The Bill Blackwood
Law Enforcement Management Institute of Texas

Emerging Technologies in Law Enforcement: Their Impact on Officer Response and Efficiency

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ABSTRACT

Emerging technology for police response and efficiency is relevant to contemporary law enforcement as American law enforcement, in general, continues to be asked to do more with less. Each law enforcement jurisdiction is comprised of differing demographic, geographic, and financial challenges that must be addressed. However, the overall economic decline within the country will force law enforcement to seriously seek alternative means to stretch resources to meet demands in the most fiscally responsible manner as possible.

The purpose of this research is to explore recent extended capabilities and also current and future technologies that impact or soon will impact the manner in which law enforcement operates. These technologies are designed to empower officers with information and capabilities beyond what has been previously available. These claimed capabilities will allow law enforcement to promote higher levels of officer safety and project efficiency and, in turn, cost savings.

The method of inquiry used by the researcher included: a review of articles, internet sites, journals, and periodicals. In addition, a survey instrument will be created and distributed to a sampling of law enforcement agencies of varying size and jurisdiction. Finally, personal interviews of experts in various pertinent fields will provide current feedback from those working closely with the technologies being researched.

The researcher discovered that there are many emerging technologies that will impact the future of law enforcement, and although a majority of agencies utilize technology, the extent and capabilities vary. Of these, next generation 911 capabilities will again revolutionize how the public can interact and provide information to law

enforcement by allowing the addition of data capabilities to the current voice system. With careful examination, implementation, and utilization of technology, the officer of today can operate in an environment of unprecedented efficiency.

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INTRODUCTION

Technology has and will continue infiltrating every facet of society, including law enforcement. Technological advances are being disclosed in rapid-fire succession from competing developers in search of the newest “necessity” or support infrastructure that allows greater capabilities to an ever-increasingly mobile and connected community. Technology sometimes permeates the public safety environment faster than it has been able to react. Identifying the challenges and opportunities that public safety will need to engage and prepare for are critical.

Law enforcement must strive to meet the changing environment in which they are required to operate. The safety, security, and needs of the community of which law enforcement serves demands that resources and changes occur within the police organization to keep pace with the expectations and capabilities of citizens. Perhaps the most significant challenge in meeting these expectations lies within the shrinking fiscal parameters that much of law enforcement is experiencing.

The purpose of this research is to explore which technologies have a direct impact on service provided to citizens in correlation to the most basic of police services. The researcher asserts that the most basic of services is the retrieval of information from the citizen in need and the distribution of that information to the responding police officer. Technologies that allow officers to arrive on scene quicker and with more information at his/her disposal will ultimately increase the confidence of the citizen in need and simultaneously increase officer safety and efficiency. If this efficiency can keep more officers available to respond to emergencies and decrease the response

time of those officers, then this can directly relate to the quality of life of the citizen because, in the public safety arena, seconds really do count.

Specific examination and attention will be given to the pathway of information from the capabilities of the national emergency number system (911) to getting that information into the hands of the responding officers. Exploration of several mobile computing software applications will be explored to assist agencies in determining what capabilities are available and which should be considered minimum acceptable standards for their implementation. The researcher intends to include a review of articles, internet sites, journals, personal interviews, and a survey of capabilities distributed to law enforcement agencies in the method of inquiry.

The researcher anticipates finding that capabilities of getting information to officers, while generally similar in concept, will vary from agency to agency. Poorly implemented or designed software and mobile infrastructure will also play a role in determining if the technology available is truly an asset to the officer in need. Technology that performs poorly or fails to provide real time information may actually inhibit the response and effectiveness of the responder.

This research will aid in the decision-making process of police administrators, budget planners, and operational managers in determining what technologies are currently available and what is on the horizon. In addition, this research will explore what technologies are positively influencing the law enforcement field and what expectations may be present within the community as to the technology available to its officers and telecommunicators.

REVIEW OF LITERATURE

An ever-increasing demand on available resources has caused many public safety agencies to explore techniques to increase efficiency. With the current economic conditions, public safety will continue to have to do more with less (L. Harrell, personal communication, October 14, 2008). The city of San Jose, California, considered one of the nation's safest large cities, stated that they had to support a 15% growth rate while working with 1998 staffing levels, and employing technology was the clear choice to continue to protect their community (Spagnoli, 2008).

