Identifying and Measuring the Effects of Information Technologies on Law Enforcement Agencies

The Making Officer Redeployment Effective Program

A Guide for Law Enforcement

Elizabeth Groff | Tom McEwen

ILJ

COPS
COMMUNITY ORIENTED POLICING SERVICES
U.S. DEPARTMENT OF JUSTICE

Identifying and Measuring the Effects of Information Technologies on Law Enforcement Agencies

The Making Officer Redeployment Effective Program

A Guide for Law Enforcement

Elizabeth Groff | Tom McEwen

Institute for Law and Justice
1018 Duke Street
Alexandria, Virginia
Phone: 703.684.5300
Fax: 703.739.5533
E-Mail: ilj@ilj.org

April 2008

Letter from the Director

One of the challenges often presented to law enforcement agencies is the need to determine the potential effects that result from implementing technologies. Identifying and measuring the benefits of acquiring new technologies, or upgrading outdated systems and equipment, enable agencies to justify their expense to local government and to community stakeholders. The benefits that technologies provide can assist agencies in reaching department goals and objectives.

This guide, one of the many resources that the COPS Office offers to law enforcement, provides information on the effects of technologies typically acquired by law enforcement agencies. The guide focuses on the Three E's—efficiency, effectiveness, and enabling—which identify the different ways the technology may affect your agency. All three may play a role in assessing the benefits, for example, of acquiring a new automated field reporting system or upgrading your records management system.

The guide is based on the results of an assessment of the COPS Office's 2002 Making Officer Redeployment Effective (MORE) grantees; however, the results apply to any agency that is considering or has recently made a technology purchase. Including our 2008 grants, the COPS Office has provided more than $2 billion in funding for crime-fighting technology and is keenly aware of the challenges of measuring the impact of law enforcement technologies. We hope this publication will address your needs as you seek to identify the myriad ways that technology purchases can benefit your agency.

In addition to this publication you may also find our series of *Law Enforcement Tech Guides* useful to your agency. They include *Law Enforcement Tech Guide: How to Plan, Purchase and Manage Technology* and *Law Enforcement Tech Guide for Creating Performance Measures that Work.* These guides, and many of our other knowledge-based resources can be downloaded from www.cops.usdoj.gov, or they can be ordered free of charge by calling the COPS Office Response Center at 800.421.6770 or by e-mail at askCOPSRC@usdoj.gov.

I hope that you find this particular guide both informative and helpful, and I encourage you to share it with other law enforcement practitioners.

Carl R. Peed
Director
Office of Community Oriented Policing Services

Contents

Exhibits

Acknowledgments

Chapter **1**

Measuring the Effects of Implementing Information Technologies

This guide will help police departments measure the effects of implementing the information technologies that they have acquired to support community policing activities. The guide is relevant to police departments of all sizes and covers a variety of applications—automated field reporting systems, computer aided dispatch, records management systems, arrest and booking systems, automated fingerprint identification, crime analysis and mapping, and others. The intent is to provide practical measures for how information technologies contribute to achieving department goals.

The COPS MORE Program

Recognizing the potential of information technologies to enhance police operations, the Office of Community Oriented Policing Services (the COPS Office) sponsored the Making Officer Redeployment Effective (MORE) program between 1995 and 2002 to support and encourage police department investments in this area. The overarching objective of the COPS MORE program was to increase the time available to police personnel for community policing activities by funding technology that enabled a department to operate more efficiently. In total, COPS MORE grants helped more than 4,500 law enforcement agencies acquire and implement technology in support of efficient community policing operations. The grants totaled more than $1.3 billion and funded crime-fighting technologies that helped redeploy the equivalent of more than 42,000 full-time law enforcement professionals into community policing activities.[1]

A primary aim of the COPS MORE program was to increase the ability of patrol officers to solve community problems. Installation of mobile digital computers in patrol cars, for example, could enable officers to receive information about local crime and disorder problems while on patrol, thereby improving their ability to address community issues quickly and effectively. The COPS MORE program also provided an opportunity for police departments to operate more effectively by providing technology to support such tasks as analyzing crime data for trends, mapping crime hot spots, analyzing latent fingerprints through automated fingerprint information systems, and redeploying patrol officers with computer aided dispatch systems.

[1]See COPS Fact Sheet, *Making Officer Redeployment Effective (MORE) Using Technology to Keep America's Communities Safe*. U.S. Department of Justice Office of Community Oriented Policing Services, 2006.

