parcel operation layer can be queried for additional information regarding property ownership and other relevant details contained within the map layer. Parcel layer data are obtained directly from the City of Redlands' spatial database when queried by the user. The City updates the parcel data layer as needed. Figure 47 displays the parcel query function.

Figure 47: NearMe Parcel Operational Layer



The core function of this app is to provide the user with spatially referenced crime data. The user will be presented with a map and crime incidents. Switching to list view will bring up all events within the current map extent. Taping on an event takes users to the synopsis information available in the records management system (RMS). Figure 48 demonstrates the mapping interface. Users can select from a mapped view or a list view. Tapping on an incident brings up more details.

Figure 48: NearMe Mapping interface

The data available within the app varies by the type of record. The list below details the data fields available[34].

34. Data fields were selected based on discussions with the RPD's crime analyst and executive staff. These fields were determined to provide the most useful information to users in the field.

Incidents

1. Incident number
2. Date / time of occurrence
3. Day of week
4. Crime class (URC Part 1 or Part 2)
5. Offense code
6. Offense description (first and second type if applicable)
7. Disposition
8. Synopsis
9. Responding officer

FI

1. FI Date / Time
2. Responding officer
3. First, middle, last name
4. Date of birth
5. Sex
6. Race
7. Hair color
8. Eye color
9. Home address
10. Comments

Alerts

1. First, middle, last name
2. Date of birth
3. Sex
4. Race
5. Hair color
6. Eye color
7. Alert 1 & 2[35]
8. Comments

Collisions

1. Incident number
2. Collision date / time
3. Collision type
4. Cause
5. Injured (number of)
6. Fatalities (number of)
7. Responding officer

Citations

1. Incident number
2. Violation date / time
3. Statute 1 / 2
4. First / last name (driver)
5. Date of birth (driver)
6. Home address (driver)
7. Responding officer

Arrestees

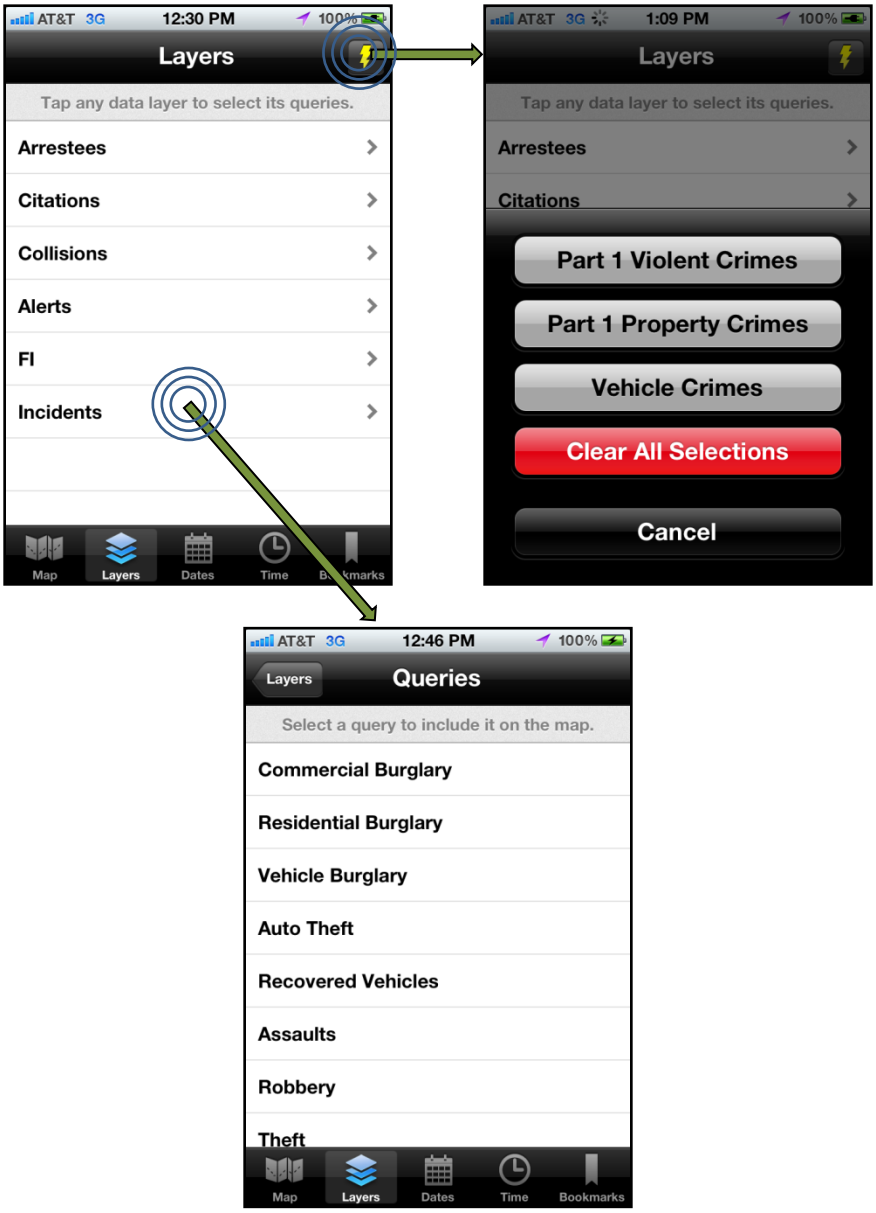
1. Arrest date / time
2. First, middle, last name
3. Date of birth
4. Home address
5. Incident number
6. Booking number
7. Statute
8. Description
9. Responding officer

Six databases were made available via the app: Arrestees, Citations (traffic), Collisions, Alerts[36], Field Interviews, and Incidents. Tapping on the database moves the user to a list of available sub-categories that are dependent upon the database selected. In the example below

35. Alerts are entered into the system for statuses such as sex offender, weapons violations, and parolees.
36. The Alerts database is a persons database that contains the residential address of individuals that may be of special interest to officers such as felons, sex offenders, people under the supervision of parole/probation.

(Figure 49) the user selected the incidents layer. Tapping on the lightning bolt button in the upper right corner brings up pre-defined shortcuts.

Figure 49: NearMe Layers Selection



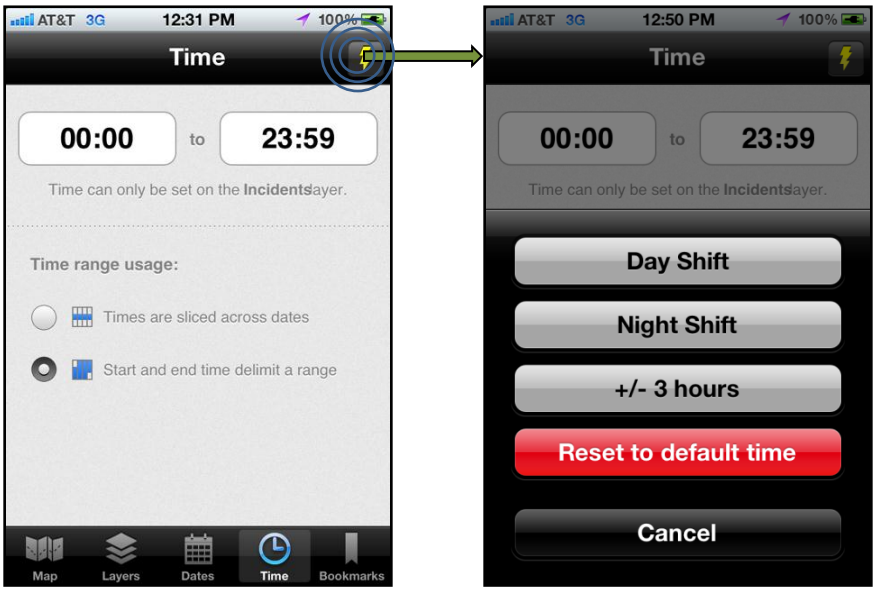
Users are able query by date ranges. Data available on the device goes back six months. Users can specify different data ranges for different data layers. For example, a user may want to see all the residential burglaries in the last week and all the locations of arrests for burglary from the

last six months. There is also the ability to create shortcuts on the fly. For example the user may want to create a shortcut so that they can look at the last week of crime. They would be able to create a seven-day shortcut using the feature below. Figure 50 demonstrates the time-range filtering capabilities of the NearMe app.

Figure 50: NearMe Date Selection

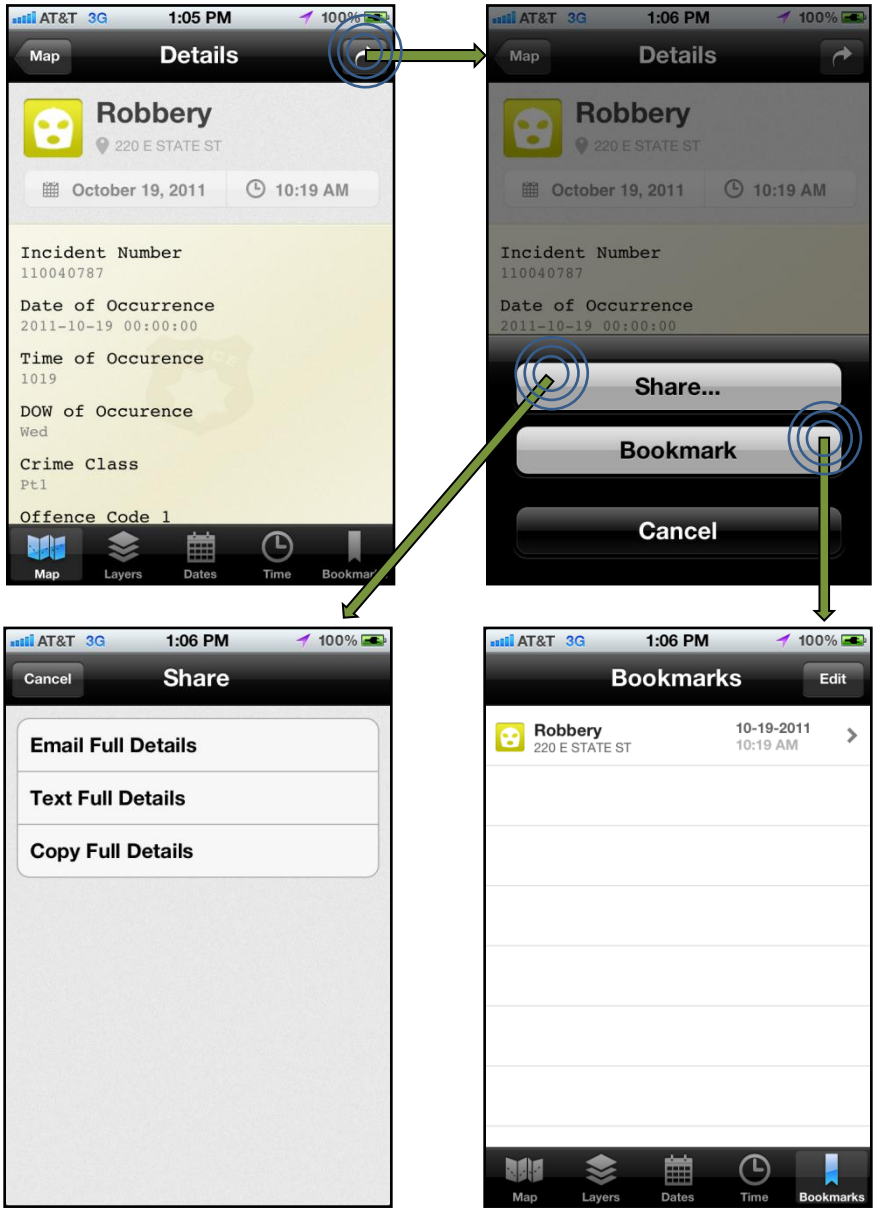
Users have the ability to query by time ranges. They can select by time slices or time ranges. Time slices cover a particular range of time across multiple days. For example, a user may want to look at crime between 6 AM and 6 PM for the last seven days. Time ranges create a start time and end time when querying crime across a date range. For example, the user may want to look at crimes that occurred between 7 AM on Monday and 6 PM on Friday. Three shortcuts were created: day shift (0600 – 1759), night shift (1800 – 0559), and +/- 3 hours. Figure 51 demonstrates the time query feature of the NearMe app.

Figure 51: NearMe Time Selection



Users are able to bookmark events and share events via email. Bookmarked events will reside under the "Bookmarks" tab and allow the user to quickly revisit an event they had viewed. Users will also have the ability to share the event via email. Figure 52 demonstrates the knowledge management and data sharing features.

Figure 52: NearMe Data Sharing & Knowledge Management



Flyers

Informational flyers represent an important avenue for disseminating information within and between organizations. Informational flyers are typically PDF documents put together on a desktop or mobile computer. Common examples of flyers include, wanted persons, missing at risk, and be on the lookout (BOLO). Figure 53 is an example of a wanted flyer.

Figure 53: Informational Flyer Example

LAW ENFORCEMENT ONLY

In most instances these flyers are time sensitive, the faster they can be created and disseminated the more likely they are to provide relevant information to other personnel. The

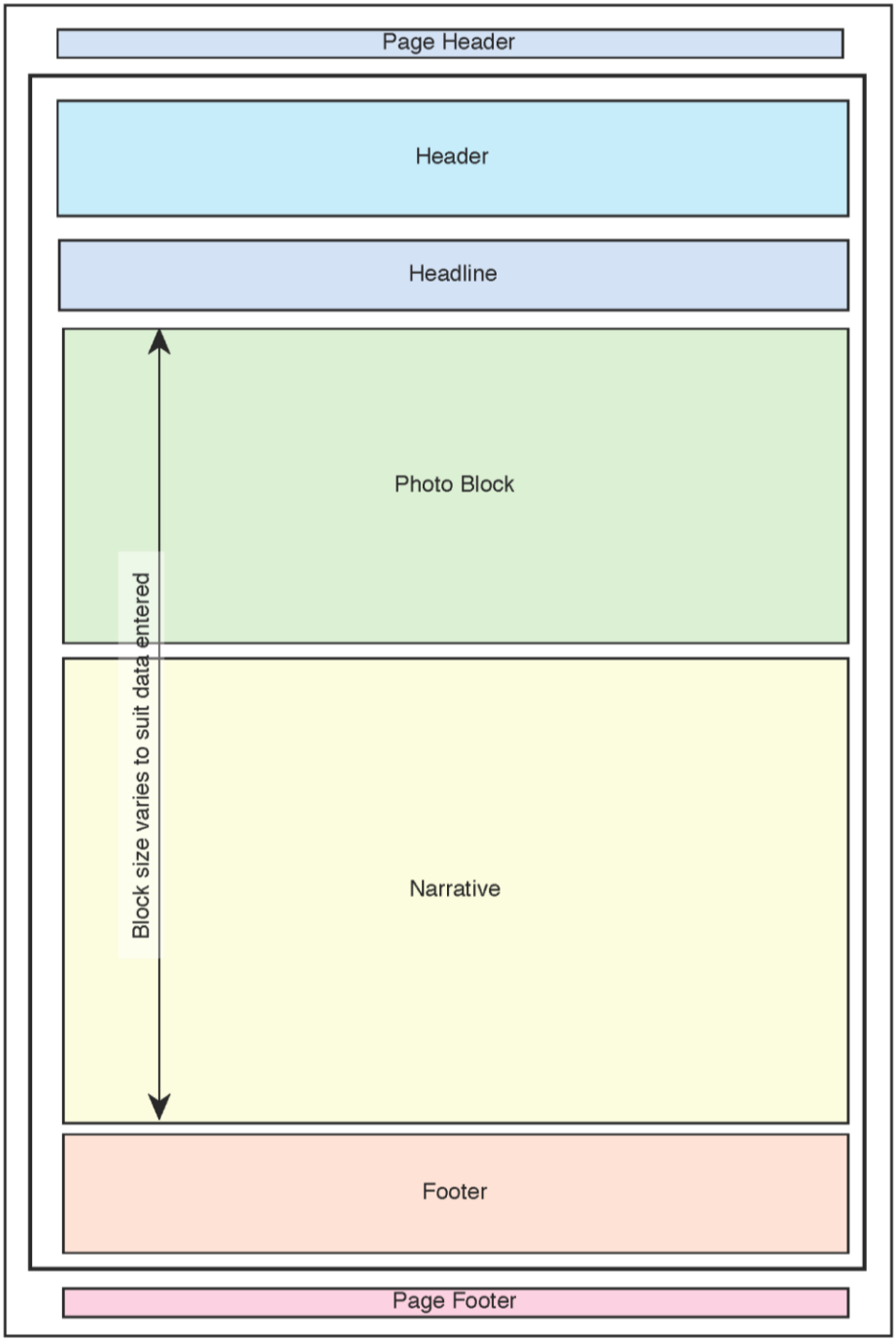
Flyer app was designed to create an easy-to-use platform to create informational flyers directly from mobile devices.

Data Architecture

This app operates independently and does not rely on any outside services. There is no integration with any departmental data resources. The app was created on the idea that flyers all contain common elements regardless of the type of flyer being created. This means that the general process of creating the flyer could be relatively consistent across many different types of flyers.

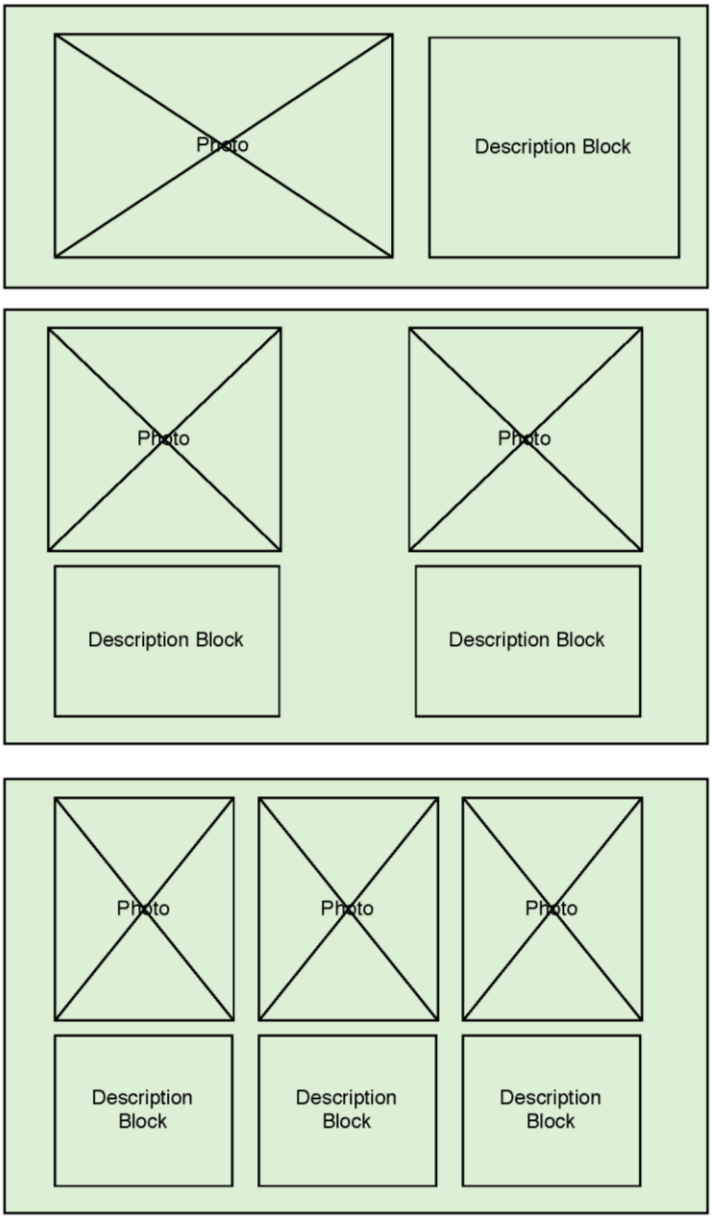
All options for display are based on the Flyer's XML schema, which is created a priori and built into the app to match commonly used types of informational flyers. Elements omitted by the user are removed from the flyer and the space they would occupy is rolled up. The photo block includes descriptions of items when entered in the photo collection screen. Text is saved as text, not graphics, so that completed PDF documents are searchable and copyable. Consistent with existing flyer guidelines, documents are automatically limited to 1 page. In the event that a flyer exceeds one page a warning is issued and the user must edit the document to make it more concise. Page headers and footers are defined in the XML and can include standard notices that are to be included on all flyers (for example, "Law Enforcement Only", logos, agency information). Headers and footers are not editable by users. The general layout of all flyers is shown in Figure 54.

Figure 54: General Layout of Completed Flyers



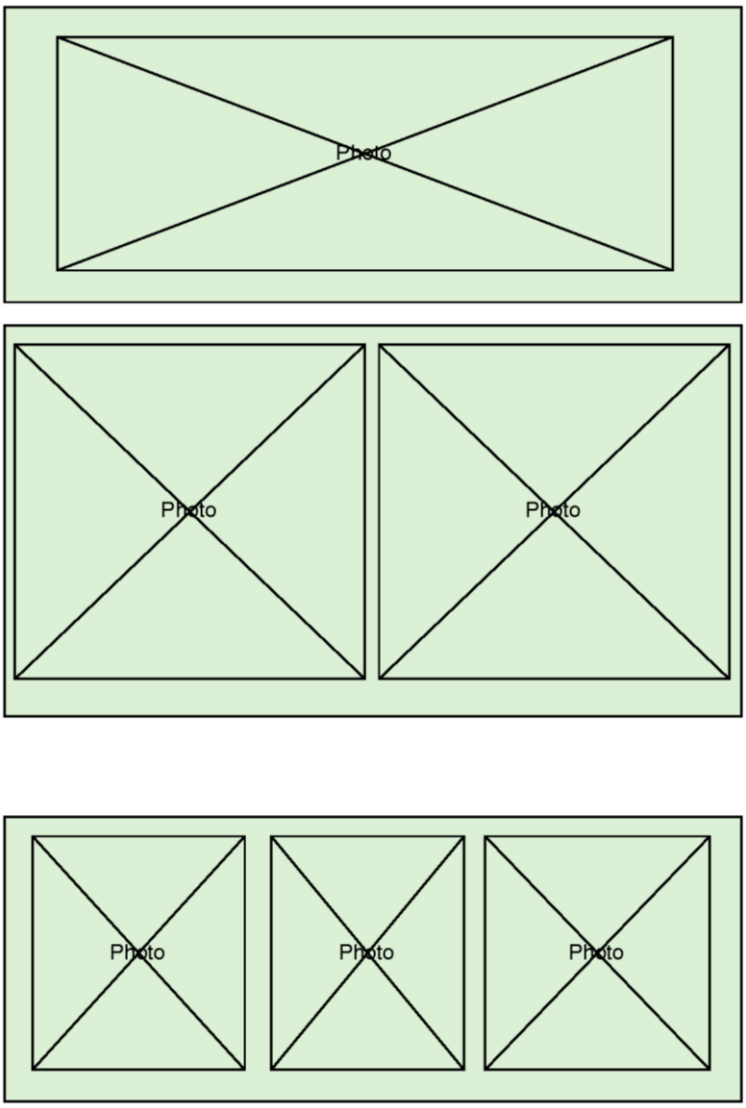
Photos can be attached to flyers. The XML file controls photo layout. Photos with user-entered descriptions are organized according to the number of photos included. Figure 55 displays the photo layout for one, two, and three photos with descriptions.