The primary responsibility of any public safety agency begins with the response to calls for police, fire, and medical service. The national emergency number, 911, has become the primary gateway to accessing public safety services, and as of September 2008, 99% of the population of the United States is covered by at least basic service (National Emergency Number Association, 2008). First implemented in Haleyville, Alabama in 1968 (Dispatch Monthly, n.d.), the 911 system has undergone several technological changes. Basic wired 911 services were "enhanced" to include calling number and location information. Wireless calls are now making up about one third of the 240 million calls made to 911 public safety access points (PSAP) annually. Wireless technological improvements, termed phase I and phase II, allows wireless numbers to be transmitted to PSAP's, and in the case of phase II wireless calls, the cellular caller location is transmitted in addition to the calling number (National Emergency Number Association, 2008).

As is the hope with all technological improvements, enhanced 911 service was reported by Athey and Stern (1999) in decreasing response times and increasing

productivity. Despite improvements to the 911 system, in its current form, it is unable to receive text, pictures, and video (Slahor, 2008). Public expectations of emergency capabilities continue to increase, and Furey (2006) posed the question of why individuals have the ability of sending a picture of a new baby to family member via cell phone but not the photo of a crime or accident to 911. To address these and other issues, work within the telecommunications industry is ongoing to bring about what has been termed "Next Generation 911," or NG911, which will provide an environment of seamless voice and data 911 systems (Slahor, 2008). NG911 systems are not anticipated to be available until sometime in 2009.

Beyond technology improvements in 911 systems, which improve efficiency in obtaining public safety access, departments across the nation have implemented widespread use of mobile computer systems within their first responder units. In fact, according to the U.S. Department of Justice, Bureau of Justice Statistics (n.d.), 83% of police agencies and 81% of sheriff's offices' officers were using mobile computers by 2003. The same report showed this as an increase from mobile computer system use at 30% and 28%, respectively, in 1990. Mirroring the propagation of mobile data computers has been the capabilities available within the systems. While original units consisted primarily of computerized records checks and basic dispatch information, today's mobile computers are providing those original features with an enhanced feature set as well as incorporating mobile reporting and graphical information systems (GIS)/mapping technology.

Various concepts are being promoted for mobile reporting from laptop computers to personal communication devices such as Personal Digital Assistants (PDA) and

Blackberry (McDonald, 2007). While the concept of mobile reporting began in the 1970s, today's mobile applications are more robust and, when carefully implemented, can increase officer efficiency. Estimates indicated that as much as 20% of an officer's time is spent writing reports (Brewer, 2007). As such, law enforcement utilization of computer and data devices for report submission has swelled from 9% to 38% between 1997 and 2003 (U.S. Department of Justice, 2008).

GIS technology is one of the newest advents to become prominent in the mobile computer solution. While capabilities vary, the GIS component has evolved significantly over the past several years. Mapping tools, auto vehicle location (AVL), and satellite images overlaid onto maps are further enhancing capabilities. Data contained in accessible layers can also be overlaid onto maps such as hydrant locations, known criminal residences, etc. AVL technology, which indicates unit location on a displayed map, gives both the dispatcher and incident commander information in a graphical, real time format of unit locations. This location information can be used to determine the closest units to emergency calls, calculate response times, and provide turn-by-turn directions to a critical incident. GIS components can also be used to integrate with the 911 phase II technology to pinpoint the whereabouts of wireless callers, again decreasing the response time to an emergency incident (Wandrei, 2007).

GIS solutions can now also go beyond general location information. Officers in the field can retrieve data on previous crimes or time periods utilizing pin maps and other types of graphical display of data. Having information about the location and types of crimes occurring arms the individual officer with information that allows him/her to more informatively apply their preventative patrol (Manson, 2008). GIS information has

further been used to understand spatial distribution of crimes and calls for service and to identify neighborhood safety concerns (ArcNorth News, 2006). According to Cook and Burton (2008), GIS information provides actionable knowledge to help determine what resources need to be allocated, and by pushing this information to field units, it allows better response for units knowing how and where to deploy.

McDonald (2007) summarized mobile technologies as providing information to field officers to be safer and more effective. Mobile reporting reduced paperwork and improved officers' availability. The ability of officers to control their own status freed dispatchers to other tasks and reduced radio congestion. AVL enhanced officer safety and improved dispatcher and supervisor capabilities to monitor and track units.