During a 2-year period starting in mid-2004, the Institute for Law and Justice, Inc., (ILJ) periodically interviewed key personnel in the 290 police agencies that received 2002 COPS MORE grants. The purpose of the interviews, which were conducted by telephone approximately every 6 months, was to assess agencies' progress toward acquiring and implementing information technologies (hardware and applications) and, more important, to obtain information about the effects and benefits of these technologies. Typical interviews required at least an hour to conduct and, in many agencies, several people were interviewed. More than one interview was required when different personnel in an agency had responsibilities for different applications.

Multiple interviews during the 2-year period were needed because agencies were experiencing delays in acquiring and installing new systems. Indeed, studies of information systems in police departments have found that it can sometimes take years to complete installation of applications because of a variety of factors such as problems with vendors, changes in policies and procedures, or budgeting funds for acquisitions.

Our telephone interviews determined that the main acquisitions by the 2002 COPS MORE grantees were as follows:

Hardware
- Mobile digital computers (MDC) for patrol cars
- Personal computers and laptops for support and analysis.

Applications
- Automated field reporting systems (AFRS) for preparing reports in the field and transmitting them to a central repository
- Computer aided dispatch (CAD) systems to enhance police communications among citizens, dispatchers, and patrol officers
- Records management systems (RMS) to expand and improve local capabilities for storing and accessing police records

- Arrest and booking systems for improved operations in local jails

- Automated fingerprint identification systems (AFIS) for obtaining, storing, and analyzing fingerprints

- Crime analysis and mapping systems to expand a department's capabilities in analysis.

Within the framework of the COPS MORE program, the implementation of information technologies was viewed as a way to enhance a department's capabilities that, in turn, would contribute to achieving overall goals. For example, acquisition of CAD and RMS applications coupled with MDCs in patrol cars enables officers to obtain information in a faster and more efficient manner. Bulletins about crime hot spots can be provided to patrol officers, who can then concentrate their available time in those areas to reduce crime.

As another example, an AFRS available through MDCs in patrol cars allows officers to remain in their patrol areas and complete incident reports more quickly than in the past. Time recovered from faster report preparation can be devoted to addressing community problems.

The above examples illustrate an important point about measuring the effects of information technologies: the link between information technologies and achievement of department goals is a two-step process. Implementing information technologies is the first step in the process, while the second step is using recovered time appropriately to achieve department goals.

Measuring department goals such as crime reduction, increases in arrests, and clearance rates is of paramount importance to a police department. Citizens judge the performance of police departments on the basis of changes in these measures. As reflected in this guide, police departments should also be interested in developing performance measures for information technologies to gauge whether they are improving department operations and how they are related to the achievement of departmental goals. Measuring the amount of time saved through implementing MDCs and an AFRS should be important to a police department because it indicates

how much additional time patrol officers have for activities directly related to community problems. Further, if department goals such as crime reduction and problem alleviation are achieved, then knowing the amount of time saved supports the investments made in information technologies.[2]

Another finding from the interviews with grantees was that information technologies have different effects on different personnel within a police department. For example, while an AFRS has a major impact on patrol officers, it also affects the activities of field supervisors, records section personnel, crime scene specialists, and others. Field supervisors are affected because they can review incident reports online and send messages requesting corrections back to patrol officers. Records section personnel are affected because they are relieved of the responsibility for entering information into a records management system and may no longer need to manually distribute reports to other units in the department. Impact measures of information technologies, therefore, should include all affected groups in a department. Our interviews confirmed the importance of addressing the effects in a broad fashion.

Assessing Information Technologies: The Three E's

The approach used in this guide for measuring the benefits of information technologies is the "Three E's"—efficiency, effectiveness, and enabling. Briefly, *efficiency* means getting a task done with a minimum expenditure of time and effort. An AFRS, for example, might allow an officer to complete an incident report in 20 minutes, compared to 40 minutes before the system was installed. The AFRS, therefore, is assisting patrol officers to be more efficient in preparing their reports. *Effectiveness,* on the other hand, means doing a better job to produce an intended or expected result. An AFRS should improve the accuracy and completeness of reports, thereby making the reports more beneficial for investigations, problem solving, crime analysis, and other department operations. Finally, technologies often *enable* police to do something they could not do before. An AFIS system, for example, enables extensive searches of latent prints that would have been impossible to accomplish manually. The result will be an increase in arrests and crime clearances.

[2]One caveat is important in this example. Some agencies believed that officer time for report preparation increased after an AFRS was implemented. The usual reason given for the increased time was that more information was collected and that online editing of reports placed an additional time burden on officers. In this regard, it would be important for an agency to determine how the additional information was applied in the department and whether the improved quality of information led to improvements in other department operations, such as crime analysis.