Figure 55: Photo layout with descriptions



Photos without descriptions are arranged as described in Figure 56. The lack of description allows the photos to occupy more document area.

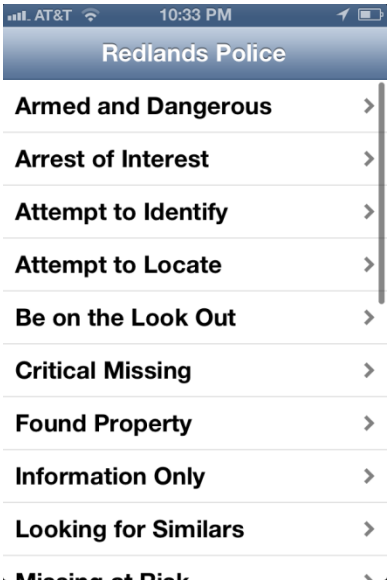
Figure 56: Photo layout without descriptions



Workflow

Workflow was designed to be a simple linear flow that guides users through the various data elements contained within the flyer format. Users are first prompted to select the type of flyer they want to create. Figure 57 displays the flyer type selection field.

Figure 57: Flyer Type Selection

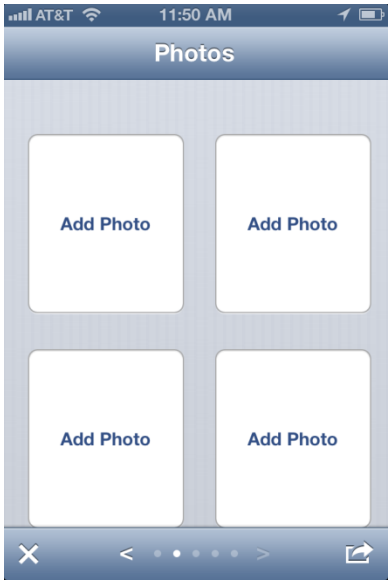


Users are then prompted to enter their personal information such as name, title, and contact information as well as case information. Personal data are saved across sessions so that users do not need to re-enter this information at the creation of each flyer. Figure 58 displays the user information data entry fields.

Figure 58: Data Entry for User Information

Next, photos are attached to the flyer. Up to four photos are allowed per flyer. Once a photo is added, an icon of the photo is displayed. The process of attaching an image is shown in Figure 59.

Figure 59: Add Image



When the user taps an “Add Photo” icon, they are presented with a list of potential image types to add. Available image types include: person of interest, vehicle, item, and general. The type of photo selected dictates the data fields collected in subsequent screens. Image type selection is displayed in Figure 60.

Figure 60: Image Type Selection

Image detail fields are determined according to the image type previously selected. Person of Interest fields include:

- Name
- Alias
- Date of birth
- Last known address
- Driver’s license
- Gender
- Ethnicity
- Hair
- Eyes
- Height
- Weight
- Clothes
- Warrant number
- Bail amount

- Other

Vehicle information fields include:

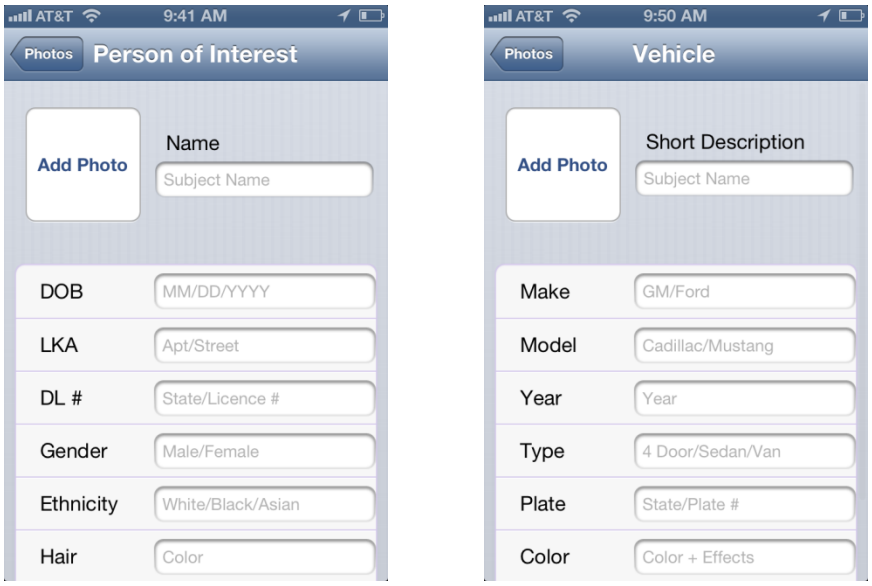
- Make
- Model
- Year
- Type
- Plate
- Color
- Other

Item photo information fields include

- Object type
- Location
- Description

General photo types contain no descriptive fields. Adding image details is described in Figure 61.

Figure 61: Image Details for Person and Vehicle Photos

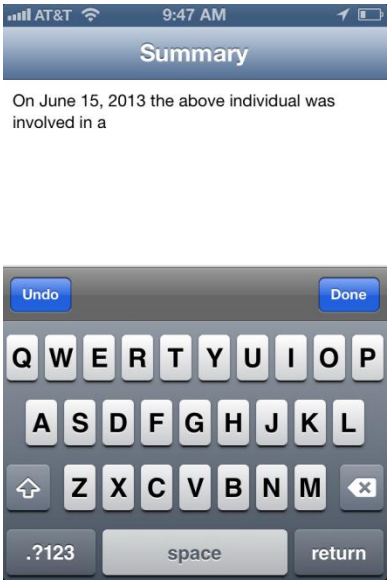


To upload a photo the user taps “Add a Photo” and either uploads a photo from the “Photo Roll’ or takes a photo using the device’s on-board camera. Figure 62 describes the process of uploading a photo to the flyer.

Figure 62: Attaching Image (Upload from Photo Roll or Capture via Camera)

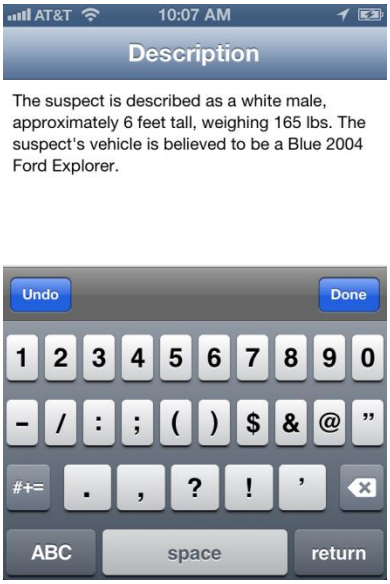
The summary data field is where users enter the primary description of the event, person or item of the flyer. This field is free form text entry field and no system checks are performed. The summary data field is demonstrated in Figure 63.

Figure 63: Summary Field



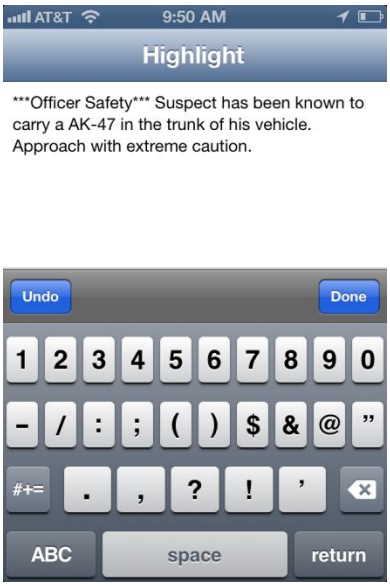
Next, users enter specific information regarding suspects or vehicles. If this information was entered in the previous field, this field can be left blank. Figure 64 shows how users enter suspect or event description information.

Figure 64: Description Field



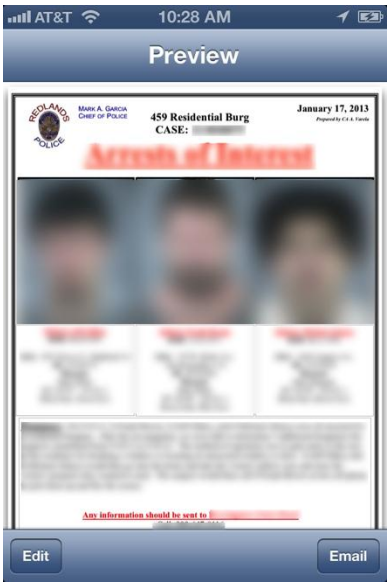
The highlight box is used to flag important information. One common scenario would be to use the highlight box to flag potential officer safety information. This field can be omitted if no special instructions are needed. Figure 65 demonstrates how users enter information that they would like included in the highlighted box.

Figure 65: Highlight Field



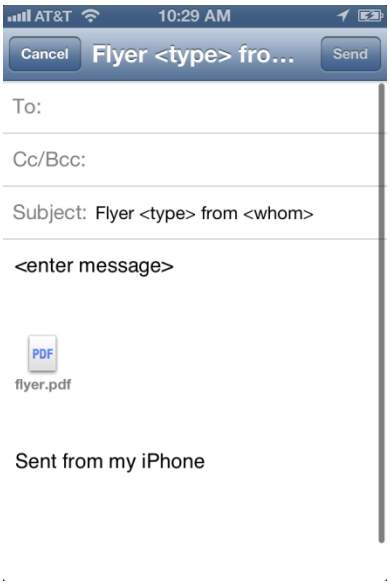
After all data have been entered the user is prompted to review the final PDF. Users have the ability to zoom, pan, and scroll around the document. Edits can be made by going back and changing previous data fields. Figure 66 displays how users would review the PDF document for accuracy and completeness.

Figure 66: Review PDF



If the user approves of the draft PDF they are taken to the native iOS email client to distribute the flyer. The native email client was used for consistency and to simplify distribution. Figure 67 demonstrates how users would distribute the flyer.

Figure 67: Email Flyer



Dissemination of Research Findings

Dissemination of this projects research has been a critical component since the beginning. Since project inception, project staff have talked to over 30 law enforcement and government agencies across the country regarding deploying iOS devices to field personnel. Personnel have provided a great deal of information to law enforcement organizations looking to implement iOS devices.

Presentations

Presentations have been made at several conferences to disseminate the findings of this project. Many of these presentations have been made available online through the Police Foundation's website.

Taniguchi, Travis A. 2011. "Three steps to bringing secure mobility management into government." Presented at the *Conversations Webinar hosted by AT&T and MobileIron*. Online Webinar. *Available at: policefoundation.org/2010-DE-BX-K006.*

Taniguchi, Travis A. 2011. "Taking it to the streets: Crime mapping, intelligence gathering, and knowledge management via smartphones." Presented at *The Eleventh Crime Mapping Research Conference*. Miami, FL. *Available at: policefoundation.org/2010-DE-BX-K006.*

Taniguchi, Travis A. 2012. "The Mobile Revolution: Crime Mapping and Intelligence Gathering Via Smartphones." Presented at the *Omega Training Summit*. San Diego, CA. *Available at: policefoundation.org/2010-DE-BX-K006.*

Taniguchi, Travis A. 2012. "AppNation Keynote Roundtable: Re-Inventing I.T. Meet the Upstarts." Presented at the *AppNation Enterprise Summit*. San Francisco.

Websites

A number of websites have been created to facilitate the timely dissemination of research activities. These webpages are housed on the Police Foundation's website and the Redlands Police Department website.

Police Foundation Websites

- General page providing an overview of the project:

  http://www.policefoundation.org/content/smartphones-law-enforcement

- The Field Interview app is described and documented at the following URL:

  http://www.policefoundation.org/content/field-interview-application

- The NearMe app is described and documented at the following URL:

  http://www.policefoundation.org/content/near-me-application

Redlands Police Department Websites

- An overview of the project can be found at the following URL:

  http://www.cityofredlands.org/police/ios

- The FI app is documented at the following URL:

  http://cityofredlands.org/police/FI

- The NearMe app is documented at the following URL:

  http://cityofredlands.org/police/NearMe

- The RPD has been featured in many news articles for its innovative use of iOS devices. A list of this media coverage can be found at the following URL:

  http://www.cityofredlands.org/police/iosmedia

- The RPD responds to many inquiries from the public and other law enforcement organizations regarding its use of iOS devices. Some frequently asked questions are addressed at the following URL: *http://www.cityofredlands.org/police/iOSFAQ*
- The RPD has compiled a list of how the department has used iOS devices. The list can be found at the following URL: *http://www.cityofredlands.org/police/iOSUses*

Implications

The goal of this project was to develop the iOS platform as a tool for the delivery and collection of information to officers in the field and was conducted in four phases. First, a needs assessment was conducted to determine the data needs of officers in the field. Second, three apps were developed to meet the demand found in phase one. Third, apps were implemented in a randomized controlled procedure to all officers and field civilians in the Redlands Police Department. Finally, the apps were evaluated for their effectiveness at assisting users in collecting and consuming information.

Implications for Policy & Practice

This study combined mobile device deployment and management, custom app development, and rigorous evaluation methodologies. A great deal has been learned with regards to these topics.

First, provisioning mobile devices to all users in a mid-size department is achievable. Although cost was a constant concern, careful selection of cellular plans and strict control of

overages made the total cost of implementation and ongoing recurring cost reasonable. At least anecdotally the cost of the program, relative to the benefits derived by increased ability to communicate, have been a worthy tradeoff. Cost sharing with employees provides a viable method of reducing the cost liability of the devices and provides employees with incentives to carry their phones during their time off and better maintain the devices.

Second, there has been a clear demand to know the return on investment (ROI) from such a wide-scale deployment, especially from agencies looking to justify implementing such wide-scale programs. As it turns out, the cost-benefit analysis for this program turned out to be impossible to answer given the data available. At an anecdotal level this question is simple to answer. There is no lack of stories related to how the devices have helped field workers conduct their work more efficiently. Nevertheless, from a quantitative perspective it has not been possible to provide a scientifically sound answer. Clearly, users appreciate the devices and believe it makes them more efficient in conducting their work duties, but quantitative evidence to support these claims is lacking. Part of the difficulty is in quantifying the cost benefit derived from "increasing communication" or having department members respond more quickly to phone, text, or email communication. While these are both worthwhile goals, they do not lend themselves to easy quantification. Mobile devices have become so tightly integrated into the department that quantifying their unique value would be similar to trying to generate a ROI on the department's email system or vehicle fleet. These items simply become tools that are necessary for employees to effectively carry out their duties.

Third, bespoke app development, although not cheap, is not beyond the reach of most organizations. The cost of development varies greatly between app developers and many of the developers met during this project expressed a willingness to reduce costs to assist local law

enforcement agencies. Bespoke app development may be even better suited to a regional deployment where the development costs can be divided between multiple agencies. The apps needed by one agency are likely to be relevant to neighboring agencies. Proper app development can generate apps with robust frameworks that can easily be customized to different agencies. For example, the Flyer app was designed to be easily modified to accommodate the different formats used by other law enforcement agencies.

Fourth, this research suggests that users have good insight into what kind of apps they would find useful to enhance their work capabilities. Our detailed needs assessment identified functionality that would be useful to field workers. The Flyer app, for example, was based on comments made by users during an early survey conducted for this project. Given enough time and resources there is no doubt that other apps, or other data, could have been made available to users. The recent certification of iOS devices as FIPS 140-2[37] compliant opens numerous development possibilities that were not previously available. Future development should focus on integrating access to secure law enforcement databases.

Fifth and related to number four, the needs assessment was not particularly effective at determining the specific workflows within the app. Even though numerous measures were taken to involve users during all stages of the process, the FI app still received poor marks for usability once the app was deployed for field use. It is clear that another beta version of the app was needed. If additional steps had been taken it may have been possible to deploy the app to users in the field before finalizing the user experience of the FI app. This may have left sufficient time and resources to further refine design elements that users found difficult to navigate while

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37. Federal Information Processing Standard (FIPS) 140-2 is a cryptographic standard that includes both hardware and software requirements. More detail is available at: http://csrc.nist.gov/groups/STM/cmvp/standards.html.

in the field. Unfortunately, in this instance the FI app was too far developed to integrate the detailed comments derived from the focus groups.

Sixth, the results of this study were not all negative and there is evidence to suggest that improving the apps may have positive effects for future adopting agencies. The evaluation found a rather substantial reduction in the amount of time between FI completion and FI upload to the primary RMS. The delay reduction between data acquisition and general data availability is a worthy goal and would help to ensure that intelligence is available for use more quickly. The barriers to use, namely a sub-optimal user experience, would need to be addressed first, but there is at least reason to believe that if these challenges can be overcome agencies will experience a positive outcome.

Implications for Further Research & Development

The NearMe app appeared to have met the demand for mobile crime mapping capability. The app is already in commercial production and is available from The Omega Group through their CrimeView suite of applications. The app, as designed, allows for customized operational layers. The current app has operational layers fed to the app as pre-defined hot spot maps. This method is limited, however, in that the event hot spot maps must be pre-generated on the server giving the user little flexibility in terms of the model's input characteristics. Future versions of the app may be improved by dynamically generating these hot spot areas. This would allow the user to select the type of crimes included as well as the time range of interest.

The NearMe app would be further enhanced with development of dynamic distribution capabilities. This could function in two ways. First, there should be a method of pushing crime analysis products to mobile devices. One example could be to use the app to distribute hot sheets (recently stolen vehicles) or other crime analysis products. Second, mobile users should

have the ability to edit, sketch, and annotate maps on their mobile device. These mobile generated crime analysis products should be shareable within the department. One scenario where this would be useful is in implementing hot spots policing. In the RPD for example, the patrol supervisor is responsible for directing their officers to current crime hot spots. Hot spot areas could be shared directly with the mobile devices of the patrol officers. Given the potential utility in distributing crime analysis and accurately directing hot spots policing, this ability should be incorporated into future development plans.

The NearMe app received some criticism because of its apparent lack of utility to field officers. Many users expressed the feeling that they had other methods of accessing spatial crime data and that the app provided no additional information. One method of addressing this concern would be to include additional data targeted towards field users. For example, a burglary event could be spatially references and temporally references and also list all the property that was taken during the event. Integration of multiple data sources may not be easy and would depend on the agency's database structure. It is clear, however, that if the app is to be of greater use to users in the field, deeper integration with other data sources will be needed.

The FI app demonstrated that it was possible to collect data via smartphones from officers in the field. Future development should recognize that although the FI is a commonly collected and important piece of criminal intelligence, it represents only one of many possible sources of information. Organizations could easily adapt this format for other data that needs to be gathered and submitted securely.

The app evaluation identified three issues with the current app that could be addressed by further development. First, as the focus group results pointed out, there is a need to

reconsider the user experience during data entry. Our extensive beta-testing of the app did not discover that users would have such difficulties with data entry in the field. It was only after the app had been fully deployed that these limitations became apparent. It is doubly unfortunate that there was not sufficient time or financial capacity to rebuild the app to address user concerns. Addressing these user interface concerns must be left to future development.

Second, the implementation assessment determined that users would prefer a method of retrieving complete FI data from within the app. Ultimately this would mean that the app could serve as a central point for both data collection and data review. Originally storing data on the devices was ruled out because of concerns around securing data at rest on the device. The recent certification of iOS devices to FIPS 140-2 compliance now means that this functionality may be possible and may make sense to link the app to closely regulated criminal intelligence databases. This task must, unfortunately, be left to future development.

Third, the upload process currently requires that the app remain open in the foreground during the entire upload process. Backgrounding the app during the upload process pauses the upload and resuming the connection means restarting the entire upload process. This is generally not problematic as most FI data can be uploaded in just a few seconds. However, if the user has attached numerous photos, or if the user is on a slow network, this process could take several minutes and force the user to discontinue interacting with their device while the process is occurring. While this is not especially problematic given the prevalence of high-speed wireless connections, this process can only be described as sub-optimal. Future development would be well directed to developing an upload process that can continue while the app is in the background.

The evaluation found an interesting relationship between the use of the apps and self-reported abilities using the iPhone. Use of the FI app was significantly associated with self-reported iPhone abilities; more tech savvy users were more likely to report using the FI app. The same relationship was not found with NearMe. There was no significant relationship between the use of NearMe and self-reported capabilities. This suggests that users may be more comfortable with data pushed to them rather than asking them to push data back into the system and further suggests that apps that intend to deliver information may be more useful and successful in the short-term than apps that require extensive data entry.

The Flyer app was not evaluated due to its late deployment relative to the other apps. Nevertheless the utility of the Flyers app to other law enforcement agencies is obvious. The utility of most flyers is directly related to them being distributed in a timely manner. This app allows users to create flyers while still in the field directly from their iOS device . The backend architecture of the app has been designed for easy portability between agencies. The types of flyers, agency information, logo, and general layout can be customized to match the existing flyers used by other agencies.

One area for future development would be to create a centralized flyer repository within the app. The app would either store the flyers on the device or it could connect to a server to retrieve recently created flyers. With this capability the app could serve as both the method of creation and the method of distribution for important informational flyers. This functionality would simplify the ability to archive the documents for later reference.

Conclusion

This multi-year four-phase project combined sophisticated technology with a comprehensive evaluation strategy. Taken at face value, the results suggest that the apps developed did not succeed along a wide-variety of success metrics. They were not well adopted, they did not provide any additional capacity beyond what already existed, and they did not appear to improve the Department's ability to disseminate information.

Nevertheless, the same results suggest reason for cautious optimism towards the deployment of smartphones and custom apps in law enforcement agencies. Users were almost unanimous that even with no custom development, smartphones were useful tools. Review of administrative and financial data during the project period suggests that smartphone deployment can be done at a reasonable cost if individual overage charges can be constrained.

Results unequivocally indicated that the current edition of the FI App missed its mark in usability. Rather than taking this criticism as indicative of a failed product, it may be more useful to interpret it as an indicator of user demand. Many users indicated frustration at the slow data input process indicating a poor user interface but perhaps also indicating a desire for the system to work better. Addressing this issue with further development may encourage greater adoption of the app.

Criticisms of NearMe focused more on the data availability and ultimately the utility, rather than specific user interface problems. Users indicated that the app did not provide any additional benefits beyond what was already available. Yet results suggested that if additional data were provided, the app could contribute significantly to addressing the mobile data needs of users. The future success of this app will depend on the ability to ingest and present novel data.

Appendices

I. References

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II. Survey Instruments

Surveys of users were conducted at four times during this study. First, the needs assessment survey sought to understand the data and accessibility needs of users in the field. The apps were then developed to respond to the needs identified. Second, the pre-CAD survey was intended to capture information before making the RPD CAD system available through the mobile devices. This survey served as the baseline before any custom content was made available to users. Third, the pre-app survey was conducted immediately before the apps were made available to users in the experimental condition. Finally, the exit survey was conducted after users had access to the apps for three months.