Efficiency improvements have also been seen as a result of mobile solutions. One United Kingdom police study showed that "mobile data solutions saved officers an average of five hours per week" (McDonald, 2007). The Lancashire Constabulary in the United Kingdom stated, "for every 1000 officers…we can create an increase in visibility equivalent to another 100 officers" (Fillingham, 2007). The Delray Beach Police Department also indicated improved efficiency. They reported an 84% increase in traffic stops and citations. In addition, a substantial decrease was seen in the time taken on the traffic stops, and a decrease in response time to calls for service was also observed (Schoeder & Rubenstein, 2005).

Overall the review of literature tends to support a common theme that the proper implementation and use of technology is having a positive impact on police efficiency and response. Several technologies were specifically discussed including the 911

national emergency number and its various iterations, mobile reporting capabilities, and the advent of GIS technology being pushed to the end user.

METHODOLOGY

The research question to be examined considers whether technology is creating a more efficient and safe environment for the police officer. The research will limit this inquiry to efficiency and safety in regards to the initial receipt of a request for service and the response by the first responders. Further, the technology available and in use by the responders will be examined.

The researcher hypothesizes that law enforcement is and will continue using technology to provide a more efficient environment for officers. Economic conditions would seem to continue to drive this trend toward technology, and the researcher believes that law enforcement will continue to shift toward technology to address this concern. Furthermore, the researcher believes that providing additional information to field units increases the safety of those responders.

The method of inquiry will include: a review of articles, Internet sites, periodicals, and journals. This review of articles will focus specifically on experts in both technology and its use in the law enforcement arena. Additionally, a survey will be created and distributed to 20 Texas law enforcement agencies of varying jurisdiction, size, and demographics,

The instrument that will be used to measure the researcher's findings regarding the subject of increased officer efficiency will include a survey to examine what technologies are currently being employed by the agencies polled. More specifically, the instrument will look at technology affecting the first responder and dispatcher in the

efficiency of getting the first personnel to the emergency location. The size of the survey will consist of 21 questions and will be distributed to 20 survey participants. The survey was distributed to representatives from municipal police departments and county sheriff's offices. Representation in the survey will be limited to Texas law enforcement agencies.

The response rate to the survey instrument resulted in 17 responses or 81% of those surveys that were distributed. Of those responses, some agencies failed to complete some sections. In other responses, there were indications that they did not know the information requested.

The information obtained from the survey will be analyzed by breaking out technological components into separate fields. This breakout will then be examined to determine the percentage of agencies employing the specific technology. Additional questions will then be examined and reported as to the survey participant's opinion in regards to increased efficiency and whether the technology is meeting needs of the agency.

FINDINGS

It has been asserted that technology will play a key role in the future of every business or organization future, and law enforcement is no exception. Budget constraints and an ever-increasing demand on resources and quality of service expectations from the public will force law enforcement entities to investigate and embrace more technology to increase the capabilities of the officer in the field. Because technology will permeate most aspects of the law enforcement function, the current focus is on the basic question of response. This response incorporates the fundamental

receipt of the information at the dispatch center, officer response, officer safety, information available in the field, and field reporting capability, which, cumulatively, has been termed officer efficiency by the researcher.

Through a survey instrument, several questions were posed regarding whether mobile computers were being employed and to what degree they were being employed in certain topic areas. Results from the respondents to the inquiry showed that in excess of 94% were using mobile computers with some type of data communication to allow the transfer of data with a dispatch center. Of those agencies reporting this capability, over 94% indicated that they were able to send and receive information regarding calls for service information and update their units' status accordingly.

In addition to basic dispatch functions, 82% of those responding agencies indicated an ability to submit offense/incident reports remotely from the field. Mobile reporting dropped significantly when accident report submission was also queried. Figure 1 below shows the distribution of those agencies with offense/incident and accident report capabilities as well as the percentage with no mobile reporting capability.