In this guide, we have provided numerous suggestions for measuring the Three E's provided by information technologies, with an emphasis on addressing all personnel affected by implementation. The result is a thorough treatment of the impact of information technologies on the operations of a police department. We also illustrate the relationship between these measures and department goals of crime reduction, increased arrests, problem solving, and others.

Highlights of the COPS MORE 2002 Survey Results

In the interviews conducted by ILJ personnel, grantees were asked about the technologies acquired, reasons for acquiring the technology, current status of implementation, implementation strategies, amount of training provided, changes to existing policies and procedures, other information technologies at the agency, how the hardware acquisitions fit with the software acquisitions, and the effects and benefits of the technologies.

Exhibit 1-1 summarizes the information technologies that were obtained by the 2002 COPS MORE grantees. The most frequent hardware technology acquired was the laptop or MDC, with 67 percent of agencies acquiring them. The MDCs were almost always coupled with the acquisition or expansion of applications such as AFRS, CAD, and RMS.

Exhibit 1-1: Information Technologies Acquired in the 2002 COPS MORE Program.

Information Technology	Number of Agencies	Percent
Laptops or MDCs (average of 30 per agency)	179	67.0
Automated Field Reporting System (AFRS)	79	29.6
Records Management System (RMS)	65	24.3
Personal Computers	55	20.4
Computer Aided Dispatch (CAD) System	45	16.9
Automated Fingerprint Identification System (AFIS)	26	9.6
Arrest and Booking System	20	7.5
Crime Analysis System	13	4.9
Mapping System	13	4.9
Other Acquisitions	87	32.6

Almost 30 percent of the agencies surveyed acquired an AFRS, which was the largest proportion of application software. RMSs were obtained by 24.3 percent of the grantees and CAD systems by 16.9 percent. About 10 percent of the agencies acquired AFIS. The fewest acquired systems were computer mapping and crime analysis systems—perhaps because most agencies already had these systems in place. Other technologies acquired by the grantees included both hardware and software technologies (e.g., handheld portable devices, automated outcall notification systems, crisis management software, wireless base stations, scanners).

Other overall findings from the interviews were as follows:

- 43.4 percent of respondents (116 agencies) reported having a strategic plan for using information technologies.
- Respondents offered the following reasons (many gave more than one reason) for obtaining information technologies:
  » Opportunity arose because grant funds became available: 220 agencies (82.4 percent)
  » Agency head wanted the technology: 87 agencies (32.6 percent)
  » An employee pushed for the technology: 74 agencies (27.7 percent)
  » Current technology needed upgrading: 71 agencies (26.6 percent)
  » A strategic plan was developed that included the technology: 69 agencies (25.8 percent)
  » An improved technology came on the market: 35 agencies (13.1 percent)

Of course, an important aspect of the interviews was to measure outcomes from the acquisition of the information technologies. Respondents described about 1,400 potential effects or benefits of the COPS MORE grants. Exhibit 1-2 summarizes selected effects or benefits for each information technology along with the personnel who were primarily affected, and Exhibit 1-3 expands the list to provide a comprehensive overview of all effects and benefits noted by respondents and all affected personnel.

Exhibit 1-2: Selected Effects and Benefits of Information Technologies.

Automated Field Reporting Systems

- » Less time needed to complete reports (patrol officers)
- » Reduced travel time to stations for report preparation (patrol officers)
- » Easier report approvals (by field supervisors and patrol officers)
- » More time in community (patrol officers)
- » Improved quality of reports (field supervisors and patrol officers)

Computer Aided Dispatch Systems

- » Faster access to information (patrol officers)
- » Decline in voice traffic (dispatchers)
- » Easier tracking of officers (field supervisors)
- » Improved information from dispatchers (patrol officers)
- » Ability to record self-initiated activities (patrol officers)
- » Improved information for investigations (detectives)
- » Can get call history of location (patrol officers)

Record Management Systems

- » Faster access to information (patrol officers and command staff)
- » Improved information about crime and calls for service (command staff)
- » More accurate information (command staff)
- » Improved UCR reporting (records section personnel)
- » Reduced data entry (records section personnel)
- » Improved investigative case management (command personnel)

Arrest and Booking Systems

- » Decreased time to book an arrestee (patrol officers)
- » More accurate identification of arrestee (patrol officers)
- » Easier to take and store mug shots (patrol officers and booking personnel)

Automated Fingerprint Identification Systems

- » Faster fingerprinting (booking personnel)
- » More accurate identification of arrestee (booking personnel)
- » Improved identification of suspects through latent fingerprints (detectives)