Survey 1: Needs Assessment Survey

Important Information and Technology Features

Please rank each of the following lists of information and technology features by their level of importance for Law Enforcement activities

	1 Least Important	2	3	4	5 Most Important
1. Officer information exchange through text messaging					
2. Computer aided dispatch (CAD) Incident Information					
3. Spatially referenced crime data/crime maps					
4. Orthophotography/aerial photos					
5. Land use & Parcel data					
6. Automatic Vehicle Locator data from patrol vehicles					
7. Active GPS offender tracking data					
8. Closed-Circuit Television (CCTV) camera locations and live feeds					
9. Data and analyses prepared by crime analysts					

Existing Information & iPhone Apps that are Useful for Law Enforcement

(Q.10) Thinking about the various data systems you access (e.g. CopLink), what systems do you think would be most useful for Law Enforcement Officers to access through an iPhone? Name or describe as many as you can.

(Q.11) How important do you think the following categories of iPhone apps are for Law Enforcement activities?

	Very Unimportant	Somewhat Unimportant	Unsure	Somewhat Important	Very Important
Books					
Business					
Education					
Entertainment					
Finance					
Games					
Healthcare & Fitness					
Lifestyle					
Medical					
Music					
Navigation					
News					
Photography					
Productivity					
Reference					
Social Networking					
Sports					

Travel					
Utilities					
Weather					

(Q.12) Thinking about apps you have used previously, or have seen others using, what apps do you think would be most useful for Law Enforcement Officers (e.g. word processing apps, language translation apps, or legal reference apps)? Name or describe as many as you can, either by title (e.g., "KeyNote" or "Video Panorama") or description (e.g., "the one that scans bar-codes" or "the one that is like Microsoft Office").

iPhone Use

(Q.13) How would you describe your ability to use the iPhone?

- Expert
- Advanced
- Intermediate
- Novice
- Beginner
- N/A - I have no experience using the iPhone

(Q.14) How long have you had a Department-issued iPhone?

- Less than 1 month
- Between 1 - 3 months
- Between 3 - 6 months
- Between 6 - 12 months
- Longer than 12 months
- N/A - I don't have a Department-issued iPhone

(Q.15) Do you have a personal iPhone? "Personal" meaning an iPhone that was not issued to you by the Department

- Yes
- No

(Q.16) How long have you had a personal iPhone? "Personal" meaning an iPhone that was not issued to you by the Department

- Less than 1 month
- Between 1 - 3 months
- Between 3 - 6 months
- Between 6 - 12 months
- Longer than 12 months
- N/A - I don't have a personal iPhone

(Q.17) The City of Redlands allows you to use your work phone for personal use if you pay a small monthly fee. Have you elected to use your Department-issued iPhone as a personal phone?

- Yes
- No

(Q.18) Do you currently have a Department-issued iPad?

- Yes
- No

iPhone Utility

(Q.19) What is the most useful aspect of the iPhone?

- Phone
- Text Messaging
- Internet Access
- Note Taking
- Camera

(Q.20) As a general tool for Law Enforcement, how useful do you consider the iPhone?

	1	2	3	4	5	
Useless or Burdensome						Very Useful

(Q.21) How likely are you to give your Department-issued iPhone number to members of the public? (...either currently, or in the future if you have not yet received a Department-issued iPhone).

- Very Likely
- Likely
- Somewhat Likely
- Somewhat Unlikely
- Unlikely
- Very Unlikely

(Q.22) Compared to your personal cell phone, how likely are you to give out your Department-issued iPhone number to the public? (...either currently, or in the future if you have not yet received a Department-issued iPhone)

- More likely to give the public my Department-issued iPhone number
- As likely to give the public my Department-issued iPhone number
- Less likely to give the public my Department-issued iPhone number
- N/A - I don't have a personal cell phone
- N/A - My Department-issued iPhone is also my personal cell phone

Demographics

(Q.23) What is your Rank or Position?

- Chief
- Lieutenant
- Sergeant
- Detective
- Corporal
- Officer

- Civilian
- Volunteer
- Other

(Q.24) What is your current assignment? (e.g., patrol, investigations, MET, narcotics, etc.)

(Q.25) What is your age?
- 18-25
- 26-33
- 34-41
- 42-49
- 50-57
- 58-65
- over 65

(Q.26) What is your sex?
- Male
- Female

Comments

(Q.27) Please use the space below to provide any comments or further information.

Pre-Mobile CAD Access Survey

Thank you for your willingness to participate in this short survey, which asks about your use and experience of information technology (IT) systems at work. This survey should take around 5-10 minutes to complete. As a reminder, your responses will be kept confidential.

The following questions ask about your use of and familiarity with information technology (IT) systems like CAD, RMS, CopLink, CopBook, CLETS, and CrimeView. This section is not asking about software like Microsoft Word, Excel, or PowerPoint.

1. How often do you use IT systems at work?
- Multiple times per workday
- Once per workday
- Several workdays per week
- Rarely
- Never

The following questions ask about your use of and familiarity with information technology (IT) systems like CAD, RMS, CopLink, CopBook, CLETS, and CrimeView. This section is not asking about software like Microsoft Word, Excel, or PowerPoint.

2. Which of the following technologies do you normally use?
(Please select all that apply.)
- CAD
- RMS
- iPhone/iPad
- CopLink
- CopBook
- CLETS
- CrimeView
- Other

3. During an average workday, approximately how many minutes do you spend ACCESSING information in these IT systems?
- Less than 5 minutes
- 5-15 minutes
- 16-30 minutes
- 31-45 minutes
- 46-60 minutes
- Other

4. During an average workday, approximately how many minutes do you spend ENTERING information in these IT systems?
- Less than 5 minutes
- 5-15 minutes
- 16-30 minutes
- 31-45 minutes

- 46-60 minutes
- Other

5. Overall, how experienced would to say you are in using these IT systems?

- (1) Very Inexperienced
- (2)
- (3)
- (4)
- (5) Very Experienced

The following questions ask about whether the IT systems you use have changed the way you use your time at work.

6. Have the IT systems you use most often changed the amount of time you spend on any of the following tasks? (Please select one box for each row.)

	Increased time spent...	No impact on time spent...	Decreased time spent..	N/A (not part of my work
on proactive patrol				
interacting with members of the community (not related to crime or emergency)				
responding to calls for service				
Follow-up calls to citizens				
writing reports and other paperwork				
planning, organizing, or analyzing information				
responding to demands from supervisors				
supervising/checking work of staff				

The following questions ask for your opinions on how useful IT systems are in your own work, and police work in general.

7. Would you agree or disagree with the following statements about the quality, reliability, and results of the IT systems you use? (Please select one box for each row.)

	Strongly Agree 5	4	3	2	Strongly Disagree 1
Needed information is readable and understandable					
IT systems are "up" and available when needed					
IT systems help provide more information than dispatch alone					
Information is sufficiently up-to-date					
Information is sufficiently detailed					
Information is sufficiently complete					
IT systems improve available information over time					
IT systems improve information sharing between units					

within the Department					
IT systems lead to collecting too much unnecessary information					
IT systems lead to information overload					

8. Would you agree or disagree with the following statements about the IT systems you use? (Please select one box for each row.)
The IT systems I use...

	Strongly Agree 5	4	3	2	Strongly Disagree 1
...have a positive impact on my effectiveness and productivity in my job					
...make work easier					
...help me manage the information I need to do my job properly					
...require me to report my activities more often					
...require unnecessary steps to finish things					
...require collecting information that distracts from my main job responsibilities					
...limit my discretion					
...improve Department's response to crime					
...improve Department's service to the public					
...lead to a more problem oriented police service					
...lead to a more effective proactive policing					
...increase officer safety					
...help employees make better decisions at work					
...increase employee involvement in decision making					
...improve capability of management					
...improve communication within the Department					
...improve trust within the Department					

Thank you for your assistance. To complete the survey, please answer a few brief factual questions about yourself and click "done" when finished. As a reminder, these answers will not be used to identify you and will not be shared with your colleagues or supervisors.

9. What is your rank or role within the Department?
- Chief
- Lieutenant
- Sergeant
- Detective
- Corporal
- Officer
- Civilian
- Volunteer
- Other (please specify)

10. What is your age?

- 18-25
- 26-35
- 36-45
- 46-55
- 56-65
- Over 65

11. What is your gender?
    - Male
    - Female

Baseline Survey

Thank you for your willingness to participate in this short survey, which asks about your use and experience of your department issued iPhone and crime analysis techniques more generally. This survey should take around 5-10 minutes to complete. As a reminder, your responses will be kept confidential.

1. Do you agree to participate?
    - Yes, I agree to participate
    - No, I refuse to participate

USE OF iPhone
The following questions ask about your use of your Department issued iPhone in the course of your work duties.

2. How would you describe your ability to use the iPhone?
    - Expert
    - Advanced
    - Intermediate
    - Novice
    - Beginner
3. During the workday, about how much time do you spend using your iPhone for purposes other than calls (such as text messaging, reading emails, etc.)?
    - Less than one hour per day
    - One to three hours per day
    - Three or more hours per day
4. About how often do you download new apps of any kind to your iPhone?
    - Never
    - Once a month or less
    - Once a week or less
    - Multiple times a week
    - Every day
5. Have you downloaded an app from the App Store or another provider to help you complete field interviews (FI)?
    - Yes
    - No
6. About how many FIs have you completed on the iPhone?
    - [TEXT FIELD]
7. How long (in minutes) did it take you to complete?
    - [TEXT FIELD]
8. Have you attached a picture or image to an FI you completed on the iPhone?
    - Yes
    - No
9. Do you want to complete FIs on your iPhone?
    - Yes

- No

10. In the last year, how often have you done the following activities using your iPhone in the course of your work duties? (please mark one box per row)

	Never	Once a month or less	Once a week or less	Multiple times a week	Every work day
Exchanged information via text message					
Accessed computer aided dispatch (CAD) information					
Used spatially referenced crime data or crime maps					
Taken images using video or camera					
Used other mapping apps					
Used note taking or audio recording apps					
Used language translation apps					
Used any other app					

USE OF OTHER DATA SOURCES

The following questions ask about data sources other than the iPhone (such as desktop, laptop, or in-car computers) that you use in the course of your work duties.

	Never	Once a month or less	Once a week or less	Multiple times a week	Every work day
Orthographs/aerial photos					
Land use or parcel data					
Automatic Vehicle Locator (AVL) data from patrol vehicles					
Computer aided dispatch (CAD) information					
Active GPS offender tracking data					
Closed-circuit television (CCTV) camera locations or live feeds					
Data or analyses prepared by crime analysts					

12. Have you ever wanted to attach a picture or image to a traditional paper FI?
    - Yes
    - No

CRIME AND PLACE

The following questions ask about how you define and respond to hot spots of crime.

13. What sort of place or area would you define as a crime hotspot? (please choose one)
    - Address or intersection
    - A cluster of addresses
    - Street blocks
    - A group of blocks
    - Neighborhoods/ beats
    - Other

14. On a scale of 1-5, how useful do you find the following resources in defining crime hotspots?

	Not Useful 1	2	3	4	Extremely Useful 5	Not Used
Community input						
Annual/monthly reports and statistics						
Daily/ weekly reports and statistics						
Intelligence reports						
Desktop crime mapping						
Weekly team briefings						

15. What is your rank or role within the Department?
    - Chief
    - Lieutenant
    - Sergeant
    - Detective
    - Corporal
    - Officer
    - Civilian
    - Volunteer
    - Other (please specify)
16. What is your age?
    - 18-25
    - 26-35
    - 36-45
    - 46-55
    - 56-65
    - Over 65
17. What is your gender?
    - Male
    - Female

You are almost done with the survey. For the final part of the survey you will be directed to a crime mapping website where you will be asked to mark where you think the highest crime areas are in Redlands. Click "Done" to go the crime mapping website.

Exit Survey

1. Do you agree to participate?
    - Yes, I agree to participate
    - No, I refuse to participate

USE OF iPhone
The following questions ask about your use of your Department issued iPhone in the course of your work duties.
2. How would you describe your ability to use the iPhone?
    - Expert
    - Advanced
    - Intermediate
    - Novice
    - Beginner

3. During the workday, about how much time do you spend using your iPhone for purposes other than calls (such as text messaging, reading emails, etc.)?
    - Less than one hour per day
    - One to three hours per day
    - Three or more hours per day
4. About how often do you download new apps of any kind to your iPhone?
    - Never
    - Once a month or less
    - Once a week or less
    - Multiple times a week
    - Every day

5. Do you currently have the RPD field interview/crime mapping applications installed on your iPhone?
    - Yes—both
    - Yes—FI app only
    - Yes—Crime mapping app only
    - No

If you have downloaded the RPD FI/Crime mapping app to your iPhone:

6. About how many FIs have you completed on the iPhone?
    - None
    - Fewer than 5
    - 6 10
    - More than 10
    - I have not installed the FI app
7. How long do they usually take to complete?
    - 3 minutes or less

- 3-5 minutes
- 5-10 minutes
- More than 10 minutes
- I have not completed FIs/installed the FI app

8. Does completing an FI via the iPhone app take more or less time than completing an FI on a paper card?
- It takes more time to complete an FI on the iPhone
- It takes more time to complete an FI the traditional way
- It takes about the same amount of time

9. Have you attached a picture or image to an FI you completed on the iPhone?
- Yes
- No

10. How often have you used the crime mapping (NearMe) iPhone application?
- Never
- Fewer than 5 times
- 6-10 times
- More than 10 times

11. Compared to other methods that are available to you, how easy is it to use the iPhone FI/NearMe app to:

	Much harder	Somewhat harder	About the same	Somewhat easier	Much easier	Not applicable
Type in the necessary information						
Navigate from screen to screen						
Manipulate options the screen						
Save the information and bring it up later						
Find information that you're looking for						

12. Compared to other methods that are available to you, does the FI/NearMe app help you to:

	Never	Almost Never	Sometimes	Usually	Always	Not applicable
Complete FIs more quickly during a contact						
Complete FIs more safely during a contact						
Access / use FI information more conveniently while on patrol						
View information about incidents more quickly						
Investigate incidents						
Communicate with the public/ residents/ businesses on your beat						
Decide where to focus efforts during patrol						

13. Which method of completing FIs do you prefer?
- Paper card
- iPhone FI app
- No preference
- Other (please specify)

14. In the last three months, how often have you done the following activities using your iPhone in the course of your work duties? (Please mark one box per row.)

	Never	Once a month or less	Once a week or less	Multiple times a week	Every work day
Exchanged information via text message					
Accessed computer aided dispatch (CAD) information					
Used spatially referenced crime data or crime maps					
Used other mapping apps					
Used note taking or audio recording apps					
Used language translation apps					
Taken images using video or camera					

USE OF OTHER DATA SOURCES

The following questions ask about data sources other than the iPhone (such as desktop, laptop, or in-car computers) that you use in the course of your work duties.

15. In the last year, other than the iPhone, which of the following data sources have you accessed or used and how often? (Please mark one box per row.)

	Never	Once a month or less	Once a week or less	Multiple times a week	Every work day
Orthographs/aerial photos					
Land use or parcel data					
Automatic Vehicle Locator (AVL) data from patrol vehicles					
Computer aided dispatch (CAD) information					
Active GPS offender tracking data					
Closed-circuit television (CCTV) camera locations or live feeds					
Data or analyses prepared by crime analysts					

16. Do you agree or disagree with the following statement:
The department should continue to provide smartphones to officers and field personnel.

- Strongly agree
- Agree
- Undecided
- Disagree
- Strongly disagree

17. Are there any other apps or capabilities you would suggest that the Department develop for the iOS platform?

Thank you for your assistance. To complete the survey, please answer a few brief questions about yourself and click "done" when finished. As a reminder, these answers will not be used to identify you and will not be shared with your colleagues or supervisors.

18. What is your rank or role within the Department?

- Chief
- Lieutenant
- Sergeant
- Detective

- Corporal
- Officer
- Civilian
- Volunteer
- Other (please specify)

19. What is your current assignment?
    - Patrol
    - Investigations
    - MET
    - Narcs
    - Community Policing
    - CSO
    - CVP/CVPR/Volunteer
    - Other (please specify)
20. What is the highest level of education you have completed?
    - High school diploma/GED
    - Some college
    - Associate's degree
    - Bachelor's degree
    - Master's degree
    - Advanced degree (MD, JD, PhD, etc.)

When you click "Done" you will be taken to an interactive mapping app that will ask you to highlight areas that you think are hot spots of crime.

Please allow the app to load fully before proceeding.

1. Click the "High Crime Area" tool.
2. Move the cursor to the map, click once to begin drawing. Click again where you want the line to stop. Double click to finish the drawing.
3. Repeat steps 1 and 2 if you want to identify another high crime area.
4. When you have identified all areas, enter your name and email address and click submit.
5. After submitting, the survey is complete and you can close the browser window.

III. Focus Group Prompts

Aim to interview 2-3 people (max 5) each in 2 groups:

1) "ADOPTERS": according to survey responses and phone usage records, these people use the app regularly and appear engaged
2) "REJECTERS": according to survey responses and phone usage records, these people have not downloaded the app, or have tried it but have not adopted it for daily work. *(note: not using these terms with the participants! Redlands contact will select participants for groups so identities of survey respondents will not be revealed to research staff)*

Intro: Thanks for taking the time to speak to us. Introduce ourselves—Charlotte and Zoe are research partners from George Mason University in Virginia. We'd like to talk about your experiences with using the department issued iPhones, especially the FI/crime mapping app we've been testing. Confidentiality: we may use quotations in reports but they will not be attributed to you and we will not pass information about this conversation or those who attended to the department.

Please tell us a bit about yourself—first name, current assignment.
Let's talk about how you use the iPhone on the job...

ADOPTERS

1) How long have you had your department-issued iPhone?
2) Do you have your own (non-department issued) iPhone/Android/other touchscreen/smartphone device?
    a. If so, what device do/did you have?
    b. Did you have one before the department issued you an iPhone?
    c. Did you use it for work activities before you got the department-issued phone?
3) Do you use your department-issued iPhone on and off duty, or just at work?
4) What do you use your phone for most often while at work?
5) What do you like most about having the iPhone on the job?
6) Tell us about how you used the field interview/mapping app on the job.
    a. How often did you use it?
    b. Did it change the way you work? If so, how?
    c. Did you know you were taking part in an experiment where some officers did not have access to the app?
        i. Did the experiment interfere with your work (for example, difficulties working with officers who did not have the app)?
        ii. Did you receive enough information about the experiment?
        iii. Did the way we carried out the experiment make sense to you? Why/why not?
7) Did you receive any training on using the app?
    a. Was it sufficient? Why/why not?
8) What were the most and least useful features in the app for you? Why?

9) If you could change something about the app, what would it be? Was there anything the app couldn't do that you would want to see included?
10) Did you use other commercially available apps alongside the FI/mapping app for work purposes?
    a. If yes, which ones? What for?

REJECTERS

1) How long have you had your department-issued iPhone?
2) Do you have your own (non-department issued) iPhone/Android/other touchscreen/smartphone device?
    a. If so, what device do/did you have?
    b. Did you have one before the department issued you an iPhone?
    c. Did you use it for work activities before you got the department-issued phone?
3) Do you use the iPhone on and off duty, or just at work?
4) What do you use your phone for most often while at work?
5) What do you like most about having the iPhone on the job?
6) Did you download the field interview/mapping app that's currently being tested?
    a. If no, why not?
    b. If yes, did you use it?
        i. How often?
        ii. Did you stop using it? If so, why?
    c. Did you know you were taking part in an experiment where some officers did not have access to the app?
        i. Did the experiment interfere with your work (for example, difficulties working with officers who did not have the app)?
        ii. Did you receive enough information about the experiment?
        iii. Did the way we carried out the experiment make sense to you? Why/why not?
            1. (if they had concerns about the experiment, ask if that affected their decision not to use/to stop using the app).
7) Did you receive any training on using the app?
    a. Was it sufficient? Why/why not?
    b. Did the training affect your decision not to download/continue using the app?
8) If you did try the app, were there any features you found useful?
9) Is there anything that could be changed in the app that would have made it more useful for you? If so, what?
10) Do you use any other commercially available apps for the same kinds of tasks as this app (FI/crime mapping)? If so, which ones?

IV. Needs Assessment Report

The needs assessment report has been reformatted to fit this document. The original version is available online and can be found at: *policefoundation.org/2010-DE-BX-K006*

Assessing the Mobile Data Needs of the Redlands Police Department: Recommendations for an iPhone Application

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This project was supported by Award No. 2010-DE-BX-K006, awarded by the National Institute of Justice, Office of Justice Programs, US Department of Justice. The opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect those of the Department of Justice or the Redlands Police Department.

Introduction

The advent and rise of computerized crime mapping and analysis techniques have gone a long way towards developing analytic capabilities within police departments. These tools, however, have generally been focused on desktop users or have been distributed in formats incompatible with the highly mobile nature of law enforcement. This project sets out to address this insufficiency by turning the iPhone into a powerful tool capable of managing spatial and non-spatial data, conducting mobile crime mapping and analysis, and facilitating communication between officers.

This project was divided into four phases: (1) the needs assessment, (2) the software development, (3) the software implementation, and (4) the implementation assessment. The needs assessment was designed to evaluate the type of data that should be made available to participants using the application being developed. It is the focus of this report. The software development phase allows time for The Omega Group to develop the iPhone apps as well as time for the RPD's technical staff to test alpha and beta versions of the application. The software implementation phase will see the application deployed to the project participants. Application deployment will follow a block randomized cross-over design. Finally, the implementation assessment will consist of surveys and focus groups to determine the utility of the application as well as any enhancements that could be made on future versions of the application.

This report discusses the lessons learned during the needs assessment phase of this project that commenced in January 2011. A multi-method approach was adopted for the needs assessment: (1) a survey of project participants (the needs assessment survey); (2) a meeting of the project advisory board; (3) an in-depth discussion with officers that covered a number of topics that are detailed in a later section; and, (4) the technical working group focused on

implementing data connectivity, security issues, and general application performance. This report documents and describes the results of each component.