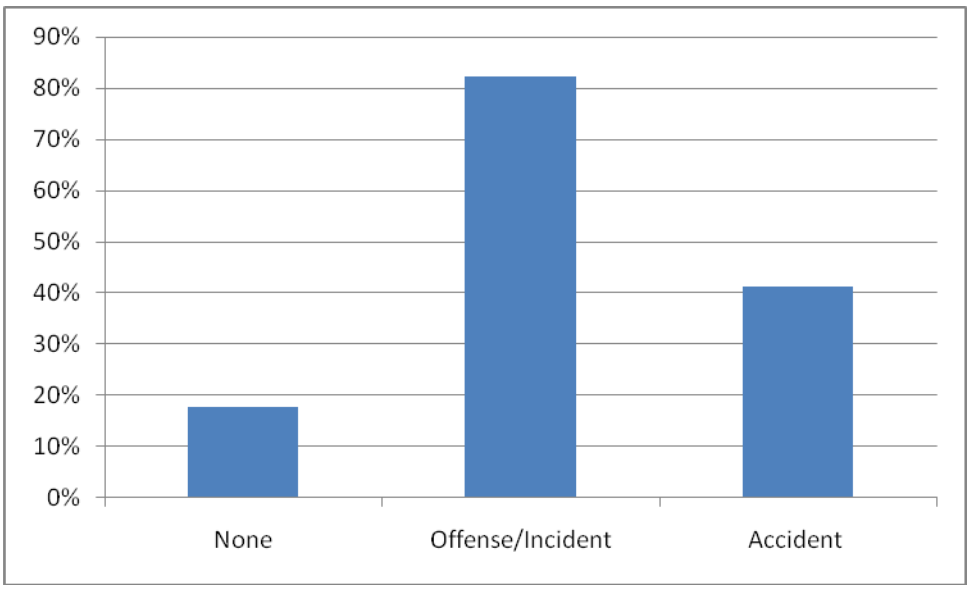

Figure 1. Shows the percentage of respondants with the ability of submitting various types of reports from the field.

Beyond mobile reporting, some of the newest technology becoming available incorporates graphical information systems (GIS) in the form of data being displayed over computerized maps. Of those surveyed, 47% reported having some aspect of mapping in place and in use in their first responder units, see Figure 2.

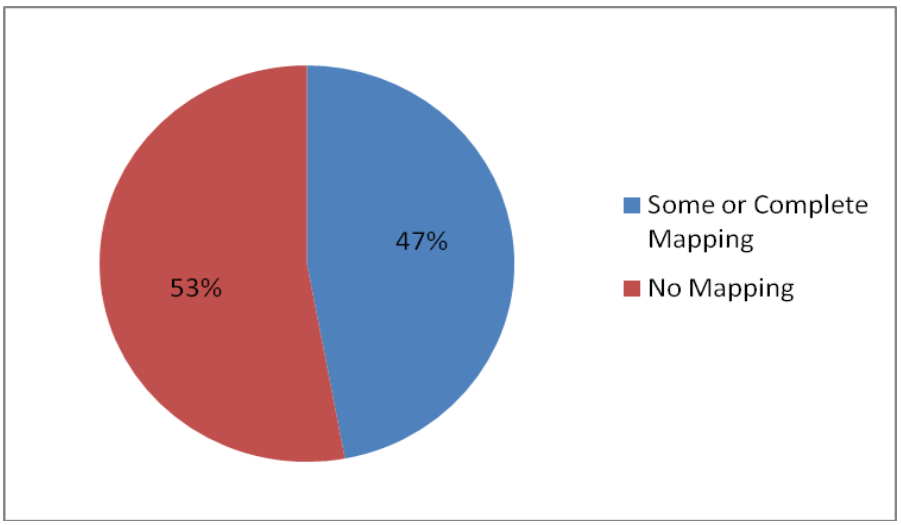

Figure 2. Respondants of survey instrument employing at least limited mapping (GIS) capabilities.

One of the most important safety enhancements that can be added after the introduction of GIS functionality is the auto vehicle location function (AVL). AVL essentially uses a global positioning receiver in the unit to transmit the unit's location, speed, and direction to others attached to the system. The advantages of knowing a units whereabouts at all times not only improves officer saftey but allows for the more appropriate allocation of units to emergency calls for service and serves to provide invaluable information to commanders in the field for allocation of resources. Figure 3 shows the percentage of respondants that stated their use of AVL technology.