Crime Analysis Systems

- » Better information for allocation of patrol (command staff)
- » More complete information on crime patterns and trends (command staff)
- » Increase in breadth and depth of information (command staff)

Mapping Systems

- » Improved communication with community (patrol officers)
- » Better information for patrol allocation (command staff)

The three greatest effects or benefits of technology acquisitions identified in the interviews of COPS MORE 2002 grantees were the following:

1. Increased information available in patrol cars.

2. Faster access to information (usually because officers could obtain it themselves).

3. Easier completion of reports (often involving entry of reports while in the field).

The mechanism underlying the first two benefits is the presence of some kind of computer in the patrol car with wireless access to the National Crime Information Center and appropriate local and state-level counterparts. Another benefit was access by patrol officers to other police databases from the patrol car (e.g., mug shots, local warrants, and call histories of addresses). The investments by law enforcement in mobile data computers or terminals and wireless infrastructure provided officers in the field with more information, more quickly. These acquisitions not only allowed officers to be more efficient (e.g., they could run tags more quickly to identify stolen vehicles) but also more effective (e.g., they could make more arrests). Further, they enabled officers to fill out crime reports more completely and more legibly than before. Improvements in report quality enable crime analysts to be more effective in their jobs of identifying crime trends and crime hot spots, as well as making recommendations on how to prevent crime.

Related Publications

This guide supplements other publications produced by the COPS Office that provide information about the process of acquiring information technologies. Here is a sample of related publications.[3]

- *Law Enforcement Tech Guide. How to plan, purchase, and manage technology (successfully!) A Guide for Executives, Managers and Technologists. 2002.*

- *Law Enforcement Tech Guide for Information Technology Security. How to Assess Risk and Establish Effective Policies. A Guide for Executives, Managers, and Technologists. 2007.*

[3]These publications and others are available at www.cops.usdoj.gov and can be obtained from the COPS Office on a CD entitled *Tech Docs: Technology Resources for Law Enforcement*, Version 1.3.

- *Law Enforcement Tech Guide for Small and Rural Police Agencies. A Guide for Executives, Managers, and Technologists. 2007.*
- *Policing Smarter Through IT: Learning from Chicago's Citizen and Law Enforcement Analysis and Reporting (CLEAR) System. 2004.*
- *Policing Smarter Through IT: Lessons in Enterprise Implementation. 2004.*
- *Standard Functional Specifications for Law Enforcement Computer Aided Dispatch Systems (produced by the Office of Justice Programs, U.S. Department of Justice).*
- *Standard Functional Specifications for Law Enforcement Records Management Systems (produced by the Office of Justice Programs, U.S. Department of Justice).*
- *Tips for Ensuring Successful Technology Implementation (Fact Sheet). 2006.*

Organization of the Guide

The remaining sections of this guide are organized as follows. Chapters 2 through 7 provide measures of efficiency, effectiveness, and enabling for the following information technologies:

- Chapter 2: Automated Field Reporting Systems.
- Chapter 3: Computer Aided Dispatch Systems.
- Chapter 4: Records Management Systems.
- Chapter 5: Arrest and Booking Systems.
- Chapter 6: Automated Fingerprint Identification Systems.
- Chapter 7: Crime Analysis and Mapping Systems.

Readers can proceed to the applications of interest rather than moving through the chapters sequentially.

For interested readers, Appendix A provides a summary of information technologies in policing with an emphasis on how these technologies support department operations such as patrol, crime analysis, problem solving, investigations, and others. Appendix B provides additional information on the concepts underlying efficiency, effectiveness, and enabling (the Three E's), and describes the foundation for the measurements provided in this guide.

Exhibit 1-3: Summary of the Effects and Benefits for Personnel Affected.

	Dispatchers/Call Takers	Patrol Officers	Field Supervisors	Detectives	Crime Scene Technicians	Command Staff	Records Personnel	Booking Personnel	Analysts
Automated Field Reporting System (AFRS)									
Less time needed to complete reports		X			X				
Less travel time to fill out reports		X							
Easier report approvals		X	X		X				
More time in community		X							
Improved quality of reports		X	X		X				
Better information to support proactive policing		X	X						
Reduced workload	X						X		X
Easier to read reports				X	X		X		X
Computer Aided Dispatch (CAD)									
Faster access to information	X	X	X			X			
Decline in voice traffic	X								
Easier tracking of officers	X		X						
Improved information from dispatchers		X							
Ability to record self-initiated activities		X							
Easier queries for investigations		X		X					
Can get call history of location	X	X							
Increased information in patrol cars		X							
Better communication with others		X	X			X			
Field access to mug shots		X							
Improved response time		X							
Increased officer safety		X							
Easier entry of citizen and other information	X								
Improved validation of caller's address	X								