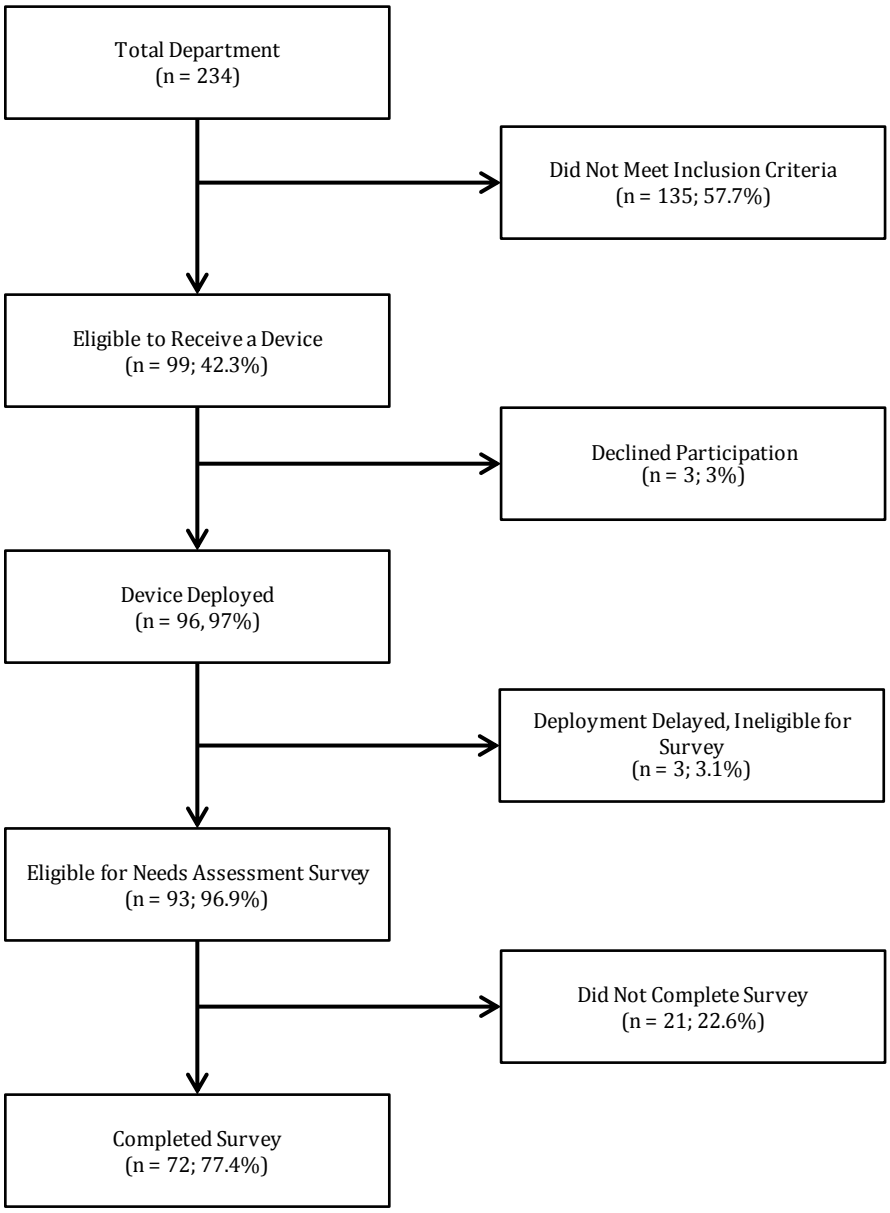
Project Participation

The Redlands Police Department is comprised of over 234 full-time employees, part-time employees, and volunteers. Eligibility for participation in the project was based on the following criteria:

1. All sworn officers were eligible
2. Civilian employees that worked predominantly in field assignments were eligible
3. Civilian employees performing operations support functions (e.g. database or network management, geographic information systems management, or crime analysis) were eligible
4. Volunteers that worked in select field assignments were eligible

There were 99 people that fell under these criteria. Three potential participants (all sworn officers) opted out of participating in the study by indicating that they did not want a department issued phone. Of the 96 remaining participants three devices were not deployed before the needs assessment survey was conducted. There were, therefore, 93 people eligible for the needs assessment survey. Figure 1 illustrates the stages where people were excluded from the study.

Figure 1: Participant flow diagram



Needs Assessment Survey

The needs assessment survey was constructed with three goals in mind. First, identify the spatial and non-spatial data participants felt would be most important to carry out their work. Second, determine which features and tools available on the device they considered most important. Finally, attempt to identify existing iPhone apps that would be useful for law enforcement purposes.

Response Rate, Representativeness, and Respondent Characteristics

The survey instrument[38] was constructed and administered through an online survey linked to a Google Docs spreadsheet (a copy of the iPhone needs assessment survey can be found in Appendix 1). The initial email invitation to participate in the survey was sent out on February 2nd, 2011. Reminder emails were sent on February 7th, and February 22nd. The survey was closed on February 26th, after being available for 23 days. The survey response rate was 76.3% (71 out of 93 possible respondents completed the survey). Our exploratory survey served its purpose of providing an initial portrait of the RPD's needs for mobile technology applications, as well as their current use of such devices. But, before discussing these results, it is first important to understand who these results are drawn from.

The following figures were based on data drawn from administrative records maintained by the RPD. Of the 96 people eligible to participate in the study at the time the devices were deployed:

- 87 were full time employees, eight were volunteers, one was a part-time employee
- 77 were male and 19 were female

[38] The needs assessment survey was reviewed and approved by the George Mason University (GMU) Human Subjects Review Board (HSRB), as well as the Police Executive Research Forum (PERF) Institutional Review Board (IRB).

- 80% of project participants were sworn law enforcement officers
- Of the 77 participants that were sworn officers, 43 held the rank of officer[39] (56%), 18 held the rank of corporal or detective (23%), 11 held the rank of sergeant (14%), five held the rank of lieutenant or above (6%)
- Of the 77 participants that were sworn officers, 39 were assigned to patrol (51%), ten were assigned to investigations (13%), and the remaining officers were assigned to various specialized positions
- 46 participants had a RPD iPhone before the beginning of the study; 50 iPhones were funded and deployed as part of this grant
- Six participants were Community Service Officers (CSO), non-sworn employees that respond to non-emergency calls for service and do basic forensic work
- Four participants were part of the Citizen Volunteer Patrol (CVP), a group of volunteers that undergo special training and participate in many of the Department's non-law enforcement activities

These data were derived from administrative databases maintained by the RPD. It is instructive to compare these data to the responses from the survey. Table 1 presents a comparison between user reported values and the known data from administrative records. Overall the results suggest that the group that completed the survey closely matched the entire population eligible to take the survey. Table 1 presents the comparison between administrative data and survey data.

[39] This includes 39 officers and four reserve officers.

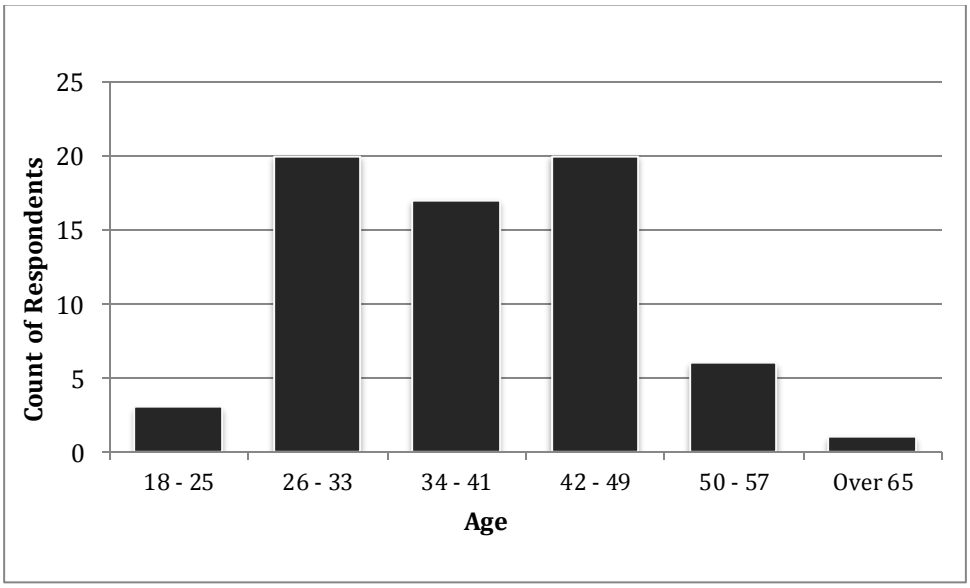
Table 1: Comparison between administrative data and survey data

Category		n (%) Population	n (%) Survey Actual (n = 71)
Gender (n = 93)	Male	74 (80%)	55 (77%)
	Female	19 (20%)	14 (20%)
	Refused/Missing	---	2 (3%)
Rank (n = 76)[a]	Officer	42 (55%)	27 (50%)
	Corporal/Detective	18 (24%)	16 (30%)
	Sergeant	11 (14%)	7 (13%)
	Lieutenant & Above	5 (7%)	4 (7%)
	Refused/Missing/Non-Officer Position	---	22(-)
Sworn vs. Non-Sworn (n = 93)	Sworn	76 (82%)	54 (76%)
	Non-Sworn	17 (18%)	15 (21%)
	Refused/Missing	---	2 (3%)
Assignment (n = 93)	Patrol	38 (41%)	28 (39%)
	Investigations	10 (11%)	7 (10%)
	Other	45 (48%)	26 (37%)
	Refused/Missing	---	10 (14%)

[a] Only includes sworn officers.

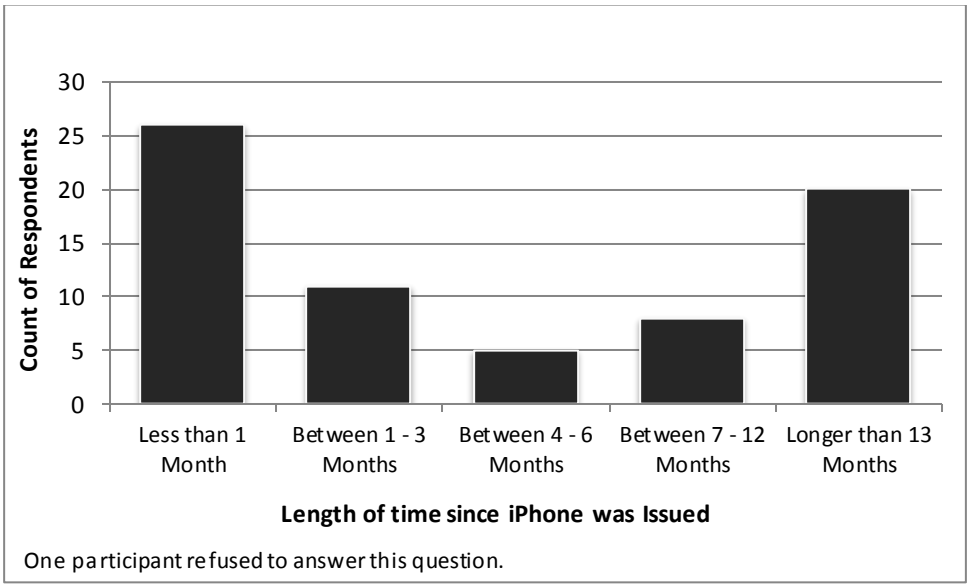
Participants were asked to self-report on age. Most respondents were between 26 and 33 or 42 and 49. Four participants failed to answer this question. Figure 2 illustrates the reported age of the survey respondents.

Figure 2: Age of Respondents



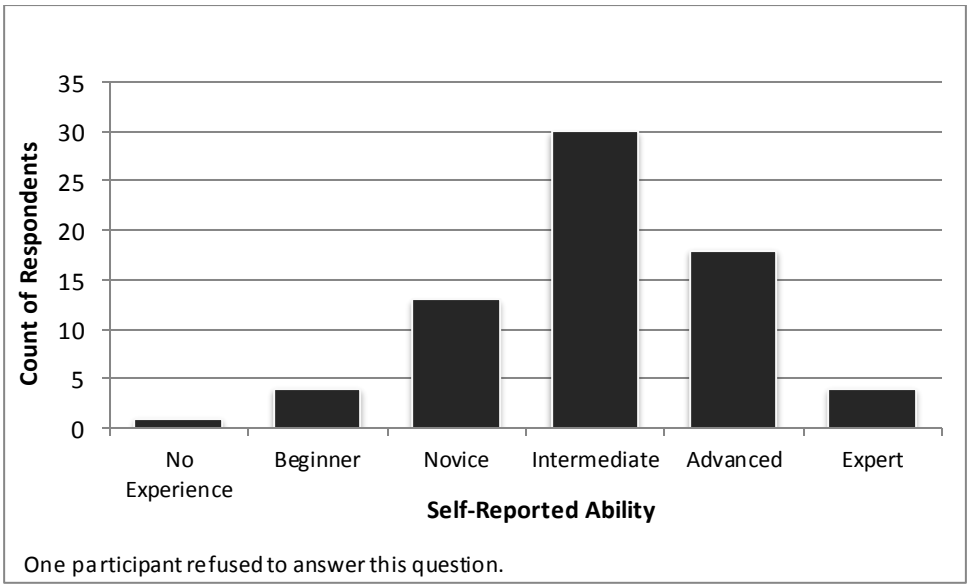
It is also important to recognize the exposure and acceptance of technology among the respondents from the RPD, as they may not be representative of police departments more generally. The RPD is widely considered a Department that embraces innovative uses of technology. For example, over half of the people responding to the survey had been issued an iPad as part of their work assignment. A number of questions were asked to assess the user's orientation towards iPhones. Figure 3 presents the length of time people had been in possession of their Department issued iPhone.

Figure 3: Length of time since iPhone was deployed



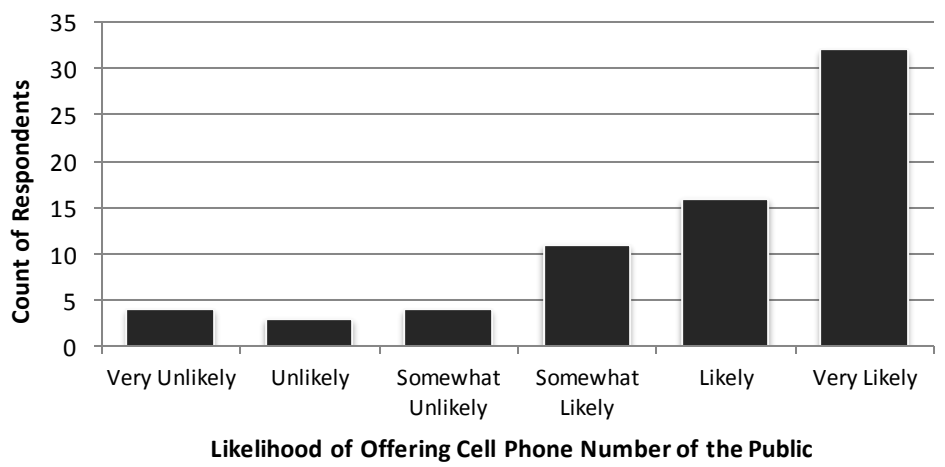
Users were asked to provide a self-assessment on their ability to use the iPhone. Most users considered themselves to be intermediate or higher. Figure 4 presents the results of this question.

Figure 4: Self-reported ability to use the iPhone



The survey also gathered some data on respondents' current or anticipated use of their iPhones. The RPD allows employees to use their Department issued phones as personal cell phones if the user pays a small monthly fee. Forty-four (62%) respondents indicated that they were or would be participating in this program. At the outset of the project we believed that providing officers and civilians with cell phones would increase communication between the Department and the public. Users were asked about their likelihood of giving out their cell phone numbers to members of the public. Figure 5 displays the likelihood that a user would give their number to a member of the public. Most people were likely or very likely to provide their number to a member of the public.

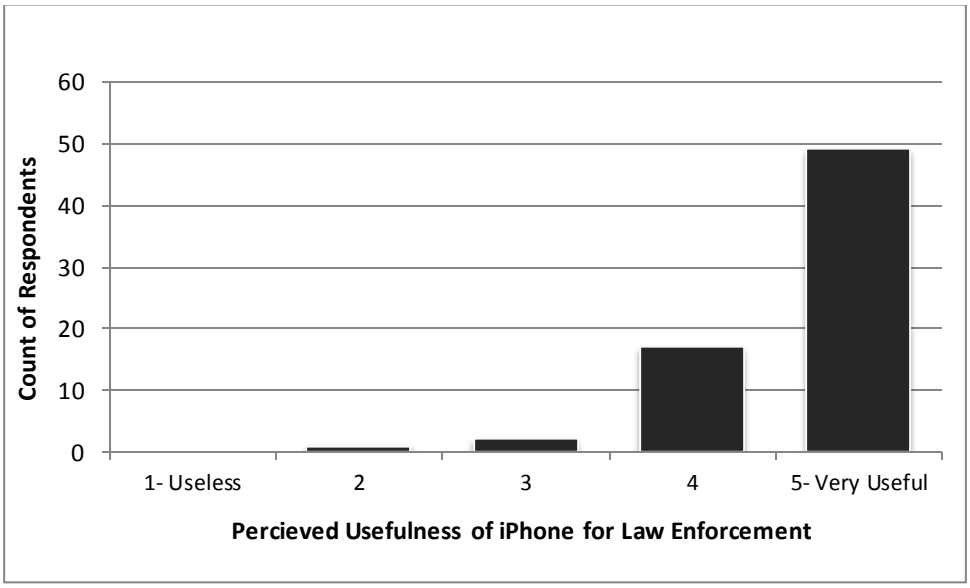
Figure 5: Self-reported likelihood of offering cell phone number to the public



One participant refused to answer this question.

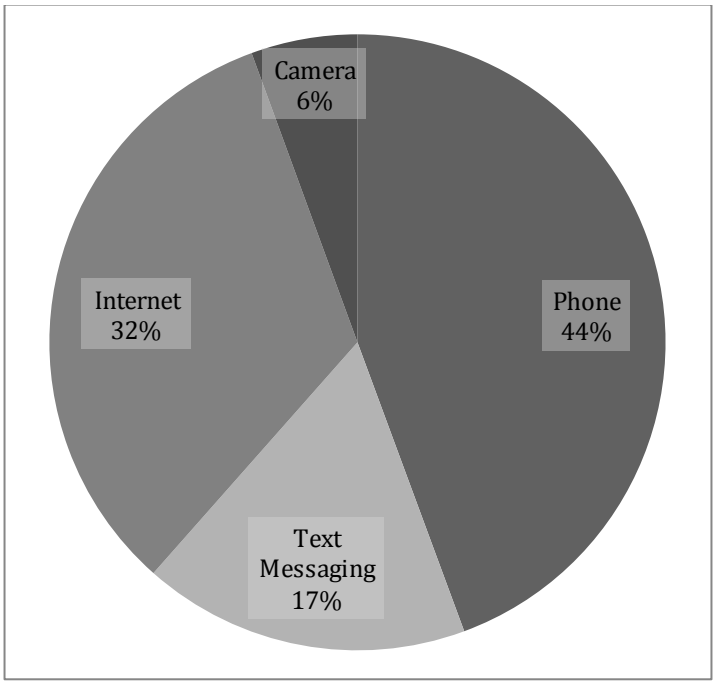
Users were asked to indicate how useful they thought the iPhone would be as a law enforcement tool. It was clear that there was a widely held attitude among respondents from the Redlands Police Department that the iPhone is a useful tool for law enforcement. Figure 6 displays the results on user's perceptions of the iPhone as a useful law enforcement tool.

Figure 6: Perceived usefulness of the iPhone for law enforcement



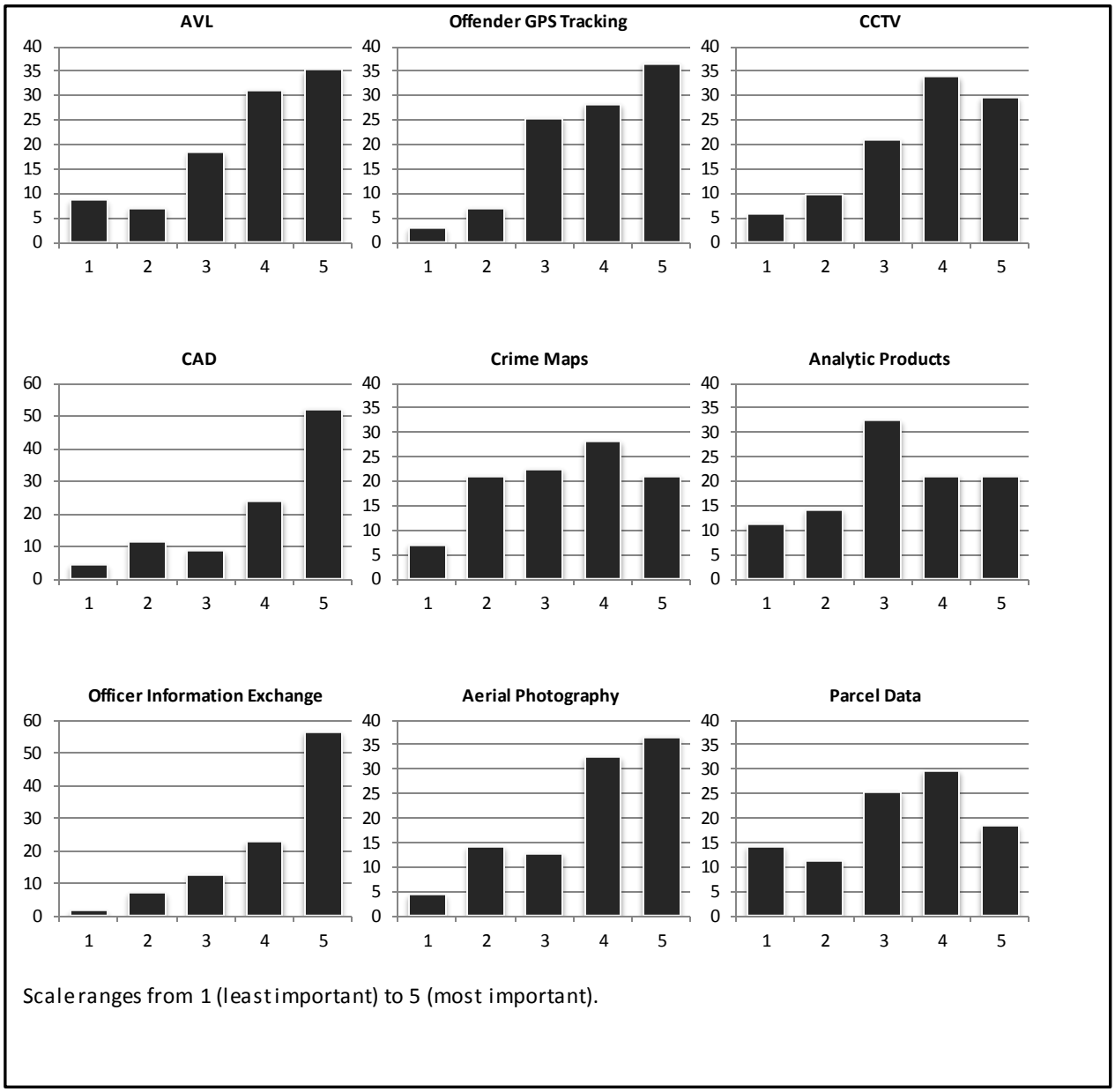
Users were asked to select the feature of the device that they thought would be most useful to their work assignment. The ability to make voice calls was selected as the single most useful feature by the most respondents. The ability to access the internet ranked a close second. Figure 7 displays the feature that respondents thought would be most useful.