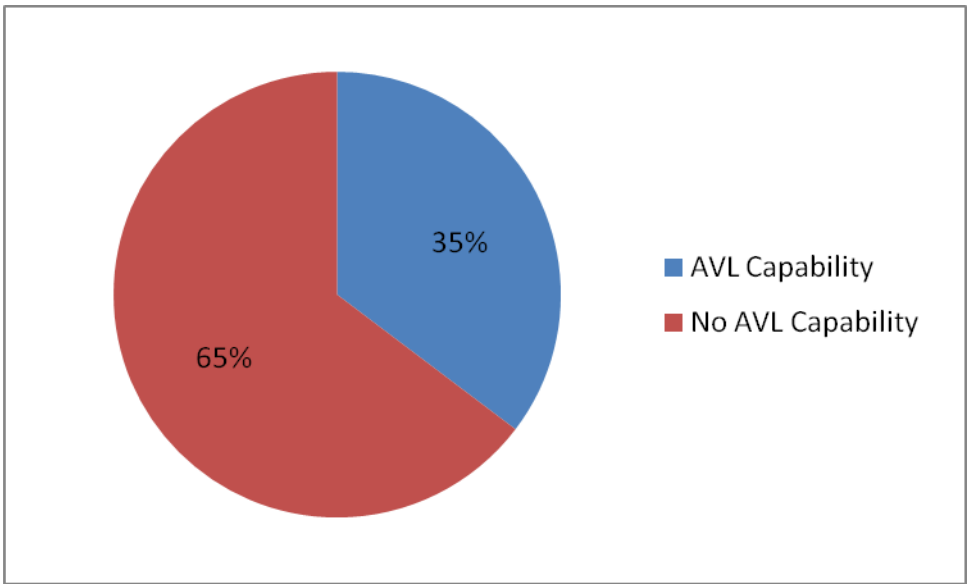

Figure 3. Shows the percentage of respondants currently using auto vehicle location.

Perhaps most important to the topic being researched is the question of efficiency. There are many vendors or sources of computer applications and other technology discussed. Agencies must, therefore, carefully weigh which components provide them with the greatest benefit. The results of the survey showed varying degrees of capabilities amongst various applications, but all in all, 82% reported that

their agency sees the technological improvements as improving their efficiency (see Figure 4).

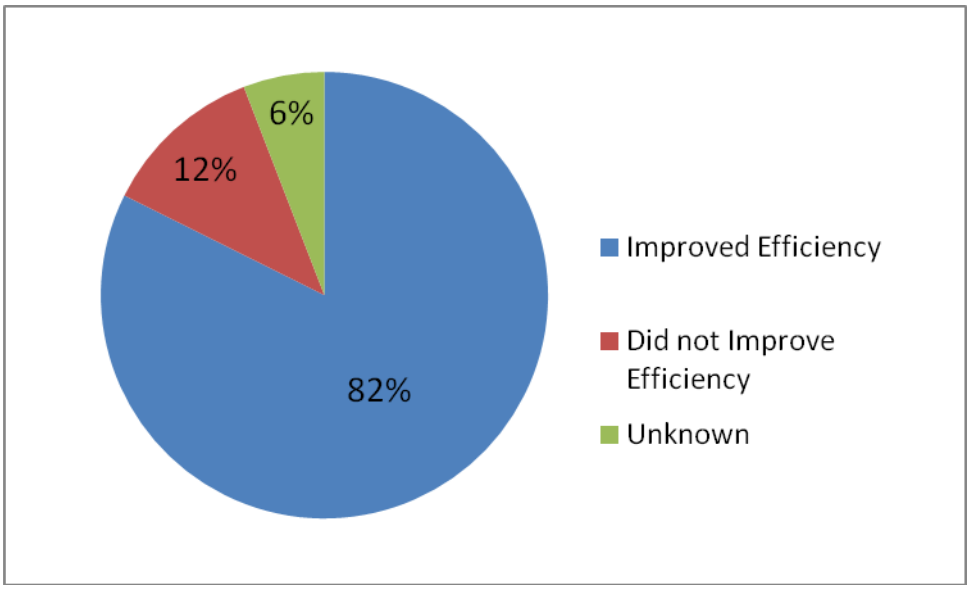

Figure 4. Respondants information regarding efficiency changes as a result of mobile computers.

DISCUSSION/CONCLUSIONS

The issue examined by the researcher considered whether technology is impacting the manner in which law enforcement operates. In a world that continually evolves through ongoing technological improvements, law enforcement executives will need to stay abreast of capabilities and trends that influence their community, officers, and fiscal requirements. Maintaining a balance, from finite budgets, for existing operational needs and exploring, researching, and implementing technology in various fields of law enforcement will be an issue for the foreseeable future.

The purpose of this research was to examine and identify some of the technological innovations that are occurring or are just on the horizon. Because the topic of technology is infiltrating every aspect of law enforcement, the researcher chose

to narrow the field of focus to just the primary response to emergency situations and identify technologies that specifically correlate to the officer's ability to locate and respond with the greatest amount of information at his/her disposal.