	Dispatchers/Call Takers	Patrol Officers	Field Supervisors	Detectives	Crime Scene Technicians	Command Staff	Records Personnel	Booking Personnel	Analysts
Less time to obtain citizen information	X								
Improved information on call location	X								
Improved map of call location	X								
Improved system for call types	X								
Improved system for unit designations	X								
Capability to stack calls	X								
Improved information for patrol deployment									X
Improved information for hot spot analysis									X
Improved information for community policing									X
Improved information for mapping									X
Improved communication with officers			X						
Record Management System									
Faster access to information		X	X	X		X	X		X
Improved information on crime and calls for service						X			
More accurate information			X			X	X		X
Improved UCR reporting						X	X		
Reduced data entry							X		
Improved investigative case management						X			
Improved tracking of officer activities						X			
Improved property/evidence management						X			
Improved access to call histories						X			
Improved information on traffic accidents						X	X		
Improved warrant tracking						X			

	Dispatchers /Call Takers	Patrol Officers	Field Supervisors	Detectives	Crime Scene Technicians	Command Staff	Records Personnel	Booking Personnel	Analysts
Improved tracking of gangs						X			
Better communication with others						X			
Easier queries to obtain information						X	X		
Improved tracking of crime reports							X		
Fewer requests for records							X		
Improved information for community policing		X							
Improved quantity of information			X	X					
Improved access to criminal histories				X					X
Arrest and Booking Systems									
Decreased time to book an arrestee		X						X	
More accurate identification of arrestee		X		X				X	
Easier to take, store, and retrieve mug shots		X					X	X	
Improved tracking of evidence				X				X	
More flexible use of digital photos				X					
Decrease workload									
Automated Fingerprint Identification Systems									
Faster fingerprinting		X						X	
More accurate identification of arrestee		X						X	
Improved identification of suspects through latent fingerprints				X			X		
Elimination of suspect as perpetrator				X					
Faster identification of suspect		X							
Verification of suspect as perpetrator				X					
More flexible use of digital photos		X		X					
Decreased time to book an arrestee								X	
Easier to take/store mug shots								X	

	Dispatchers /Call Takers	Patrol Officers	Field Supervisors	Detectives	Crime Scene Technicians	Command Staff	Records Personnel	Booking Personnel	Analysts
Improved tracking of evidence								X	
Improved storage of fingerprint information							X		
Better communication with other agencies		X							X
More staff time available due to quicker fingerprinting			X			X			
Crime Analysis Systems									
Better information for allocation of patrol						X			
More complete information on crime patterns and trends						X			
Increase in breadth and depth of information						X			
Use of maps for better information on patrol allocation						X			
Faster turnaround on requests						X			
Improved communication with community		X							
Improved crime-prevention activities		X							
Increased information on crimes		X							
Mapping Systems									
Improved communication with community		X							
Better information for patrol allocation						X			
Improved crime-prevention activities		X							
Improved problem-solving capability		X							
Integration of data from other agencies						X			

Chapter 2

Automated Field Reporting Systems

Description of Automated Field Reporting Systems
Basic AFRS Functions

Until the automated field reporting system (AFRS) was developed and put into use, officers completed handwritten incident reports in the field and submitted them at the end of a shift to a field supervisor. After reviewing and approving reports, field supervisors would send them to a central repository for filing, usually in the department's records section. Personnel in the records section were responsible for distributing copies to other units in the department, such as the appropriate investigative unit, and entering information from the incident reports into a database. Depending on the specific system at a police department, the incident report process could take days, or even weeks, from the time the report was written to its availability in a database.

An AFRS is intended to reduce the time required to complete incident reports and improve the quality of data collected in the reports. An AFRS allows officers to use mobile data computers or laptops to fill out incident reports without leaving their assigned areas. A complete AFRS provides for the following:

- Data entry in the field through a mobile digital computer
- Electronic approval by field supervisors
- Electronic transfer of the approved report to a database.

An AFRS has the potential to achieve benefits in efficiency, effectiveness, and enabling (the Three E's) for patrol officers, field supervisors, records section personnel, and others.

The additional benefit of an AFRS is that a department's records management system (RMS) has the information more readily available for access by others in the department. Detectives can receive crime reports for immediate investigation rather than having to wait for a handwritten report to become available. Crime analysts also have faster access to incident reports for developing crime trends, identifying hot spots, and preparing crime bulletins. Quicker access by command personnel gives them a greater awareness of what is happening in their jurisdiction.