Figure 7: Most useful aspect of having an iPhone



Perhaps the most important aspect of the exploratory survey was the assessment of the respondents' perspectives on the most important aspects and features of the iPhone, and what would be helpful to include as part of a law enforcement specific application. The survey asked officers to indicate the importance of nine different specific features for law enforcement activities. This list of potential features was generated by the technical working group and the advisory board. These nine specific features were: officer information exchange, computer aided dispatch (CAD), spatially referenced crime data, orthophotography, land use and parcel data, automatic vehicle locator (AVL) data, active GPS offender tracking, closed-circuit television monitoring, and data and analyses prepared by crime analysts. In general, most users thought that most of the possible features would be useful in law enforcement. Figure 8 displays the perceived importance of having access to various data elements via the iPhone.

Figure 8: Perceived Importance of Data Elements



Conclusions from the Exploratory Survey

The exploratory survey indicates that there is already a high level of receptivity to the use of smart phones in the Redlands Police Department. Most people reported themselves as having intermediate or higher skills with using the iPhone. It also indicated that there are multiple

perspectives on the use and role of the iPhone in police work within the department. Furthermore, most respondents indicated that they would be willing to provide their department issued cell phone number to a member of the public. This has potentially positive implications for the ability of the Department to connect with members of the public. The survey solicited excellent feedback from future end-users on specific features they would like to see from the apps being developed. If the responses to the potential data list are any indication, users desire access to a range of datasets covering a broad spectrum of topics and sophistication levels.

Advisory Board

The advisory board was developed with the goal of providing guidance on the development of the application. Specifically, the board was comprised of researchers knowledgeable in the field of policing and crime prevention. Thus, the role of the advisory board was not to provide technical input on the coding of the application, but rather to ground the application in evidence-based crime policy. As such, the board's primary focus was on what kind of data would be available to the officer via the app and how those data could be used to facilitate crime prevention. The advisory board meeting had four goals:

- Provide recommendations on features that should be included in the app
- Construct theories or rationales behind application features
- Clearly define the expected effects
- Define outcomes that could measure the expected effects

The advisory board was convened on February 9th, 2011 in San Diego, CA. In attendance from George Mason University were Dr. David Weisburd, Dr. Cynthia Lum, Dr. Charlotte Gill, and

David McClure. From the Redlands Police Department were Jim Bueermann, Dr. Travis Taniguchi, and Philip Mielke. From Temple University was Dr. Elizabeth Groff. The Omega Group was represented by Milan Mueller, Bruce Sylva, and Pericles Haleftiras. Contact information for the advisory board attendees can be found in Appendix 2.

The advisory board began with a presentation made by The Omega Group on the preliminary direction of the software development and detailed key application functionality. The results of the participant survey (detailed above) were then presented. The presentation made by The Omega Group can be found in Appendix 3.

The advisory board discussed the ability of the app to reinforce existing departmental priorities and evidenced based practices. For example, the social network module could be an excellent method for facilitating problem-oriented policing. The NearMe module can be used to focus the user on small areas and thereby reinforce the hotspots approach adopted by the department.

The advisory board also discussed aspects of officer safety in regards to the use of mobile devices while on patrol. It was suggested that mobile technology may prove detrimental to an officer's situational awareness. In other words, officers may be more focused on their phones than on other potentially dangerous situations. This possibility was acknowledged and it was agreed that the final report would include a component on officer safety issues.

One key contribution of the advisory board was identifying the need to more clearly articulate the outcomes that would be assessed during the final phase of the project. The implementation assessment can be divided into three components: officer survey data, use data, and official recorded crime and activity data. Officer survey data will provide critical insight

into application performance and creating a future features list. Potential outcome measures include:

- User feedback on application performance and reliability
- User ideas on future app modules that could be useful in the context of law enforcement
- Attempt to determine if users felt the app provided information that was valuable to their work assignment
- Determine any changes that should be made to the user interface or application defaults

System measures and use data will provide insight into how often the application and device was utilized. These measures include:

- The number of field interviews (FI) completed via the application
- The ratio of FIs completed via the app module versus the traditional paper method
- The time until FIs are available to other officers through the system
- The number of times the NearMe app module (detailed in a later section) is utilized
- The amount of time spent using the app
- The types of data accessed through the NearMe app module

Additionally, traditional measures of officer activity will also be considered:

- Crime trends and patterns
- Number of FIs and traffic stops conducted
- Change in time spent on calls

Conclusions from the Advisory Board

The advisory board was critical in helping to identify the need for performance measures that will be used to assess the performance of the project. Furthermore, the advisory board identified the need to approach application performance from a variety of perspectives including user experience, technical performance, and actual crime and activity measures. This multifaceted approach to program evaluation will ensure that the program is assessed on all relevant dimensions.

User Working Group

The user working group (UWG) was arranged to discuss specific app features with end-users. The UWG was comprised of three officers and one corporal: two were assigned to patrol, one was assigned to traffic, and one was assigned to investigations. The group discussion was led by one member from the RPD research team and one member from the GMU research staff. The meeting began with a presentation of the results from the needs assessment survey. Each application module (NearMe, FI, Officer Information Exchange, and CAD) was discussed in turn. The UWG lasted approximately 2.5 hours.

The goal of the UWG was to solicit feedback on the application mockups while there was still time to make changes to the application. Users were selected because they had been active participants in many of the Department's previous efforts at maximizing the utility of mobile devices for law enforcement use. The research team solicited feedback on the various aspects of the app. Other potential features that would be useful to law enforcement were also discussed.

Conclusions from the User Working Group

General comments from the meeting are summarized below.

- There exists a need to have a method of easily sharing anecdotes involving the innovative uses of the devices. In response we have established an email list where users can share innovative uses of their mobile phones.
- A good deal of time was spent discussing the application deployment, training, and evaluation component. Users were asked to provide feedback on the proposed project design. One participant suggested that it would be best to present the multi-wave implementation to the officers as "we are developing this new app, we are trying to make it better, and we are giving it to you for a three-month-trial-period," rather than we are going to give it to you and then take it away from you to give it to other people. One implication of these suggestions is that the assignment, to either the treatment or control group, would need to be blocked along patrol teams and organizational units. Otherwise, it would be necessary to explain to the team why some are getting it and others aren't, and the rules for how they are allowed to interact with those who do/don't have the app.
- Scenario-based training for each module would be a useful way of instructing officers on the application features. The group thought that the best method of doing so would be to train a few officers and have them present to the rest of the users. This training would clarify both the utility of the app as well as the actual operation.
- A number of potential outcome measures were discussed in relation to the use of the FI module. These include tracking the number of FIs completed, the quantity of data associated with the submitted FIs, and the presence of photos in the FI reports.

FI Module

- The group requested the ability to add multiple photos to an FI including front and side profile, tattoo, and identifying scar images. Users should therefore have the ability to include multiple photos when completing an FI.
- The app should have the ability to add new address information to existing contacts in the database without deleting the existing contact information. In order to maintain the integrity of the dataset the app will need to append data to any existing contact rather than replacing existing data.
- Users suggested that there should be an open-ended comments field at the end of each FI section (e.g. contact information, vehicle information). This will allow them to include other relevant information that may not be adequately captured by existing data fields.
- Any flags that exist in the system should display when the user pulls up that individual's record. For example, if someone is flagged as being combative with officers that flag should be displayed to the user.
- Several data fields will contain enumerated data selection options. These data fields will only allow the user to input specific values. This type of selection process works best for data fields with limited options such as gender, hair color, and eye color. The group thought this would be a good way of reducing the amount of time it takes to complete an FI while also improving the integrity and consistency of the data.
- It was determined that additional data fields should be included. The group specifically requested that a section be added for scars, tattoos, California Department of Correction (CDC) number, and bike serial number. Users also requested a field

clarification by including an indication of what kind of phone number was being entered (e.g. cell, work, or home).

- The amount of data required before a FI could be considered complete and eligible for submission through the app was discussed. The group determined that an FI must, at a minimum, contain completed personal contact information and location data. Other data fields, while useful, are not consistently applicable and should not be required in order to submit the FI.

NearMe

- The group thought that this module would be an excellent way of fostering the idea of the decentralized crime analyst. This approach places the role of routine crime analysis into the hands of each individual officer. This has two benefits. First, it allows the officer to make decisions based on the most current data available. The officer does not have to wait weeks or even days before having access to crime records. Second, the decentralized crime analyst approach frees the time of the fulltime crime analyst to do more comprehensive evaluation and crime analysis.
- The group felt that the key to making this app successful would be to make it as simple as possible. Working with the developers, we have constructed several pre-defined queries that will allow the user to quickly and easily select the most common event types, date ranges, and time slices.
- The group provided several examples of where this feature would be useful. These examples will be incorporated into training scenarios used when demonstrating the app to users.

Officer Information Exchange

- The group came up with several scenarios in the recent past in which this type of utility would be useful. For example, during a recent pursuit, an officer followed an individual to a location over 50 miles away. The officer was receiving a great deal of information that he needed to communicate to his team, but he was having a lot of trouble entering each recipient individually for each text and email that he needed to send. Eventually, he started sending the information to just one person who was then responsible for relaying that information to the other people on the team. The ability to create pre-specified groups of recipients, provided by this app feature, would have made that sort of communication much easier for the individual officer. The group thought that this would be particularly helpful in investigations or critical incidents where an officer was trying to share information with a group of people.
- The group expressed a desire for the ability to create temporary work groups. These groups would only persist as long as they were needed. Once the group had completed its function all the data associated with the group would be deleted.

Computer Aided Dispatch (CAD)

- The group had mixed opinions on the utility of having the CAD system available via their mobile devices. Some thought that the access would be largely redundant because they already have access to it via the mobile data computers (MDC) located in patrol cars. However, a number of legitimate use cases were presented. Many officers, such as detectives and narcotics, do not drive marked units and therefore do not have access to vehicle mounted MDCs. These officers could greatly benefit from the ability to access the CAD system, especially in the discreet manner made possible by a smart phone.

- The group was interested in the ability to have two-way communication with the CAD system. For example, it would be useful if an officer could close out a call or add comments directly from the application. We are working with the developers to determine the feasibility of two-way communication through the app.

Additional Features

- Users expressed a desire to have the ability to create flyers, such as missing persons or runaway juveniles, directly from their devices. They reported that this would save considerable time over returning to a computer and creating the flyer the traditional way. We have begun to explore the feasibility of creating another application with this functionality.

The UWG generated a number of actionable suggestions. First, as part of the evaluation component of this project, we will track the number of completed FIs over time. Furthermore, assuming that some officers will continue to use traditional paper FIs, we will track the time between when an FI is completed and when it is available through the records management system (RMS). Second, we will create an email list where participants can report stories of successful or innovative use of the iPhone; we will send periodic reminders to participants that they should use this email list to report these events. Third, scenario based training will be developed for the app modules. Fourth, we will explore the possibility of using the iPhone as a platform to create flyers. Finally, consistent with suggestions from the advisory board, we will examine the feasibility of conducting the experimental blocking along patrol teams.

Technical Working Group

The technical working group (TWG) was comprised of software developers from Omega as well systems specialist within the RPD and the City of Redlands. The technical working group was responsible for determining how data would be served securely and how a two-way flow of data could be achieved while maintaining the integrity of the underlying databases. The TWG identified a number of issues that needed to be resolved before developing the actual application. These issues mostly revolved around how data could be created and transmitted in a way that maintained the overall integrity of the backend database.

Conclusions from the TWG

- The ability to serve data to the devices while maintaining security protocols must be a top priority. The TWG has identified the need for additional hardware not originally envisioned at the outset of this project. This server will host the spatial data layers that the application will need to access. This server will reside in the demilitarized zone (DMZ) outside the RPD's firewall. The RPD will work closely with the software developers to ensure that appropriate connection security is maintained.
- Users should not be able to create new FI records without validating against existing records. Users should be required to first search for existing records within the database and, only if no existing record exists, create a new entry. Within the existing system this function occurs when the records clerk enters the FI into the system. This app module removes that validation; therefore the user must be responsible for maintaining the integrity of the database. Failing to validate against existing records would create duplicate records for individuals.

- The user must have the ability to attach and upload multiple photos when completing FIs. Multiple photos are needed to capture front and profile images, tattoos, and scars.
- When creating and uploading FIs the app must receive two confirmations. One would indicate that the event has been sent to the server and a second sent by the server that confirms it has been received. Once this client-server handshake has been validated the event can be removed from the device.
- Queries performed using the NearMe module should have pre-defined settings as well as defaults. These predefined queries will cover the selection of common incident types (e.g. UCR part one violent crimes), common date ranges (e.g. last seven days) and common hour slices (e.g. dayshift from 0600-1800). These defaults will streamline the user's decision making and increase the speed at which they can conduct routine crime analysis.
- Memory management in the NearMe mapping modules will need to be closely monitored to ensure application and device stability. This will entail adjusting the amount of cached map data that is stored on the device.
- The user working group identified a number of additional data fields that could be captured via the FI app module. These additional data fields do not exist in the current database schema. It will be necessary to ensure that the data coming out of the FI app module be mapped to the existing data schema of the RPD's database. We will work closely with the application developers in order to ensure that this can occur. The most cost effective solution would be to concatenate a number of fields together and map them to the "notes" field in the existing databases.

Key Application Functionality

Taking the information from these sources (participant surveys, advisory board, users working group, and the technical working group), four key functionalities for the application were identified. Broadly speaking these revolve around providing information to officers and creating new intelligence from officers in the field. These modules have been labeled as Field Reporting, NearMe, Officer Information Exchange, and Computer Aided Dispatch (CAD). These applications will reside within an application launcher framework. The application launcher will operate as the central repository for the modules that will be developed. Users will access the application launcher to open and access the other modules under development. A security login requirement will be implemented to ensure that only authorized users access the application modules.

Field Reporting

Field interview (FI) cards are frequently collected by law enforcement officers. FIs are gene rally created as part of a traffic stop, pedestrian stop, or other interactions between law enforcement and the public. The basic premise is to collect contact information and other pertinent details (e.g. vehicle description, tattoos, etc.) about an individual. Within the RPD, FIs are filed on paper note cards and then submitted to the Records Department. From there a records clerk must enter these data into the records management system (RMS). The Field Reporting module will provide officers the ability to directly enter field interviews into the RMS. This reduces the amount of work necessary to get FIs into the RMS while also decreasing the delay between when FIs are created and when they are available to other officers.

NearMe

The NearMe module will allow the user to view various spatial datasets made available through the spatial data warehouse (a server running ArcGIS Server). The NearMe module will map these events and allow the user to have easy access to spatial data such as calls for service, crime incidents, and arrests. The ability to view crime in such a highly mobile manner may allow officers to more quickly observe crime trends and patterns.

Based on discussions within the TWG, the NearMe module will perform spatial filtering following the current map extent. This means that only events within the current map view will be queried and displayed. This reduces bandwidth and improves application performance. Additionally, stored queries, also known as "queries on demand," will be predefined and allow users to quickly search for the most relevant events without having to define the search terms each time they use the module. Events found on the map extent will also be available via a table view to facilitate further investigation.

Officer Information Exchange

The Officer Information Exchange module is designed to facilitate unstructured text-based interaction between application users. For example, an *ad hoc* group can be formed whenever a patrol team begins their shift allowing team members to quickly disseminate information when necessary. An existing social network API (Socialtext) will be used (The Omega Group maintains an appliance with Socialtext). The Socialtext API supports group blogging and micro-blog capabilities.

Computer Aided Dispatch (CAD)

Computer Aided Dispatch systems are nearly ubiquitous throughout modern police departments. CAD systems have traditionally been deployed via traditional computer systems

usually mounted in a vehicle. The CAD module aims to make the data available through the CAD system available via the mobile phone. The CAD module will be a web-portal that accesses a separate application provided by Spillman Inc., the RPD's CAD vendor. This separate application was purchased by the Department without grant funding. The first version of this system that the RPD will deploy will be read-only. The user will be able to see active calls for service as well as perform searches on in-house databases. The user will not, however, be able to directly edit anything from this system. It is understood that editing and two-way communication will become available at a later date.

Conclusion

This needs assessment was done through four phases: a user survey, an advisory board meeting, a user working group, and a technical working group. Using this multi-method approach provided a firm foundation on which the application and its various modules could be constructed. The user survey identified key application elements that could be developed. The advisory board helped to frame the application within the available research and developed metrics through which performance of the application could be measured. The user working group created scenarios for training users on how to best utilize the application. The technical working group identified potential security and app stability issues that need to be addressed before the application is deployed. This process identified a number of apps that would be useful to law enforcement personnel. These apps will help to facilitate a two-way flow of information between users.

Appendices

Appendix 1: Survey instrument

The survey instrument can be found on page 129 of this document.

Appendix 2: Advisory Board Participants

The advisory board on the development of the iPhone application was held in San Diego, CA on February 9, 2011. The following people were in attendance (ordered by institution):

George Mason University (4400 University Drive MS 6D3, Fairfax VA 22030)

- David Weisburd, PhD, Distinguished Professor, Department of Criminology, Law and Society
- Cynthia Lum, PhD, Assistant Professor, Department of Criminology, Law and Society
- Charlotte Gill, PhD, Post-Doctoral Fellow, Department of Criminology, Law and Society
- David McClure, Graduate Research Assistant, Department of Criminology, Law and Society

Redlands Police Department (30 Cajon St, Redlands CA 92373)

- Jim Bueermann, Chief of Police
- Travis Taniguchi, PhD, Criminologist
- Philip Mielke, GIS Supervisor

Temple University (1115 Polett Walk, Philadelphia PA 19122)

- Elizabeth Groff, PhD, Assistant Professor, Department of Criminal Justice

The Omega Group (5160 Carroll Canyon Rd, San Diego, CA 92121)

- Milan Mueller, President
- Bruce Sylva, Director of Software Applications Research
- Pericles Haleftiras, Strategic Business Development

Appendix 3: Omega's Advisory Board Presentation Slides

Objective

The objective of Omega's contribution to the Redlands PD NIJ project is the creation of a geospatial mapping and analysis application framework that is compatible with the operating environments of mobile and handheld computing devices.

This project will specifically target the iPhone although the fundamentals of the approach and server side tools can extend to other mobile devices.

THE OMEGA GROUP BUILDING SAFER COMMUNITIES

Goals

- Provide ability for the mobile user to interact with a variety of useful spatial data.
- Design an application launch app for the iPhone for easy access to the applications created as part of this project.
- Include 3rd party tools where appropriate to meet the needs determined.

THE OMEGA GROUP BUILDING SAFER COMMUNITIES

Applications

- Application Launch
- NearMe
- Field Reporting
- CAD Incident
- Officer Information Exchange

THE OMEGA GROUP BUILDING SAFER COMMUNITIES

App Launcher

- Home base for mobile users
- Security interface login screen
- Application launching point
- Links to 3rd party applications

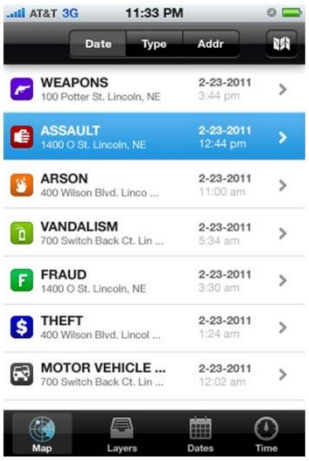
THE OMEGA GROUP BUILDING SAFER COMMUNITIES

NearMe

- View crime layers in map on mobile device:
  (Incidents, Persons, FIs, Citations, Collisions)
- Locate activity near the user
- Select stored query(s) to filter the data layers
- Configure individual date and time ranges
- Identify (map tip), list crimes, get more information
- Navigation tools, bookmarks
- Simple interface for ease of use

THE OMEGA GROUP BUILDING SAFER COMMUNITIES

NearMe



THE OMEGA GROUP BUILDING SAFER COMMUNITIES

Field Reporting

- Create new FI entries from iPhone
- Use existing (search) or add new name record
- Match the Spillman data fields
- Include GPS coordinate
- Optionally add photos
- CALGANG designation flag
- Required RPD data flow through Spillman

THE OMEGA GROUP BUILDING SAFER COMMUNITIES

CAD Incident

- Simple CFS feed for mobile users
- Spillman Touch 3rd party application
- Potential to query and edit data
- Includes its own security

THE OMEGA GROUP BUILDING SAFER COMMUNITIES

Officer Information Exchange

- Provides two-way flow of unstructured information between officers and headquarters
- Based upon existing and tested social interaction software service (Socialtext)
- Ad-hoc group creation for special projects
- Twitter-like micro-blogging
- Workspace sharing

THE OMEGA GROUP BUILDING SAFER COMMUNITIES

REST Endpoints

- REST endpoints will be used for data accessibility behind the user apps
- GeoRSS may be used as data sharing method for spatially enabled data

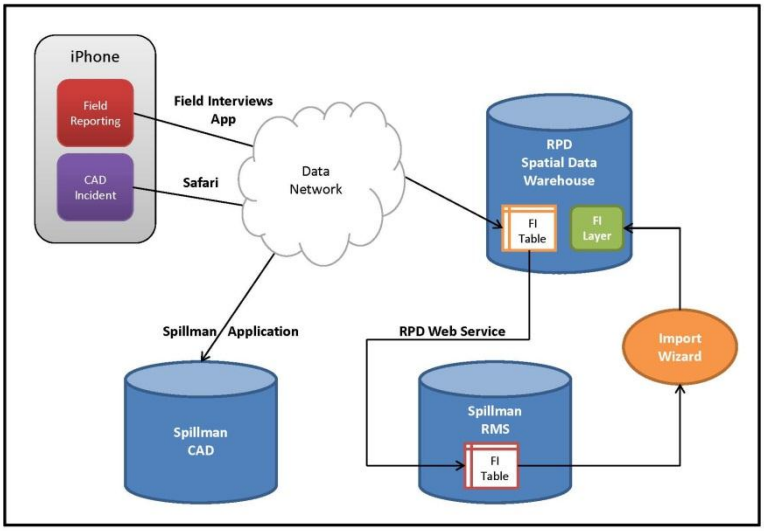
THE OMEGA GROUP BUILDING SAFER COMMUNITIES

Base map services

- Base map data will rely on map caches from RPD
- Geocoding services will use RPD locators

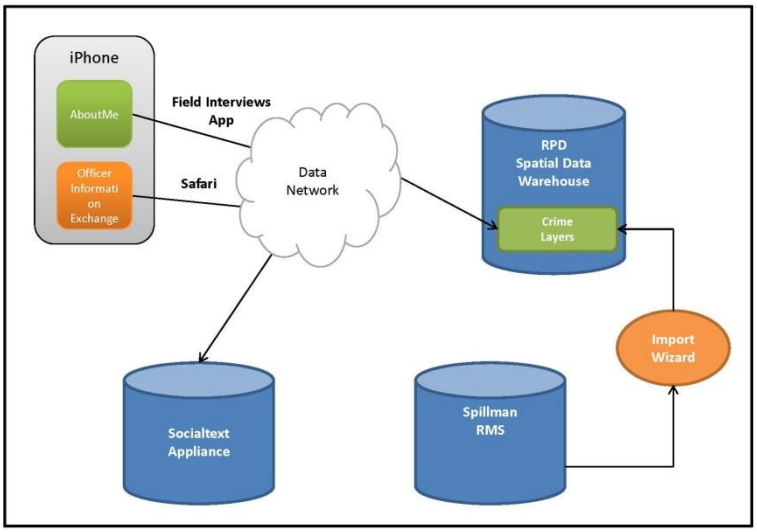
THE OMEGA GROUP BUILDING SAFER COMMUNITIES

Field Interviews and CAD Incident Data Flow Processes



THE OMEGA GROUP BUILDING SAFER COMMUNITIES

NearMe and Officer Information Exchange Data Flow Processes



THE OMEGA GROUP BUILDING SAFER COMMUNITIES

V. User Manual- NearMe

This document is available online at: policefoundation.org/2010-DE-BX-K006

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Chief of Police

REDLANDS POLICE DEPARTMENT NEAR ME APPLICATION

User Manual

This project was supported by Award No. 2010-DE-BX-K006, awarded by the National Institute of Justice, Office of Justice Programs, U.S. Department of Justice.