The research question that was examined focused on emerging technology in the current national emergency number system (911), mobile data solutions available in the patrol vehicle, and the emerging trends in geographical information systems. Changes to the 911 system were discussed and how that will impact the information available to law enforcement even before the arrival of the first responder. Mobile data solutions and GIS capabilities were examined to determine what capabilities and resources were available and how they were being utilized by law enforcement in the field.

The researcher hypothesized that although many police agencies utilize the various technologies reported in this research, the capabilities of these technologies would vary broadly from agency to agency. The researcher anticipated that 911 capabilities would tend to be more uniform because of the regional providers and dependence upon the phone companies involved. He further believed that mobile computing capabilities and newer technologies emerging in GIS would show a much wider range of utilization and functionality.

The researcher concluded from the findings that, overwhelmingly, agencies tended to state that technology has had a positive impact on the efficiency of their personnel. Again, some 94% of those surveyed indicated the use of mobile computers in their police units, and over 80% of these were able to submit offense/incident reports from these devices. When queried about the ability to submit accident reports, the

percentages began to drop markedly. When looking at GIS capabilities, the utilization rate dropped below 50%. One important element of GIS, auto vehicle location (AVL), was present in only about one third of the agencies surveyed.

The findings of the research did support the hypothesis. The reasons why the findings did support the hypothesis are probably due to a wide range of cities surveyed from large to small and some whose financial resources are much greater than others. Additionally, the utilization of disparate software vendors will inherently provide some differing capabilities. Agencies and software vendors' ability to recognize, develop, and implement technology will occur at varying rates.

Limitations that might have hindered this study resulted because the sample size was somewhat limited and only included agencies from the state of Texas. Further, some respondents were not experts in the field that the survey covered, and their understanding of some of the technical aspects may have been limited. For example, an operator of mobile field computing equipment may not have been familiar with the level or capabilities of a 911 phone system.

The study of technology for safety and efficiency is relevant to contemporary law enforcement because agencies need to be able to meet the expectations of the citizens that they serve in responding to emergency situations while doing so in the most efficient and cost-effective manner possible. Identifying and assessing what limited resources should be applied to what purpose will continue to occupy those that create and approve budgets, as they must keep in mind the safety of both the officer and citizenry.

Police executives and budget decision-makers stand to be benefit from the results of this research as they plan for the future. They must be forward thinking, planning to meet the challenges of an ever-changing environment. They must prioritize their resources to provide the officer and citizen with the assets that will ensure a safer and more efficient world for them both.

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APPENDIX/APPENDICES

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This survey is intended to collect data in conjunction with research to meet partial requirements of the Law Enforcement Management Institute of Texas, Leadership Command College. Data being collected extends to technology in place as it relates to police response, efficiency, and safety.

Name of Agency: _____

Number of Sworn Officers: _____

Population Served: _____

Does your agency have a police employee or full time city employee dedicated to technology for the police department? Yes / No

Dispatch 911 Capabilities

Does your agency have the capabilities to receive any of the following via its 911 telephone system?

Text messages Yes / No
Photographs Yes / No
Video Yes / No

Mobile Computer Capabilities

Does your agency utilize mobile computers in its police units? Yes / No
(*if no, this concludes your portion of the survey.)*
What type of data connection is being used in the mobile units?
Cellular / Radio / 802.11 / other (*Circle all that apply*)

Please place a check next to the mobile computer capabilities, listed below, currently in use at your agency.

Receive information related to assigned calls for service _____

Change unit status _____

Run checks through NCIC/TCIC for Persons _____

Run checks through NCIC/TCIC for Vehicles _____

Run checks through NCIC/TCIC for Property _____

Display unit status of all units in service _____

Research previous calls for service _____

In vehicle mapping _____
(electronic maps indicating location of calls for service)

In vehicle routing _____
(turn by turn directions on how to get to location)

Auto Vehicle Location _____
(Display real time location of units in dispatch on a map)

Auto Vehicle Location in Field _____
(Same as above viewed by a unit in the field on a map)

Create and submit electronic offense/incident reports _____

Create and submit electronic accident reports _____

Ability to retrieve photo/video/fingerprint information _____

Do you feel that technological advances have increased the efficiency of your personnel? Yes / No (Circle One)

Do you feel that your current mobile computing technology is meeting all of the officers needs in the field? Yes / No (Circle One)

If no to the previous question, what do you see as important improvements that need to be made?

_____
_____
_____

Thank you for your time and attention in completing this survey.