Differences Among Automated Field Reporting Systems

The differences among automated field reporting systems across police departments are primarily a function of the completeness of the systems. In some departments, the AFRS captures only the information in a mobile digital computer and the reports are printed out at a later time for review by supervisors. In other systems, the AFRS allows supervisors to electronically approve reports prepared by officers, but does not automatically transfer the report to a database. Instead, the report is submitted separately either in printed or electronic form for entry into a database.

Of course, there also are significant differences in the amount and types of information captured by an AFRS in different departments. Some systems capture only a minimum amount of information about an incident, while other systems capture detailed information on all aspects of an incident. The amount of time required for preparing a report through an AFRS depends to an extent on the detail of information that is obtained.

Resulting Benefits of Automated Field Reporting Systems

Time Needed to Complete Reports

COPS Making Officer Redeployment Effective (MORE) grantees overwhelmingly stated that, with the implementation of an AFRS, less time was needed to complete incident reports. The largest number of agencies mentioned automated entry and a reduction in drive time as the major factors contributing to time savings. Comments like this were heard frequently: "Most time savings comes from reduced drive times, but some smaller amount of time is saved on report writing." The greatest savings in drive time were reported in jurisdictions where the geographic areas are large. Previously, officers either returned to the stations periodically during their shift to finish reports or completed their reports at the end of a shift. An AFRS allows patrol officers to stay in the community while they complete their reports.

Sources of Time Savings Leading to Greater Efficiency

Survey respondents noted that the most important sources of time savings were:

- Reduced drive time
- Less duplication (i.e., from handwritten notes to form to data entry)
- Digital forms faster to complete.

A majority of agencies also reported that the overall time to complete reports was reduced with AFRS. Most agencies had not measured the time needed to complete a paper report compared to completing an automated one, but about 17 reported time savings for report generation separately from drive-time savings. Almost 50 percent of these agencies indicated that the time to complete a report was reduced by at least half.

Challenges in Measuring Time Savings

Often, the police agencies surveyed found it difficult to compare report-writing time before and after the existence of an AFRS because the amount of information collected on new crime reports had changed. As a result, agency responses varied considerably.

- One agency reported that the average time to fill out a report decreased from 45 minutes to 30 minutes (not including drive-time savings) even though the new reports collected more information (the agency became compliant with the National Incident-Based Reporting System [NIBRS][4] when the system changed).

- Several agencies experienced no difference in the time needed to complete a report.

- A small group of agencies found that data entry was initially slower than writing a report by hand, but as officers gained experience, AFRS was just as fast or faster.

- Generally, most of the time savings (i.e., gains in efficiency) in completing reports occurred because of "self-population of fields" (the software automatically completes certain fields), and because the need to transcribe from handwritten notes to data entry was eliminated.

[4]Compliance with NIBRS requires reporting significantly more information than was reported under the Uniform Crime Reporting (UCR) system.

Faster Approval Process

Electronic approval of reports by supervisors has a variety of efficiency, effectiveness, and enabling benefits. Patrol officers receive quicker feedback on reports and can address problems while the details of the incident are still relatively easy to remember. In addition, reports prepared with an AFRS are generally more accurate initially. Accuracy cuts down on the number of times that officers have to correct or revise a report and the frequency of face-to-face meetings with supervisors, which translates into significant savings for both officers and supervisors. Easier report approval for patrol officers was mentioned by 42 agencies in the COPS MORE interviews.

Field supervisors also experience benefits from electronic approval. They are more efficient because they do not have to locate officers when there are problems with a report (64 mentions). Easier report approval is directly related to the improved quality of reports submitted by officers (36 mentions). Reports are easier to read, more complete, and can sometimes be reviewed in real time.

Automated checking reduces the number of errors in reports and speeds up the review process. Supervisors, therefore, are more efficient (i.e., they can review the reports more quickly) and more effective (i.e., they catch errors the first time, which eliminates the back-and-forth between officers and supervisors).

Faster Report Availability

Because of improvements in the speed with which reports can be filed and approved, it takes less time for reports to become available in a central database. This means that the database is more up-to-date as is the information that analysts use in generating crime alerts and preparing for CompStat meetings (see sidebar). More timely information enables the agency to better react to changes in crime patterns and trends.

AFRS Benefits for CompStat

CompStat is a police management strategy that stresses up-to-date information and accountability. To be successful, CompStat requires that timely information be available to both field commanders and high-level police management.

While CompStat meetings are structured differently in each agency, typical discussions revolve around recent crime trends, arrest activity, and often, quality-of-life indicators.

Finally, records staff do not have to enter the information or make copies of reports. This allows them to take on different duties or simply handle their current responsibilities.