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I. Application Setup

1. Launch Application

- Enter your User Name and Password. This is the same user name and password you use to access your department email.

2. Create Pass Code

- Enter a four-digit pass code. Reenter the code to confirm. You will be prompted to enter this code each time you launch the application and after 15 minutes of inactivity.

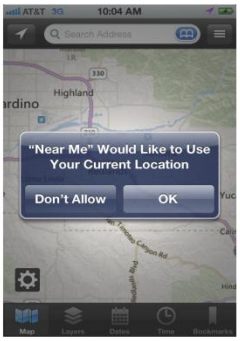
3. Home Screen

- The home screen will start-up with a map of Redlands, several location options on the top menu bar, and a tool bar on the bottom of the screen that can be used to customize the map.

II. Map Extent

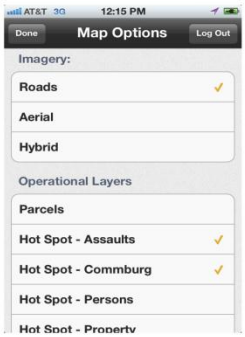
1. Location Settings

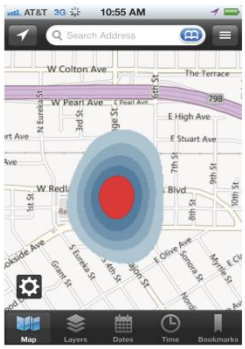
- The location information can be manually entered into the search bar on the top of the screen or you can use your current location by tapping the arrow in the top left corner of the screen. If you ping your location, tap "OK" when asked if Near Me can use your location. You can also use locations from your address book by tapping the blue address book button in the search bar and selecting a contact.



2. Settings Option

- To select the style of map (e.g. Roads, Aerial, or Hybrid) or operational layers (e.g Parcels, Hot Spots), tap the settings button on the bottom left of the page. Selecting the hot spot operational layers will display pre-defined hot spot maps based on events from the last 90 days.

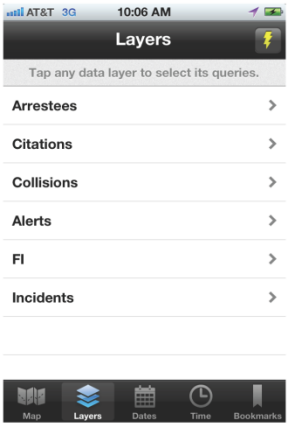


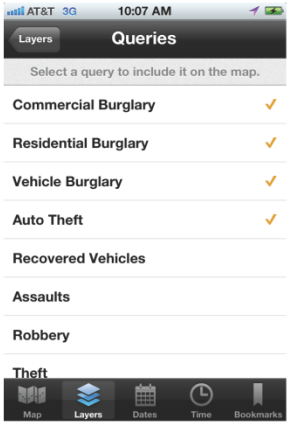


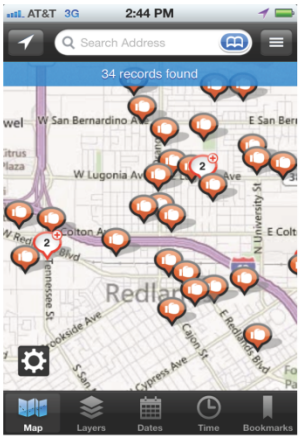
III. Layers

1. Layers Function

- The layers tab on the tool bar is used to select the arrestees, citations, collisions, alerts, F.I.'s, or incidents. Select one of these categories on the screen and select which sub-groups within the category you want displayed. You may need to edit the date/time setting before these events will be populate the map.



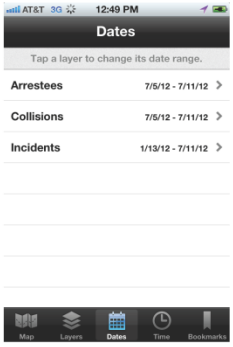


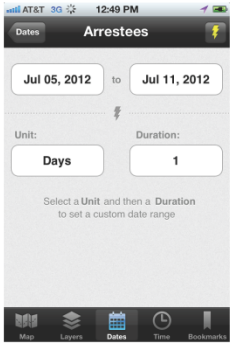


IV. Dates

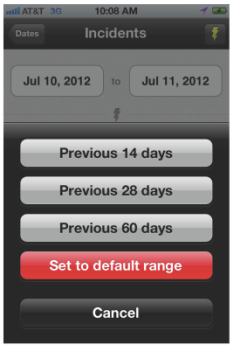
1. Dates Function

- The “Dates” tab on the toolbar will allow you to set a date range for the layers. Different date ranges can be specified for each event type. To do so, select the layer you would like to change. For convenience, several pre-defined date ranges have been created.





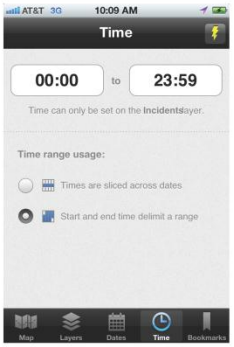
- The yellow lightning bolt to the top right of the screen is equipped with four options that can be used to automatically set the date to the previous 14 days, 28 days, or 60 days.



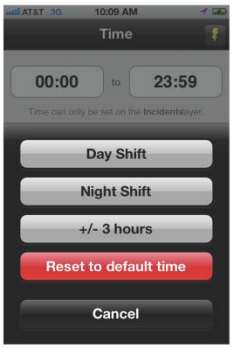
V. Time

1. Time Function

- The “Time” tab on the toolbar is only used for the incidents layer. To set the time, tap on the times and use the scrolling function to select the time range of the incidents you would like to appear on the map. There are two options on the screen under the heading “Time range usage.” The option “times are sliced across dates” will apply the selected times to each day within the date range. The option “Start and end time delimit a range” will apply the selected times to the start and end date selected in the date range.



- The yellow lightning bolt in the top right of the screen is equipped with four shortcuts that can be used to set the time window to day shift, night shift, or +/- 3 hours from the current time.



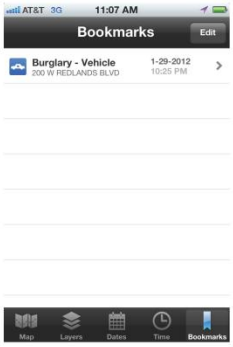
VI. Queries / Bookmarks

1. Viewing Queries

- To view details about a specific event tap on the icon then tap the blue arrow. The details screen will be displayed. The arrow in the top right of the screen can be used to “share” or “bookmark” this query.

2. Bookmarks

- Tapping the “Bookmarks” tab located on the far right side of the toolbar will access events that have been bookmarked previously.



VI. User Manual- Field Interview

This document is available online at: policefoundation.org/2010-DE-BX-K006

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REDLANDS POLICE DEPARTMENT FIELD INTERVIEW APP

User Manual

This project was supported by Award No. 2010-DE-BX-K006, awarded by the National Institute of Justice, Office of Justice Programs, U.S. Department of Justice.

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I. Launching & Registration

1. Launch App

- Enter User Name and Password. Your user name and password are the same as those you use to access your department email.

2. Register

- To register the app, enter your First Name, Last Name, and Officer Code (Employee Identification number).

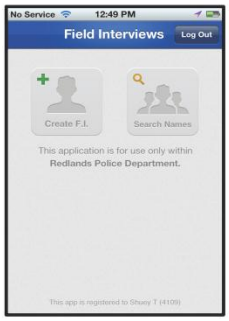
3. Create Pass Code

- Enter a four digit pass code. Re-enter the code to confirm. You will be prompted to enter this code each time you launch the app.

II. Field Interview Creation

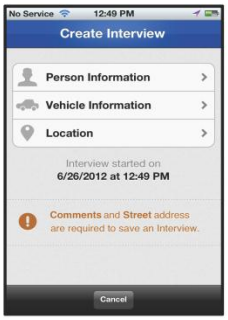
4. Create F.I. / Search Names Options

- To create a new field interview, select the "Create F.I." function.



5. Create Interview

- The app will prompt you to select the type of information you would like to enter: person, vehicle, or location information.



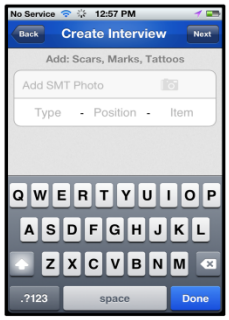
III. Person Information

6. Enter Person Information

- To enter person information, tap on the field you would like to edit and either type the information or select an option from the scrolling menu. After completing the page, tap "next" in the top right corner to proceed to the next field.

7. Capturing Photos

- Throughout the field interview, there will be opportunities to add photos. If present, tap the camera icon on the screen to add a photo.



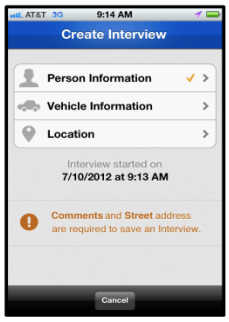
8. Person Information Completion

- **Comments must be entered in this section.** The app will not allow you to complete the field interview without entering notes in this field. Tapping "Done" will take you back to the Create Interview screen.

IV. Vehicle Information

9. Vehicle Information

- Tap "Vehicle Information" on the create interview screen.



10. Enter Vehicle Information

- To enter vehicle information, tap on the field you would like to edit and either type the information or select an option from the scrolling menu. After completing the page tap next in the top right corner to proceed to the next information field.

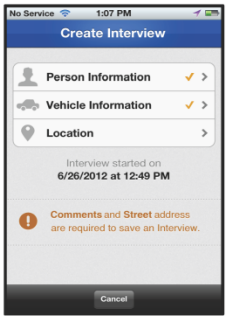
11. Vehicle Information Completion

- The last page will allow you to enter comments about the vehicle. After entering any comments tap "Done" in the top right corner to complete this section.

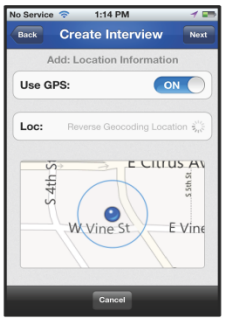
V. Location Information

12. Location Information

- Location information must be added to the field interview. Tap "Location" on the Create Interview screen to begin.

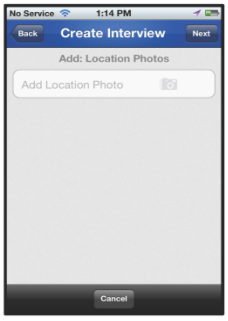


13. Enter Location Information



- Location information can be entered manually or captured automatically by the device's GPS. Switching the "Use GPS" option from off to on will automatically enter the current location. If GPS is unavailable or incorrect turn the GPS slider to "Off" and enter the address manually. Once an address is entered tap "Next".

14. Enter Location Photo



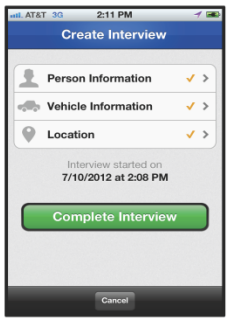
- After tapping "Next", the app will provide the option to add a location photo. To do so, tap the camera icon.

15. Location Information Completion

- The last page provides space for location comments. After entering any comments select “done” in the top right corner to complete this section.

16. Complete Field Interview

- After all sections have been completed, the submission process can be started. To do so, tap “Complete Interview.”

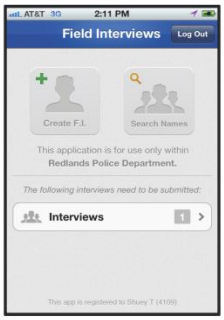


To complete a field interview you must enter information in the “Comments” section of “Person Information” and enter a location in the “Location” section.

VI. Complete & Submit Interview

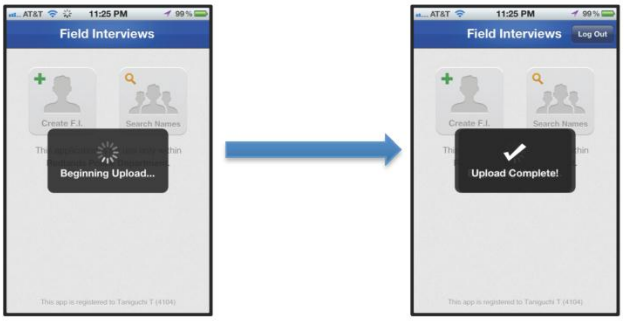
17. Review Interviews

- After all FI data has been entered the app will send you back to the "Create F.I. / Search Names" page. On the bottom of the page will be an "Interviews" button followed by the number of interviews awaiting submission. To submit these interviews tap "Interviews".



18. Final Submission

- To complete the submission process tap "Submit All Interviews." To submit, edit, or delete just a single interview, tap on that specific interview. Once you tap "Submit All Interviews" two status messages will be displayed. The time between "Beginning Upload" And "Upload Complete" will depend on the amount of photos taken and the type/strength of data connection.

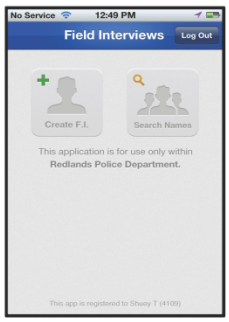


Uploading FIs over Wi-Fi is recommended but not required. Uploading over 3G data may take a considerable amount of time. **You must leave the app running during the upload process.** The app cannot be backgrounded or closed during the upload. Backgrounding the app will close the connection and require you to restart the upload process the next time you open the app.

VII. Search Names Function

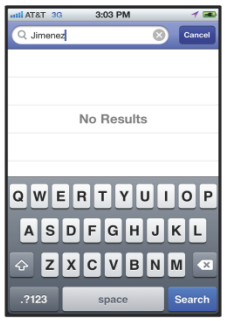
19. Search Names

- The "Search Names" function can be used to search existing records in Spillman that, if selected, will populate known details of a subject. To use this function, select the "Search Names" option.



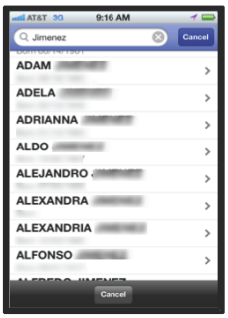
20. Begin Search

- To begin the search type the subjects name into the search bar on the top of the screen and press "search."



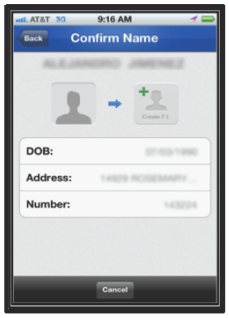
21. Name Selection

- After the search is completed, the names matching your search will appear on the screen. Tap on a name to select it.



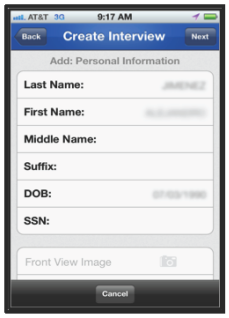
22. Confirm Name

- The app will request that you confirm the name you have selected. If this is not the correct individual select the back button to choose a different name. If this is the name you would like to prepopulate the field interview with, tap “Create F.I.”.



23. Create Interview

- You can edit any of the data that has been prepopulated. You must still enter notes in the “Comments” section of the “Person Information” field.



VII. FAQ

What information must be entered before a FI can be completed?

You must enter comments in the person section and a location before an FI can be marked as complete and queued for upload.

Where can photos be attached to an FI?

- Person information: Front view, profile view, and scars, marks, and tattoos.
- Vehicle Information: Vehicle description
- Location: Location description

What happens if an upload is interrupted?

When a FI is queued for upload the app sends a manifest to the server that lists all the data that needs to be uploaded. The app then starts transmitting data to the server. If the upload is interrupted for any reason the app will retain the FI data. When a connection is reestablished it will begin the upload process again. Data are deleted off the device only if the server confirms that all the data in the manifest have been received by the server.

When are the FIs removed from my device?

FIs are removed from the device under four conditions. First, a user may manually delete an FI. Second, a FI is deleted from the device after it has been successfully uploaded to the server. Third, if the user logs out of the app any queued FI data will be cleared. Fourth, if the app is deleted from the device all saved FI data will be purged.

How can I keep FIs stored on my device?

Once an FI is submitted the data are removed from the device. The decision to remove locally stored data from the device was made in the interest of data security. Removing the locally stored data removes one potential failure point in the security architecture of the app.

How long will it take to upload a FI?

The amount of time it takes to upload an FI will depend on two factors: (1) the number of photos attached to the FI and (2) the strength and status of the device's data connection. If you have relatively few pictures an upload should take no more than a few seconds, even over 3G data service. If the FI has many pictures the upload can take several minutes. If you create an FI with many pictures it is recommended that you queue the FIs until you can connect to a high speed Wi-Fi network.

How is security handled?

Security on mobile devices must be addressed at three stages: (1) device security, (2) data at rest, and (3) data in transit. We have taken a multifaceted approach to address these issues. First, only devices that are enrolled in MobileIron are capable of downloading and installing the application. This requirement ensures that at least basic security is enforced on the device. Second, the app has been designed with a number of security features. Users are required to authenticate with their department credentials the first time using the app. After that the app will prompt the user for a four digit

passcode. This passcode must be entered after 15 minutes of inactivity. Data transmissions are secured by a token-based authentication system. This token-based system both authenticates the user and establishes a secure data connection with the ArcGIS server that handles the back-end data.

VII. User Manual- Flyers

This document is available online at: policefoundation.org/2010-DE-BX-K006

25 June 2013

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REDLANDS POLICE DEPARTMENT- FLYERS

User Manual

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II. Creating Flyer/Case Info 4
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IV. Summary/Description/Highlight 7
V. Preview and Distribution 8

I. Downloading the Application

Launch Apps@Work.

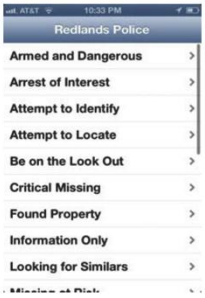
Tap on "Flyer Maker."

Tap on "Request." A dialog box will appear requesting to proceed with the installation. Tap "Install" to continue. The application will automatically appear on your home screen. *NOTE*: If notification of "Unable to Download Application" pops up, continue to press "Retry" until download begins.

II. Creating Flyer/Case Info

1. Creating Flyer

    - The Flyer home screen prompts you to select the type of flyer that will be created. Begin by selecting the flyer type.



2. Case Info

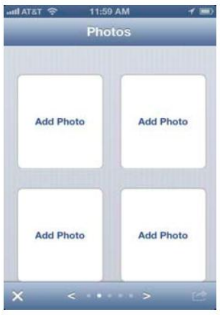
    - After selecting the flyer type, enter case info. Enter information by tapping in the field and typing. Officer information is also collected at this point. This information is persistent across flyers so you should only need to enter this information the first time the app is used.

NOTE: To navigate to the next screen either tap the arrows at the bottom of the screen or swipe left or right.

III. Photos

3. Photos

- The next screen allows you to add photos to the flyer. To add a photo tap one of the "Add Photo" boxes then select the type of photo you would like to include.



4. Entering Photo Info

- The next screen will allow you to add the photo and enter photo information. To add a photo, tap the "Add Photo" field. Select either "Take Photo" or "Choose Existing Photo."

5. Edit or Clear Photo

- To manage photos, tap on the photo you wish to alter. Tap edit to change the photo or any information entered or tap clear to delete the photo.

Repeat steps 3-5 to add additional photos.

Person of Interest fields:

- Name
- Alias
- Date of birth
- Last known address
- Driver's license
- Gender
- Ethnicity
- Hair
- Eyes
- Height
- Weight
- Clothes
- Warrant number
- Bail amount
- Other

Vehicle information fields:

- Make
- Model
- Year
- Type
- Plate
- Color
- Other

Item photo information fields:

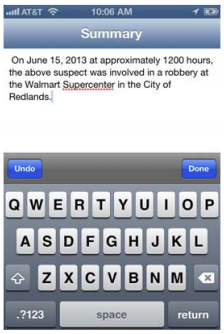
- Object type
- Location
- Description

General (no additional data fields are given)

IV. Summary/Description/Highlight

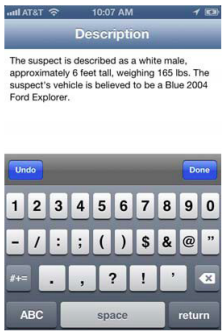
6. Summary

- Swipe or navigate to the next screen to enter summary case information. To bring up the keyboard, tap into the white area.



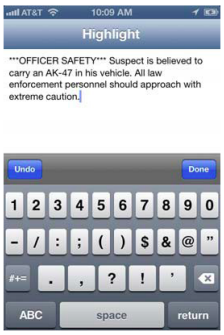
7. Description

- The next screen allows for a full description of person(s), item(s), or event(s) involved in the case. To enter text, tap into the white area.



8. Highlight

- The next screen will allow for entry of any information that warrants highlighting (such as officer safety concerns). The information entered in this field will be placed in a special highlight box at the bottom of the document.



V. Preview and Distribution

9. Preview

- After completing the desired fields, preview the completed flyer by tapping the arrow in the bottom right corner. If you are not satisfied with the completed flyer, tap edit in the bottom left corner to return to the flyer editor.

10. Completion

- If you are satisfied with the completed flyer, tap the email button in the bottom right corner. An email will generate with the flyer attached, ready to be sent to the desired recipients.

VIII. Technical Documentation- Server Architecture & Web Applications

Overview
The mobile applications receive and send data to custom web services installed on RPD's demilitarized zone (DMZ). Each app has its own set of web services. The Near Me application uses the Omega GeoEngine web services and the Field Interviews application uses the Omega Field Interview Engine web services.

Security
SSL (Secure Sockets Layer) protocol is used for device access to the crime and person data over the public internet in order to ensure a secure connection. This is the same protocol used by banking systems for customer access to their private banking data.