Implications for Effectiveness

A patrol officer's effectiveness is increased by AFRS software features such as pre-population of fields and spell-check, which improve the quality of the end product. Immediate data entry also contributes to effectiveness because details are fresh in the officer's mind, and missing information can be obtained more easily by reinspecting the scene or questioning victims and witnesses. Immediate entry has the added benefit of making the information available to other police personnel more quickly (e.g., investigators or command staff).

Electronic transfer of files brings additional benefits to officers, command staff, and personnel who provide administrative support, such as crime analysts and records department staff. Electronic transfer of reports from the car to a main database speeds the transfer of reports from the field to headquarters and, as noted earlier, it eliminates the need for officers to drive to the station periodically. Eliminating those trips allows officers to spend a greater portion of their time in the community.

Patrol Officers

Patrol officers noted that the quality of information available to them had improved after the agency installed an AFRS because the data entered were more accurate and because more information was available in the patrol car, which is where they needed it the most. Improved quality of information entered into the system stemmed from the automation of forms (i.e., spell-check and validation during data entry) and from not having to decipher handwriting. This, in turn, improved the quality of information that patrol officers received when they queried CAD and RMS.

Effective Use of Time Saved

Many respondents also said that time freed by AFRS enabled officers to engage in more community policing, problem solving, or proactive policing. Several agencies reported that patrol officers spend more time in the community, thereby increasing their visibility. One respondent reported a "drastic reduction in response time because the officers are already in the field patrolling." One agency noted that time savings from AFRS allowed the agency to sustain service levels without hiring more officers.

Report Review by Field Supervisors

As previously mentioned, the ability to review incident reports while in the field was the major benefit to field supervisors. Problems with reports could be resolved faster by contacting patrol officers while the incident was fresh in their minds. Once an incident report was acceptable, a field supervisor could forward the report electronically to a database, making it immediately available for other personnel in the department.

Reduced Workload of Records Staff

Records clerks experienced reduced workloads because they no longer had to enter information from reports into a database. This enabled them to take on new responsibilities. For example, one agency noted that with AFRS, records staff "become the primary contact for nonlaw enforcement duties, which frees police to do more proactive policing.") Members of the records section also gained access to information more quickly. They, as well as the rest of the department, reaped the benefit of having information from reports move electronically from point of entry to a database.

Summary of Responses about Automated Field Reporting Systems

AFRS provided many of the benefits noted by COPS MORE 2002 grant recipients, regardless of the specific features of the technology. Most of the benefits from AFRS accrued to patrol officers and field supervisors, but command staff, dispatchers, analysts, and records personnel benefited, as well.

Listed below are the **primary** and *secondary* benefits noted by survey respondents in discussing acquisition of an AFRS. The list includes benefits that the agencies experienced and expected to see.

Patrol Officers

- **Less time needed to complete reports**
- **Were able to spend more time in the community**
- **Prepared reports with improved quality of information**
- **Received easier and faster report approval**
- *Had improved productivity*
- *Recorded more information in reports*

Supervisors

- **Provided easier and faster report approval**
- **Received reports of improved quality**
- **Received reports with more information**

Records Section Personnel

- **Had reduced workload by no longer entering data from reports**
- *Had quicker access to information*
- *Achieved improved communication with field personnel*

Crime Scene Specialists

- *Required less time to complete reports*
- *Prepared reports that were easier to read*

Outcome Measures for Automated Field Reporting Systems

Suggestions for measuring the effects of the AFRS are summarized in Exhibit 2-1. The exhibit contains the role or roles expected to be affected by the technology acquisition, suggested measures, and the type of effects or benefits expected. It is worth noting that a technology acquisition can affect more than one role in the same manner. For example, reducing the number of errors on a report increases the effectiveness of patrol officers and everyone else who uses that information downstream, such as a line supervisor, the command staff, crime analysts, or detectives.

Exhibit 2-1: Outcome Measures for Automated Field Reporting Systems.