The use of agency LDAP is highly recommended, assuming it can be made available. Alternatively SQL Server based authentication can be used.

An inactivity (time out) period is to be configured by the agency. Inactivity is determined by a lack of HTTP requests from the app to the server. Server requests are made for data, map cache tiles and operational layers.

Omega GeoEngine and Field Interview Engine Web Services
The Engine web services reside in an ASP.NET web application. Each web application has an XML configuration file that is used to set database table locations, geocoding services, available base map layers, operational layers, authentication services, LDAP servers, and more . The XML configuration can be edited by hand if needed without having to recompile the mobile application; however it is recommended that Omega's configuration building tool be used to edit these documents.

Omega GeoEngine
The Omega GeoEngine is responsible for providing the NearMe mobile application with its data. Access to the database for this application is read-only. The GeoEngine exposes web services for the following functions:

- Search map extent for records
- Get record details
- Search for address
- Get map layers
- Authenticate User
- Kill User's Session
- Validate User's Session

Omega Field Interview Engine
The Omega Field Interview Engine is responsible for providing the Field Interview application with its data and for storing the interview data recorded by the officer through the mobile app. The Field Interview Engine exposes web services for the following functions:

- Get reference data for picker lists
- Search name records
- Save field interview
- Batch-save field interviews
- Save field interview image
- Batch save field interview images
- Save scar/mark/tattoo
- Batch save scar/mark/tattoos
- Search for address
- Reverse geocode coordinate
- Get map layers
- Authenticate User
- Kill User's Session
- Validate User's Session

Session Management
When a user authenticates with the database (or LDAP domain) through the mobile app the Engine web application returns a Token to the mobile app. That Token has a configurable expiration date. The mobile app is responsible for using this Token with every request for data from the web services. When web services are accessed with the Token, the Token has its expiration data refreshed automatically. If after the configured expiration date a web service is accessed by the expired Token the request is denied and the app is notified that the Token has expired. The user must then re-authenticate and receive a new Token. The default expiration time for a Token is 20 minutes.

Storage of Field Interview Data
Field Interview, image and scar/mark/tattoo data is recorded on the mobile app locally and sent to the Field Interview Engine at the officer's discretion. Field Interview data is stored by the Engine in custom database tables on the server. These data can be accessed by the Omega Import Wizard to create a layer or another process to integrate them into an RMS or warehouse database.

Authentication Database Tables
The Session table manages Tokens, expiration times and user-Token relationships. The Session Log records the status of any active sessions. The Users table contains user names and passwords. This table is optionally used when LDAP access is not provided. RPD is responsible for managing the user names and passwords in this table.

- **Session**
  - SessionID_PK (int, not null)
  - TicketID (varchar(50), null)
  - UserGlobalID (unique identifier, null)
  - TimeCreated (datetime, null)
  - TimeExpire (datetime, null)
  - IsSessionValid (bit, null)

- **SessionLog**
  - SessionLogID_PK (int, not null)
  - UserGlobalID (unique identifier, null)
  - SessionStartTime (datetime, null)
  - SessionEndTime (datetime, null)
  - HasSessionExpired (bit, null)
- **Users**
  - UserID_PK (int, not null)
  - GlobalID (unique identifier, null)
  - UserName (nvarchar(200), null)
  - Password (nvarchar(128), null)
  - PasswordSalt (nvarchar(256), null)
  - CreateDate (datetime, not null)

NearMe Database Tables
The NearMe application reads point data directly from RPD's source tables (imported layers). The table name and database access is configured via the XML document in the web application.

Field Interview Database Tables
The Field Interview application reads data from reference tables and writes data to the FieldInterviews, FieldInterviewImages and SMT tables.

Reference Tables
These tables hold the IDs and values (where applicable) for all of the app's pick lists. Separate tables for these values were created to streamline the app's access to these values and ensures that when the values change that the app will continue to function as expected.

- BodyItemCodes
  - BodyItemCodeID (PK, char(4), not null)
  - Description (varchar(30), not null)
- BodyPositionCodes
  - BodyPositionCodeID (PK, char(2), not null)
  - Description (varchar(30), not null)
- BuildTypes
  - BuildTypeID (PK, varchar(5), not null)
  - Description (varchar(20), not null)
- Colors
  - ColorID (PK, varchar(4), not null)
  - Description (varchar(20), not null)
- ComplexionTypes
  - ComplexionTypeID (PK, varchar(5), not null)
  - Description (varchar(20), not null
- EthnicityTypes
  - EthnicityTypeID (PK, varchar(5), not null)
  - Description (varchar(30), not null)

- EyeGlassesTypes
  - EyeGlassesTypeID (PK, varchar(2), not null)
  - Description (varchar(20), not null)
- FacialHairTypes
  - FacialHarTypeID (PK, varchar(2), not null)
  - Description (varchar(40), not null)
- HairStyles
  - HairStyleID (PK, varchar(5), not null)
  - Description (varchar(30), not null)
- Races
  - RaceID (PK, varchar(2), not null)
  - Description (varchar(50), not null)
- Sexes
  - SexID (PK, varchar(2), not null)
  - Description (varchar(10), not null)
- SMTTypeCodes
  - SMTTypeCodeID (PK, char(4), not null)
  - Description (varchar(30), not null)
- *SpeechTypes*
  - SpeechTypeID (PK, varchar(50), not null)
  - Description (varchar(20), not null)
- States
  - StateID (PK, char(2), not null)
  - Description (varchar(20), not null)
- Suffixes
  - SuffixID (PK, varchar(6), not null)
- TeethTypes
  - TeethTypeID (PK, varchar(5), not null)
  - Description (varchar(30), not null
- VehicleMakes
  - VehicleMakeID (PK, varchar(5), not null)
  - Description (varchar(30), not null)
- VehiclePlateTypes
  - VehiclePlayteTypeID (PK, varchar(2), not null)
  - Description (varchar(50), not null)
- VehicleTypes
  - VehicleTypeID (PK, varchar(6), not null)
  - Description (varchar(30), not null)

Field Interview Database Tables

- FieldInterviews
  - FieldInterviewID (PK, FK, unique identifier, not null)
  - DateOfInterview (datetime, not null)
  - DateAdded (datetime, not null)
  - DateUpdated (datetime, null)

- Source (varchar(31), not null)
- Officer (varchar(16), not null)
- Agency (varchar(5), not null)
- Contact (varchar(10), null)
- FirstName (varchar(16), null)
- MiddleName (varchar(16), null)
- LastName (varchar(31), null)
- SuffixID (FK, varchar(6), null)
- DateOfBirth (date, null)
- SSN (varchar(12), null)
- HomeOrCellPhone (varchar(19), null)
- WorkPhone (varchar(19), null)
- StreetAddress (varchar(61), null)
- City (varchar(16), null)
- State (FK, char(2), null)
- Zip (varchar(11), null)
- Height (varchar(6), null)
- Weight (smallint, null)
- BuildTypeID (FK, varchar(5), null)
- SexID (FK, varchar(2), null)
- RaceID (FK, varchar(2), null)
- EthnicityID (FK, varchar(5), null)
- ComplexionTypeID (FK, varchar(5), null)
- HairColorID (FK, varchar(4), null)
- FacialHairTypeID (FK, varchar(2), null)
- EyeColorID (FK, varchar(4), null)
- EyeGlassesTypeID (FK, varchar(2), null)
- HairStyleID (FK, varchar(5), null)
- TeethTypeID (FK, varchar(5), null)
- SpeechTypeID (FK, varchar(50), null)
- DriversLicenseNumber (varchar(21), null)
- DriversLicenseState (FK, char(2), null)
- StateID (varchar(16), null)
- FBINumber (varchar(16), null)
- VehicleYear (smallint, null)
- VehicleMakeID (FK, varchar(5), null)
- VehicleModel (varchar(30), null)
- VehiclePrimaryColorID (FK, varchar(4), null)
- VehicleSecondaryColorID (FK, varchar(4), null)
- VehicleTypeID (FK, varchar(6), null)
- NumberOfDoors (smallint, null)
- LicensePlateTypeID (FK, varchar(2), null)
- LicensePlateNumber (varchar(11), null)
- LicensePlateIssuingState (FK, char(2), null)
- LicensePlateExpirationDate (date, null)
- VIN (varchar(31), null)

    - LocationX (decimal(18,0), null)
    - LocationY (decimal(18, 0), null)
    - LocationAddress (varchar(50), null)
    - InterviewComments (text, not null)
- FieldInterviewImages
    - FieldInterviewImageID (PK, unique identifier, not null)
    - FieldInterviewID (FK, unique identifier, null)
    - SMTID (FK, unique identifier, null)
    - DateAdded (datetime, not null)
    - DateUpdated (datetime, null)
    - DateTaken (datetime, not null)
    - Description (varchar(30), null)
    - LocationX (decimal (38, 8), not null)
    - LocationY (decimal (38, 8), not null)
    - ImageBinary (image, not null)
    - ImageMIMEType (varchar(20), not null)
    - Size (int, not null)
- SMT
    - SMTID (PK, unique identifier, not null)
    - DateAdded (datetime, not null)
    - DateUpdated (datetime, null)
    - FieldInterviewID (FK, unique identifier, not null)
    - SMTTypeCode (FK, char(4), null)
    - BodyPositionCodeID (FK, char(2), null)
    - BodyItemCodeID (FK, char(4), null)
    - Description (char(30), null)

IX. Technical Documentation- NearMe

GeoEngine REST Services (Redlands Near Me App)

The following rest endpoints should be used with the map and use the search parameters to search the database for points. If you would like to see the JSON objects parsed out try using JSONViewer.

Authenticate User

This endpoint authenticates the user with our API and provides the app with an API key, or "authentication ticket." The authentication ticket is set to expire at a configurable time. The default amount of time is 30 minutes.

ENDPOINT SYNTAX:

```
AuthUser?user={userName}&pass={password}&domain={domain}
```

PARAMETERS:

userName

password

domain – can be left blank for now.

RETURN VALUES:

A valid **authenticationTicket**. This is the key that authenticate every request for the app.

```
"D5442536-D686-4F0A-9635-396E89CF44B3"
```

Store this ticket within the app somewhere and use it for every request made to any of the following endpoints.

Authenticate User with Settings

This endpoint authenticates the user with our API and provides the app with an App Settings object containing the API key or "authentication ticket," the list of QueryLayers, MapLayers and a SessionTimeOutResult. The authentication ticket is set to expire at a configurable time. The default amount of time is 30 minutes.

ENDPOINT SYNTAX:

```
AuthUserWithSettings?user={userName}&pass={password}&domain={domain}
```

PARAMETERS:

userName

password

domain – can be left blank for now.

RETURN VALUES:

An object containing the application settings. Here is a sample settings object with AuthenticationTicket, MapLayers, QueryLayers and SessionTimeoutResult:


```
{"AuthenticationTicket":"47678263-3b5b-4ea3-bc59-
223dca1c065f","MapLayers":[{"LayerType":"Bing_Roads","Name":"Bing_Roads","Token":"AotO
s5Xqe8OwHlJDLKanQ_wDvHzEPIwWNjp6kMUORWKPjAXIbtftvFsNjpeppIlI","Url":""},{"LayerType":"
Bing_Aerial","Name":"Bing_Aerial","Token":"AotOs5Xqe8OwHlJDLKanQ_wDvHzEPIwWNjp6kMUORWK
PjAXIbtftvFsNjpeppIlI","Url":""},{"LayerType":"Bing_Hybrid","Name":"Bing_AerialWithLab
el","Token":"AotOs5Xqe8OwHlJDLKanQ_wDvHzEPIwWNjp6kMUORWKPjAXIbtftvFsNjpeppIlI","Url":"
"},{"LayerType":"Dynamic","Name":"Hot
Spot","Token":"","Url":"http:\/\/64.165.22.169\/ArcGIS\/rest\/services\/NearMe\/Hot_Sp
ot_Layer\/MapServer"},{"LayerType":"Feature","Name":"Parcels","Token":"","Url":"http:\
/\/64.165.22.169\/ArcGIS\/rest\/services\/NearMe\/Parcel_Layer\/MapServer\/0"}],"Query
Layers":[{"HasDateSupport":true,"HasTimeSupport":true,"ID":"DAE53CD3-88FA-46B0-A0DE-
6D72AE239D02","Legend":{"__type":"SimpleMarkerLegend:#OmegaGroup.GeoEngine.Data.Displa
y","StackedSymbolID":"","StackedSymbolLibrary":"","SymbolID":"","SymbolLibrary":""},"N
ame":"Arrestees","SavedQueries":[{"ID":1,"IsSelected":false,"Name":"Commercial
Burglary"},{"ID":2,"IsSelected":false,"Name":"Residential
Burglary"},{"ID":3,"IsSelected":false,"Name":"Vehicle
Burglary"},{"ID":4,"IsSelected":false,"Name":"Auto
Theft"},{"ID":5,"IsSelected":false,"Name":"Recovered
Vehicles"},{"ID":6,"IsSelected":false,"Name":"Assaults"},{"ID":7,"IsSelected":false,"N
ame":"Robbery"},{"ID":8,"IsSelected":false,"Name":"Theft"},{"ID":9,"IsSelected":false,
"Name":"Narcotics"},{"ID":10,"IsSelected":false,"Name":"Vandalism"}]},{"HasDateSupport
":true,"HasTimeSupport":true,"ID":"C0E13565-AEFC-4904-82E2-
FF66666A9AA7","Legend":{"__type":"SimpleMarkerLegend:#OmegaGroup.GeoEngine.Data.Displa
y","StackedSymbolID":"","StackedSymbolLibrary":"","SymbolID":"","SymbolLibrary":""},"N
ame":"Citations","SavedQueries":[{"ID":1,"IsSelected":false,"Name":"All
Citations"}]},{"HasDateSupport":true,"HasTimeSupport":true,"ID":"E10CE452-B6F6-4520-
8421-
91D0BB8CE682","Legend":{"__type":"SimpleMarkerLegend:#OmegaGroup.GeoEngine.Data.Displa
y","StackedSymbolID":"","StackedSymbolLibrary":"","SymbolID":"","SymbolLibrary":""},"N
ame":"Collisions","SavedQueries":[{"ID":1,"IsSelected":false,"Name":"All
Collisions"}]},{"HasDateSupport":true,"HasTimeSupport":false,"ID":"54AC4D81-1C79-4D0D-
9F99-
C4482DACBFAA","Legend":{"__type":"SimpleMarkerLegend:#OmegaGroup.GeoEngine.Data.Displa
y","StackedSymbolID":"","StackedSymbolLibrary":"","SymbolID":"","SymbolLibrary":""},"N
ame":"CVNames","SavedQueries":[{"ID":1,"IsSelected":false,"Name":"Narc
Registrant"},{"ID":2,"IsSelected":false,"Name":"Sex
Registrant"},{"ID":3,"IsSelected":false,"Name":"Arson
Registrant"},{"ID":4,"IsSelected":false,"Name":"Parolee"}]},{"HasDateSupport":true,"Ha
sTimeSupport":true,"ID":"30F4F965-F7FB-4B35-B6FC-
53FC75345868","Legend":{"__type":"SimpleMarkerLegend:#OmegaGroup.GeoEngine.Data.Displa
y","StackedSymbolID":"","StackedSymbolLibrary":"","SymbolID":"","SymbolLibrary":""},"N
```

ame":"FI","SavedQueries":[{"ID":1,"IsSelected":false,"Name":"All Field
Interviews"}]},{"HasDateSupport":true,"HasTimeSupport":true,"ID":"65794852-79D4-49D2-
96D0-
A6FC70C21D3E","Legend":{"__type":"SimpleMarkerLegend:#OmegaGroup.GeoEngine.Data.Displa
y","StackedSymbolID":"","StackedSymbolLibrary":"","SymbolID":"","SymbolLibrary":""},"N
ame":"Incidents","SavedQueries":[{"ID":1,"IsSelected":false,"Name":"Commercial
Burglary"},{"ID":2,"IsSelected":false,"Name":"Residential
Burglary"},{"ID":3,"IsSelected":false,"Name":"Vehicle
Burglary"},{"ID":4,"IsSelected":false,"Name":"Auto
Theft"},{"ID":5,"IsSelected":false,"Name":"Recovered
Vehicles"},{"ID":6,"IsSelected":false,"Name":"Assaults"},{"ID":7,"IsSelected":false,"N
ame":"Robbery"},{"ID":8,"IsSelected":false,"Name":"Theft"},{"ID":9,"IsSelected":false,
"Name":"Narcotics"},{"ID":10,"IsSelected":false,"Name":"Vandalism"},{"ID":11,"IsSelect
ed":false,"Name":"Person Crimes"},{"ID":12,"IsSelected":false,"Name":"Property
Crimes"},{"ID":13,"IsSelected":false,"Name":"Part 1
Crimes"},{"ID":14,"IsSelected":false,"Name":"Part 2
Crimes"}]}],"SessionTimeoutResult":{"HasValidSession":true,"ServerSessionTimeout":"201
11101211109"}}

Store this ticket within the app somewhere and use it for every request made to any of the following endpoints.

Validate Ticket

This endpoint checks to see if this ticket is valid and if it is it extends the session by the configured time out length. This endpoint is to be used

ENDPOINT SYNTAX:

`CheckAuthenticationTicket?ticket={authenticationTicket}`

PARAMETERS:

authenticationTicket

RETURN VALUES:

True or False. True if the ticket was valid, False if not.

You can use this method to explicitly extend the user's session. You may not need to use this method because many of the API calls automatically extend the session as you'll see below.

Kill Session (Log Off)

This endpoint deletes an authentication ticket from the session database, rendering it useless.

ENDPOINT SYNTAX:

`KillSession?ticket={authenticationTicket}`

PARAMETERS:

authenticationTicket

RETURN VALUES:

A string confirming the session has been deleted:

```
"Session Deleted"
```

Get Session Timeout

This returns a **SessionTimeoutResult** object in JSON. This object tells you whether the session is still valid and when it expire.

ENDPOINT SYNTAX:

`SessionTimeout?ticket={authenticationTicket}`

PARAMETERS:

authenticationTicket

RETURN VALUES:

A **SessionTimeoutResult** object.

```
{"HasValidSession":true,"ServerSessionTimeout":"20110916224738"}
```

Use this endpoint to determine the next time the session will expire.

Get All Map Layers

ENDPOINT SYNTAX:

MapLayers/Layers?ticket={authenticationTicket}

PARAMETERS:

authenticationTicket – This parameter is a key that authenticates your request.

RETURN VALUES:

A JSON serialized list of **MapLayer** objects. Each MapLayer has a type and a name. There are several different types of layers and based on the type you'll add the layer to the map differently. For example, a layer whose LayerType is "Bing_Roads" will be added as you normally add a Bing layer. You'll use the Token property as the ApplicationID when hooking up the Bing Maps layer. If the layer is Dynamic, or Feature, you'll use a Dynamic Map Service or Feature Layer to add the layer to the map. When a URL is necessary for creating and adding the layer to the map it will be provided. When security is required as is the case with a Bing Maps layer the Token property should be used. The JSON looks like this:


```
[{"LayerType":"Bing_Roads","Name":"Bing_Roads",
"Token":"AotOs5Xqe8OwHlJDLKanQ_wDvHzEPIwWNjp6kMUORWKPjAXIbtftvFsNjpeppIlI","Url":""},
{"LayerType":"Bing_Aerial","Name":"Bing_Aerial",
"Token":"AotOs5Xqe8OwHlJDLKanQ_wDvHzEPIwWNjp6kMUORWKPjAXIbtftvFsNjpeppIlI","Url":""},
{"LayerType":"Bing_Hybrid","Name":"Bing_AerialWithLabel",
"Token":"AotOs5Xqe8OwHlJDLKanQ_wDvHzEPIwWNjp6kMUORWKPjAXIbtftvFsNjpeppIlI","Url":""},
{"LayerType":"Dynamic","Name":"Hot Spot","Token":"",
"Url":"http:\/\/64.165.22.169\/ArcGIS\/rest\/services\/NearMe\/Hot_Spot_Layer\/MapServer"},
{"LayerType":"Feature","Name":"Parcels","Token":"",
"Url":"http:\/\/64.165.22.169\/ArcGIS\/rest\/services\/NearMe\/Parcel_Layer\/MapServer\/0"}]
```


You'll display the **Name** in the Map Options tab.

Get All Query Layers

ENDPOINT SYNTAX:

QueryLayers/Layers?ticket={authenticationTicket}

PARAMETERS:

authenticationTicket – This parameter is a key that authenticates your request.

RETURN VALUES:

A JSON serialized list of **QueryLayer** objects. Each QueryLayer has an ID, some other properties and a list of SavedQueries. The JSON looks like this:

```
[{"HasDateSupport":true,"HasTimeSupport":true,"ID":"C0E13565-AEFC-4904-82E2-
FF66666A9AA7",
"Legend":{"__type":"SimpleMarkerLegend:#OmegaGroup.GeoEngine.Data.Display",
"StackedSymbolID":"","SymbolID":""},"Name":"Citations","SavedQueries":[{"ID":1,
"IsSelected":false,"Name":"Incident Numbers starting with G1"}]},{"HasDateSupport":true,
"HasTimeSupport":true,"ID":"E10CE452-B6F6-4520-8421-
91D0BB8CE682","Legend":{"__type":"SimpleMarkerLegend:#OmegaGroup.GeoEngine.Data.Display",
"StackedSymbolID":"","SymbolID":""},"Name":"Collisions","SavedQueries":[{"ID":1,
"IsSelected":false,"Name":"Incident Numbers starting with 06"}]}]
```


The **QueryLayer** has a few other properties which you can ignore for now. You'll need to display the "Name" in the list view on the Layers Tab, and then when the Layer is tapped you'll display the list of Saved Queries by name in the next view.

Search by Envelope (using a serialized JSON object)

ENDPOINT SYNTAX:

```
QueryLayers/SearchLayersByEnvelope?query={envelopeSearchJson}&ticket={authenticationTicke
t}
```

PARAMETERS:

envelopeSearchJson – The JSON representing an **EnvelopeSearch** object. Notice how the **LayerParameters** object can accept one or more saved queries in a comma delimited list. The values in the list are the saved queries IDs. So if the user chooses some queries from "Arrestees" and some from "Incidents" you'll build the JSON as you see below with the date filter, the ID of the layer and the list of the selected saved queries for each layer as needed. A date filter in the proper format and a time filter in the propert format may also be specified.


```
{"Envelope":{"XMax":-13009785.249812098,"XMin":-
13114503.978562647,"YMax":4048893.2740069614,"YMin":3986673.5329829114},
"LayersParameters":
[{"DateFilter":"2011050120110830","ID":"65794852-79D4-49D2-96D0-
A6FC70C21D3E","SavedQueryIDs":[1],"TimeFilter":""},
{"DateFilter":"2011050120110830","ID":"54AC4D81-1C79-4D0D-9F99-
C4482DACBFAA","SavedQueryIDs":[1],"TimeFilter":""}]}
```


authenticationTicket - This parameter is a key that authenticates your request.

RETURN VALUES:

A **SearchResult** object serialized as JSON. The JSON looks like this.

```
{"ReachedMaxValues":true,"SearchResults":[{"LayerID":"54AC4D81-1C79-4D0D-9F99-
C4482DACBFAA","ReachedMaxValues":true,"Records":[{"Address":"29082 MERRIS
ST","Date":"201004070000","ID":"163452","Legend":"NA","X":-
13043291.1800243,"Y":4019316.06940572},{"Address":"po box
472","Date":"201004070000","ID":"160237","Legend":"NA","X":-
13046593.1298985,"Y":4019134.52699908}]}
```


Each layer in the **SearchResult**s should appear as a separate graphics layer on the map so the user can toggle them on / off. If the **SearchResult** ReachedMaxValues property is true, the map should flash the "Max records reached" message similar to the CrimeMapping.com app.

Get Record Details

ENDPOINT SYNTAX:

`QueryLayers/{layerID}/RecordDetails?id={recordID}&ticket={authenticationTicket}`

PARAMETERS:

layerID – The ID of the **QueryLayer** to search from.

recordID – The ID of the Record whose details you want returned.

authenticationTicket – This parameter is a key that authenticates your request.

RETURN VALUES:

A JSON serialized **DetailedRecord** object. This object contains a list of string attributes for the record, the ID of the layer to which it belongs and a Legend. The JSON looks like this:


```
{"Attributes":["     2750","29082 MERRIS ST","SUSP DR 011109232. RPT
SCANNED.",""],"ID":"163452","LayerID":"54AC4D81-1C79-4D0D-9F99-
C4482DACBFAA","Legend":"NA"}
```


Geocode Address

This endpoint takes an address string as a parameter and returns a list of matching addresses.

ENDPOINT SYNTAX:

`Geocode?address={address}&ticket={authenticationTicket}`

PARAMETERS:

address – The string to match

authenticationTicket – This parameter is a key that authenticates your request.

RETURN VALUES:

A JSON serialized list of **AddressCandidate** objects. The JSON looks like this:


```
[{"Address":"100 S Main St, Blacksburg, VA 24060-4859","Score":50,"X":-
8951651.655222294,"Y":4471064.617730479},{"Address":"100 N Main St,
Blacksburg, VA 24060-3947","Score":50,"X":-
8951639.076119836,"Y":4471152.697872176}]
```


The score can be used to sort the candidates if necessary.

Reverse Geocode Address

This endpoint takes an address string as a parameter and returns a list of matching addresses.

ENDPOINT SYNTAX:

```
ReverseGeocode?x={x}&y={y}&ticket={authenticationTicket}
```

PARAMETERS:

x – The x coordinate of the point to reverse geocode

y – The y coordinate of the point to reverse geocode

authenticationTicket – This parameter is a key that authenticates your request.

RETURN VALUES:

A JSON serialized list of **AddressCandidate** objects. The JSON looks like this:


```
[{"Address":"100 Redlands Mall, Redlands, CA 92373","Score":100,"X":-
13044841.765984636,"Y":4036378.2373857894}]
```


The score can be used to sort the candidates if necessary.

X. Technical Documentation- Field Interview

FieldInterviewEngine REST Services (Redlands Field Interview)

The following rest endpoints should be used with the map and use the search parameters to search the database for points. If you would like to see the JSON objects parsed out try using JSONViewer.

Authenticate User

This endpoint authenticates the user with our API and provides the app with an API key, or "authentication ticket." The authentication ticket is set to expire at a configurable time. The default amount of time is 30 minutes.

ENDPOINT SYNTAX:

`AuthUser?user={userName}&pass={password}`

PARAMETERS:

userName

password

RETURN VALUES:

A valid **authenticationTicket**. This is the key that authenticate every request for the app.

```
"D5442536-D686-4F0A-9635-396E89CF44B3"
```

Store this ticket within the app somewhere and use it for every request made to any of the following endpoints.

Validate Ticket

This endpoint checks to see if this ticket is valid and if it is it extends the session by the configured time out length. This endpoint is to be used

ENDPOINT SYNTAX:

`CheckAuthenticationTicket?ticket={authenticationTicket}`

PARAMETERS:

authenticationTicket

RETURN VALUES:

True or False. True if the ticket was valid, False if not.

You can use this method to explicitly extend the user's session. You may not need to use this method because many of the API calls automatically extend the session as you'll see below.

Kill Session (Log Off)

This endpoint deletes an authentication ticket from the session database, rendering it useless.

ENDPOINT SYNTAX:

```
KillSession?ticket={authenticationTicket}
```

PARAMETERS:

authenticationTicket

RETURN VALUES:

A string confirming the session has been deleted:

```
"Session Deleted"
```

Get Session Timeout

This returns a **SessionTimeoutResult** object in JSON. This object tells you whether the session is still valid and when it expire.

ENDPOINT SYNTAX:

```
SessionTimeout?ticket={authenticationTicket}
```

PARAMETERS:

authenticationTicket

RETURN VALUES:

A **SessionTimeoutResult** object.

```
{"HasValidSession":true,"ServerSessionTimeout":"20110916224738"}
```


Use this endpoint to determine the next time the session will expire.

Get All Reference Data

ENDPOINT SYNTAX:

`FieldInterviews/Reference/ReferenceData?ticket={authenticationTicket}`

PARAMETERS:

authenticationTicket – This parameter is a key that authenticates your request.

RETURN VALUES:

A JSON serialized list of **ReferenceData** objects. Each **ReferenceData** object has a name and a list of key value pairs. These values populate the UI picker lists in the UI. The first object is a list of **BodyItemCodes**. The **BodyItemCodes** go on the SMT picker. The JSON looks like this:


```
{"BodyItemCodes":[{"Desc":"Abdomen","ID":"ABDM"},{"Desc":"Acne","ID":"ACNE"},
{"Desc":"Anticonvulsants","ID":"ACON"},{"Desc":"Antidepressants","ID":"ADEP"},
{"Desc":"Adenoids","ID":"ADND"},{"Desc":"Alcohol","ID":"ALCO"},
{"Desc":"Allergies","ID":"ALRG"},{"Desc":"Amphetamines","ID":"AMPH"},
{"Desc":"Analgesics (Pain Relievers)","ID":"ANAL"},{"Desc":"Ankle","ID":"ANKL"},
{"Desc":"Appendix","ID":"APNX"},{"Desc":"Appliance","ID":"APP
"},{"Desc":"Arm","ID":"ARM "},
{"Desc":"Arthritis","ID":"ARTH"},{"Desc":"Back","ID":"BACK"},
{"Desc":"Barbiturates","ID":"BARB"},{"Desc":"Behavior Disorder","ID":"BEHA"},
{"Desc":"Blood","ID":"BLOO"},
{"Desc":"Breast","ID":"BRST"},{"Desc":"Buttocks","ID":"BUTK"},
{"Desc":"Calf","ID":"CALF"},{"Desc":"Cancer","ID":"CANC"},
{"Desc":"Cardiac Medications","ID":"CARD"},{"Desc":"Cerebral Ventricle","ID":"CERB"},
{"Desc":"Chin","ID":"CHIN"},{"Desc":"Cheek (Face)","ID":"CHK "},
{"Desc":"Chest","ID":"CHST"},{"Desc":"Clavicle","ID":"CLAV"},
{"Desc":"Cocaine","ID":"COCA"},{"Desc":"Diabetic","ID":"DIAB"},
{"Desc":"Drug Abuse","ID":"DRUG"},{"Desc":"Ear","ID":"EAR "},
{"Desc":"Elbow","ID":"ELBO"},{"Desc":"Eye","ID":"EYE "},{"Desc":"Face","ID":"FACE"},
{"Desc":"Forehead","ID":"FHD "},{"Desc":"Finger","ID":"FING"},
{"Desc":"Finger Joint","ID":"FJT
"},{"Desc":"Foot","ID":"FOOT"},{"Desc":"Gallbladder","ID":"GALL"},
{"Desc":"Glue","ID":"GLUE"},{"Desc":"Genitalia","ID":"GNTL"},{"Desc":"Groin
Area","ID":"GROI"},

…. Etc …
```

Here's where each of the **ReferenceData** object's lists go in the UI:

Search Names

The following rest endpoint is to be used to search for existing records to pre-populate the Field Interview forms.

ENDPOINT SYNTAX:

`FieldInterviews/SearchNames?query={query}&ticket={authenticationTicket}`

PARAMETERS:

query – The query is a simple string parameter that should be URL encoded and is expected to be a first, last or middle name.

authenticationTicket - This parameter is a key that authenticates your request.

RETURN VALUES:

A **NameRecord** object serialized as JSON. The JSON looks like this.


```
[{"DateOfBirth":"2/23/1980","DriversLicenseNumber":"","FirstName":"Michael","Height":"
5'9''","LastName":"Connolly","MiddleName":"Aaron","MostRecentAddress":"2570 Grape St.
","Number":"123456789","Race":"W","Suffix":"","Weight":165}]
```


There may be 0 or more **NameRecord** results

Save Field Interview Record

ENDPOINT SYNTAX:

`FieldInterviews/SaveFieldInterviewRecord?ticket={authenticationTicket}`

PARAMETERS:

authenticationTicket - This parameter is a key that authenticates your request.

FieldInterviewRecord – The JSON serialized object representing the field interview.

RETURN VALUES:

If the record was saved successfully the REST endpoint will return a '0'. If not the REST endpoint will throw an error.

This endpoint requires a valid **authenticationTicket** and that you POST the **FieldInterviewRecord** object as serialized Json. Here is a sample FI object with some of the parameters filled in:


```
{"ID":"f41c6fce-92e6-01f1-b5b2-
fa34b1fd35cd","DateOfInterview":"201108021200","DateAdded":null,"Source":null,"Officer
":"Catron,
C","Agency":null,"Contact":null,"FirstName":"Claude","MiddleName":"Blanc","LastName":"
Rouge","SuffixID":"III   ","DateOfBirth":"196601301200","SSN":"111-22-
3333","Height":"5'9'''","Weight":"225","BuildTypeID":"MCLR ","SexID":"U ","RaceID":"W
","EthnicityID":"FRCH ","ComplexionTypeID":"FAR  ","HairColorID":"BRO
","FacialHairTypeID":"N ","EyeColorID":"BLU ","EyeGlassesTypeID":"N
","HairStyleID":"LONG ","TeethTypeID":"STR  ","SpeechTypeID":"EURP
","HomeOrCellPhone":null,"WorkPhone":null,"StreetAddress":null,"City":null,"State":nul
l,"ZipCode":null,"StateID":null,"FBINumber":null,"DriversLicenseNumber":"156","Drivers
LicenseState":"CA","LicensePlateTypeID":"CO","LicensePlateNumber":"123456","LicensePla
teIssuingState":"CA","LicensePlateExpirationDate":"201401011200","VIN":"1234","Vehicle
Year":"2999","VehicleMakeID":"VESP ","VehicleModel":"Ex","PrimaryVehicleColorID":"CHA
","SecondaryVehicleColorID":"COM ","VehicleTypeID":"COVAN
","NumberOfDoors":"0","LocationX":"-12312.123123","LocationY":"-
2989827.9829892","LocationAddress":"123 Boulevard, Aurora, CA
","InterviewComments":"These are my comments. There are many like them but these are
mine."}
```


NOTE: You are required to provide a unique GUID value for the ID parameter. This ID parameter is to be used when saving SMT (Scar, mark and tattoo) and Image data. This parameter will link the SMT and Image data to the particular Field Interview to which they belong.

Save Field Interview Record as Batch

ENDPOINT SYNTAX:

`FieldInterviews/SaveFieldInterviewRecord?ticket={authenticationTicket}`

PARAMETERS:

authenticationTicket - This parameter is a key that authenticates your request.

FieldInterviewRecords – The JSON serialized object representing the field interview list.

RETURN VALUES:

If the records were saved successfully the REST endpoint will return '0'. If not the REST endpoint will throw an error.

This endpoint requires a valid **authenticationTicket** and that you POST the **FieldInterviewRecords** object as serialized Json. The JSON is simply an array of **FieldInterviewRecord** objects whose properties can be seen above. The JSON array syntax looks like this:

```
[<FieldInterviewRecord JSON>, <FieldInterviewRecord JSON> .. , <FieldInterviewRecord
JSON>]
```

NOTE: That each **FieldInterviewRecord** in this list must have its own unique ID property.

Save SMT (Scar, Mark, Tattoo) Record

ENDPOINT SYNTAX:

```
FieldInterviews/SaveSMTRecord?SMT={SMTRecordJson}&ticket={authenticationTicket}
```

PARAMETERS:

SMTRecordJson – The JSON serialized object representing the SMT.

authenticationTicket - This parameter is a key that authenticates your request.

RETURN VALUES:

If the record was saved successfully the REST endpoint will return '0'. If not the REST endpoint will throw an error.

This endpoint requires a valid **authenticationTicket** and a JSON serialized **SMTRecord**. Here is a sample SMT object with some of the parameters filled in:


```
{"ID":"6ef97f09-f83e-cd58-1fab-2f1c68f7835e","FieldInterviewID":"EB191CD4-2349-4CFA-
A1A0-
05AF66F9C580","SMTTypeCodeID":"CARD","BodyPositionCodeID":"BT","BodyItemCodeID":"ANKL"
,"Description":"Comments 123"}
```


NOTE: That each **SMTRecord** in this list must have its own unique ID and the **FieldInterviewID** property must be the ID of an existing **FieldInterviewRecord** object.

Save SMT Records as Batch

ENDPOINT SYNTAX:

`FieldInterviews/SaveSMTRecordsAsBatch?ticket={authenticationTicket}`

PARAMETERS:

authenticationTicket - This parameter is a key that authenticates your request.

SMTRecords – The JSON serialized object representing the field interview list.

RETURN VALUES:

If the records were saved successfully the REST endpoint will return '0'. If not the REST endpoint will throw an error.

This endpoint requires a valid **authenticationTicket** and that you POST the **SMTRecords** object as serialized Json. The JSON is simply an array of **SMTRecord** objects whose properties can be seen above. The JSON array syntax looks like this:

```
[<SMTRecord JSON>, <SMTRecord JSON> .. , < SMTRecord JSON>]
```

NOTE: That each **SMTRecord** in this list must have its own unique ID property.

Save Image Record

ENDPOINT SYNTAX:

`FieldInterviews/SaveFieldInterviewImageRecord?ticket={authenticationTicket}`

PARAMETERS:

authenticationTicket - This parameter is a key that authenticates your request.

FieldInterviewImageRecord – The JSON serialized object representing the field interview image.

RETURN VALUES:

If the record was saved successfully the REST endpoint will return a '0'. If not the REST endpoint will throw an error.

This endpoint requires a valid **authenticationTicket** and that you POST the **FieldInterviewImageRecord** object as serialized Json. Here is a sample FI object with some of the parameters filled in:

```
{"DateAdded":"000101011200","DateTaken":"201109220447","Description":"Example
Image","EncodedImageBinary":"\/9j\/4Tp6RXhpZgAATU0AKgAAAAgABgESAAMAA .. (truncated for
brevity) .. \/\/Z","FieldInterviewID":"EB191CD4-2349-4CFA-A1A0-
05AF66F9C580","ID":"5e148cf9-19c9-42a9-9662-
acf3c1ea51d9","ImageBinary":null,"ImageMIMEType":"image\/jpeg","ImageSize":122550,"Loc
ationX":-10758178.081621248,"LocationY":4984431.0987421125,"SMTID":""}
```


NOTE: The EncodedImageBinary field is a byte array encoded a Base64 string. Hopefully there won't be any issues with this format.

NOTE: You are required to provide a unique GUID value for the ID parameter.

NOTE: You must enter EITHER the **FieldInterviewID** image property OR the **SMTID** property, but not both. We'll handle the linking between the SMT and the FieldInterview so you don't need to enter both. The value you use must be the ID of a valid SMT or Field Interview that you've already entered.

Geocode Address

This endpoint takes an address string as a parameter and returns a list of matching addresses.

ENDPOINT SYNTAX:

`Geocode?address={address}&ticket={authenticationTicket}`

PARAMETERS:

address – The string to match

authenticationTicket – This parameter is a key that authenticates your request.

RETURN VALUES:

A JSON serialized list of **AddressCandidate** objects. The JSON looks like this:


```
[{"Address":"100 S Main St, Blacksburg, VA 24060-4859","Score":50,"X":-
8951651.655222294,"Y":4471064.617730479},{"Address":"100 N Main St,
Blacksburg, VA 24060-3947","Score":50,"X":-
8951639.076119836,"Y":4471152.697872176}]
```


The score can be used to sort the candidates if necessary.

Reverse Geocode Address

This endpoint takes an address string as a parameter and returns a list of matching addresses.

ENDPOINT SYNTAX:

```
ReverseGeocode?x={x}&y={y}&ticket={authenticationTicket}
```

PARAMETERS:

x – The x coordinate of the point to reverse geocode

y – The y coordinate of the point to reverse geocode

authenticationTicket – This parameter is a key that authenticates your request.

RETURN VALUES:

A JSON serialized list of **AddressCandidate** objects. The JSON looks like this:


```
[{"Address":"100 Redlands Mall, Redlands, CA 92373","Score":100,"X":-
13044841.765984636,"Y":4036378.2373857894}]
```


The score can be used to sort the candidates if necessary.

XI. Technical Documentation- Flyers

Flyer Maker is an iPhone/iOS application targeted for iOS 6+. It is written in standard Objective-C and does not incorporate any third-party libraries. It can be built using XCode 4 or later. The source code uses standard Apple MVC templates, storyboards and typical features of XCode. There are comments as appropriate, a developer well versed in the art of iOS development should be able to add or modify the code with little additional knowledge. No scripts or outside tools are required to edit or build the application.

As delivered, it is an enterprise application `Flyer Maker 1.0.7 Final.ipa`, suitable for dropping into an MDM or directly onto an iPhone.

Customization

There are many options that can be configured at compile time. They are all set in the application's properties ("plist"):

Key	Type	Value
▼ Information Property List	Dictionary	(24 items)
Localization native development reg	String	en
Bundle display name	String	${PRODUCT_NAME}
Executable file	String	${EXECUTABLE_NAME}
▶ Icon files (iOS 5)	Dictionary	(1 item)
Bundle identifier	String	com.rpd.${PRODUCT_NAME:rfc1034identifier}
InfoDictionary version	String	6.0
Bundle name	String	${PRODUCT_NAME}
Bundle OS Type code	String	APPL
Bundle versions string, short	String	1.0.2
Bundle creator OS Type code	String	????
Bundle version	String	1.0.6
Application requires iPhone environ	Boolean	YES
Main storyboard file base name	String	MainStoryboard_iPhone
Main storyboard file base name (iPa	String	MainStoryboard_iPad
▶ Required device capabilities	Array	(1 item)
▶ Status bar tinting parameters	Dictionary	(1 item)
▶ Supported interface orientations	Array	(3 items)
▶ Supported interface orientations (iPa	Array	(4 items)
pfDeptHeadName	String	Mark A Garcia
pfDeptHeadTitle	String	Chief of Police
pfFlyerFooter	String	LAW ENFORCEMENT ONLY
pfFlyerHeader	String	
▼ pfFlyerList	Array	(21 items)
Item 0	String	Armed and Dangerous
Item 1	String	Arrest of Interest
Item 2	String	Attempt to Identify
Item 3	String	Attempt to Locate
Item 4	String	Be on the Look Out
Item 5	String	Critical Missing
Item 6	String	Found Property
Item 7	String	Information Only
Item 8	String	Looking for Similars
Item 9	String	Missing at Risk
Item 10	String	Missing Juvinile
Item 11	String	Missing Person
Item 12	String	Officer Safety
Item 13	String	Parolee at Large
Item 14	String	PC Arrest
Item 15	String	Seeking Information
Item 16	String	Stop and Arrest
Item 17	String	Stop and Detain
Item 18	String	Stop and F.I.
Item 19	String	Wanted
Item 20	String	Wanted for Questioning
pfMainTitle	String	Redlands Police

General Configuration Parameters

Flyer Name List - `pfFlyerList`

This is the list of Flyers that is initially displayed for selection when the application starts. The selected name is printed at the top of the PDF output, reduced in size to fit the width of the PDF.

Main Title - `pfMainTitle`

This is the title that is displayed at the top of the iPhone's screen when the application is started, above the Flyer list.

PDF Output Parameters

The following strings can be configured in the application's configuration:

Flyer Header – `pfFlyerHeader`

This is standard text that appears at the top of every PDF. For the Redlands implementation this is blank.

Flyer Footer – `pfFLyerFooter`

This is standard text that appears at the bottom of every PDF. For the Redlands implementation this is set to "LAW ENFORCEMENT ONLY".

Department Heading

The department head's name and title appear on the top left of the PDF. It is broken into two fields, on for the Department Head's Name and the second for their title.

Name – pfDeptHeadName

For Redlands this is set to "Mark A Garcia".

Title – pfDeptHeadTitle

For Redlands this is set to "Chief of Police"

Graphics

Springboard Icon

The application's icon is provided in two sizes, for older and "Retina" displays. The file is "`Icon57.png`" and "`Icon114.png`" respectively.

Department Logo

The department logo that appears on the PDF is found in the file "`deptlogo.png`". For Redlands that image is 170 x 182 pixels, however the PDF writer will scale the image to fit the output in a 1" x 1" square.

Help Files

The help screens are a series of graphics based on screen shots. The file names are "`ss-##.png`", from 01 – 16. They are displayed in turn in the help screens. The original Adobe Illustrator file is included with the document zip file. The help screens are individual artboards within the `Help Screens.ai` file and are exported individually to create the help png files used in the application.

Future Considerations

There are some features or ideas that were tabled during development for assorted reasons – user input, time and/or cost for example. Areas for future enhancement include:

Dynamic Configuration

The original design called for dynamic configuration of the screens presented to create a flyer, the type, descriptive field labels & hints, screen order, photo options, etc. being determined via an XML (or other format) configuration file (or multiple files, one per flyer type).

Saving Flyer Data

As the application is now, there is no option to save one's work in progress or to re-edit a completed flyer. Using the built-in database in iOS, completed flyers could be stored for recall, editing, or re-display. Additionally, by saving the flyere data, it would be available for entry into a department database without re-keying.

Photo Editing

Currently the photo editing is limited to that offered by iOS. There are suitable 3rd party libraries (such as Aviary) that could be (relatively easily) incorporated into the application that would offer superior photo editing, cropping, adjustments, etc.

Photo Layout

Currently the application calculates a 'best guess' layout of the photos and narrative text in the flyer. Given sufficient demand, it could be beneficial to allow the phone's user to drag and resize photos, allowing more user input into the final flyer layout and design.

iOS 7 /iPad

The application is designed for iOS 5/6 and might have display issues (color, layout, contrast) with iOS 7. Additionally, it would be very suitable to have an iPad version.