Personnel Affected	Measure		Outcome
Patrol Officers	»	Time spent filling out paper reports vs. automated report	Efficiency
	»	Elapsed Time—taking of incident report to appearance in the database	Efficiency
	»	Elapsed Time—taking of report through supervisor approval	Efficiency
	»	Number of errors per report	Effectiveness
	»	Number of reports rejected by supervisor as illegible	Effectiveness
	»	Number of reports rejected by supervisor for other errors	Effectiveness
Supervisors	»	Number of errors per report	Effectiveness
	»	Number of reports rejected by supervisor as illegible	Effectiveness
	»	Number of reports rejected by supervisor for other errors	Effectiveness
	»	Faster access to reports	Effectiveness
Records Personnel	»	Faster access to information	Effectiveness
	»	Number of new activities because of freed time	Enabling
Crime Scene Specialists	»	Time spent filling out paper reports vs. digital report	Efficiency
	»	Elapsed Time—taking of incident report to appearance in the database	Efficiency
	»	Elapsed Time—taking of report through supervisor approval	Efficiency
	»	Number of reports rejected by supervisor as illegible	Effectiveness
	»	Number of reports rejected by supervisor for other errors	Effectiveness

Chapter 3

Computer Aided Dispatch Systems

Description of Computer Aided Dispatch Systems

Basic Functions

A computer aided dispatch (CAD) system manages the call taking and dispatching functions of a police department. For citizens calling a police department for assistance through emergency (911) and nonemergency telephone numbers, the CAD system is the starting point for recording information about an incident. Call takers enter information from citizens into the CAD system and the system transmits the information to the appropriate dispatcher for dispatching patrol units to a scene.[5] An agency's CAD system may also capture information about self-initiated activities (e.g., traffic stops, motorist assists, and others) from patrol officers in the field. Further, calls may automatically come into a CAD system from alarms, web-based applications, and other entry points.

Unlike other information systems, a CAD system is a real-time application that operates 24 hours a day in most communities and has been termed the nerve center of a communications center. Information typically captured in CAD systems includes address of the call, type of call, call priority, patrol unit(s) dispatched, time of arrival of units at the scene, time the call was completed, call disposition (report taken, arrest made, etc.), incident report number (usually generated by the CAD system), and patrol area. A geocoding system within a CAD system will perform several important functions, including validating an address, relating common place names (such as a bank name) to actual addresses, providing x-y coordinates for mapping incidents, and determining police areas (precinct, reporting area, etc.).[6]

A call for service will be closed when all units at the scene have notified the dispatcher that they are clearing the scene and are available for another call. When a call is closed, CAD information about the call may be automatically transferred to a records management system (RMS). Subsequent reports on the call, such as a crime report or arrest report, eventually may be entered into the RMS and merged with information from the CAD system. With this approach, complete records about the police response can be maintained; however, many law enforcement agencies have CAD and RMS systems that do not talk to each other. In these agencies, data in the CAD system may have to be entered manually into the RMS system.

[5]In some agencies, the call taker and dispatcher may be the same person. He or she is still responsible for entering information about calls into a CAD system. Another variation of response is that the information entered by a call taker may be transmitted to a telephone report unit for taking the report over the phone rather than dispatching officers. In these cases, the CAD system still records the information about the call.

[6]A good reference on CAD functionality can be found in *Standard Functional Specifications for Law Enforcement Computer Aided Dispatch (CAD) Systems* developed by the Law Enforcement Information Technology Standards Council (LEITSC). See www.leitsc.org for more information.

Differences among Computer Aided Dispatch Systems

Police departments acquire CAD systems from commercial vendors that specialize in the development of these systems and the specific capabilities of a system differ from one vendor to another. For example, in addition to the functions already mentioned, a CAD system may support the creation and transmission to the field of BOLO (Be on the Lookout) messages about wanted persons.

Another optional CAD feature is silent dispatching, which refers to the capability of some CAD systems to send information to patrol cars without using radio frequencies. This is important because silent dispatches cannot be intercepted by people using radio scanners. In addition, the CAD systems in some departments form the basis for tracking exact locations of patrol units in the field through automatic vehicle location (AVL) systems.

Most CAD systems support automatic digital communications for queries on car license numbers, drivers' licenses, names, and other information. These communication linkages, via message switches, allow for queries into local, state, and federal database systems and can send results back to patrol units within minutes. The combination of mobile digital terminals in patrol vehicles and communication through CAD systems can lead to significant improvements in the efficiency and effectiveness of police departments. The results can include increases in arrests on outstanding warrants, and recovery of stolen vehicles, to name a few.

Resulting Benefits of Computer Aided Dispatch Systems

Agencies that acquired CAD systems with support from COPS Making Officer Redeployment Effective (MORE) 2002 grants provided comments during the interviews that covered the full range of CAD functions from basic voice dispatching to silent dispatching, and from systems with no automatic query capabilities to those in which querying is completely automated.

As would be expected, personnel who receive, assign, and respond to calls for service are the primary beneficiaries of CAD systems. The benefits are greatest for call takers, dispatchers, and police officers, but respondents listed benefits for other positions, including crime analysts, detectives, field supervisors, and command staff.

Less Time to Process Citizen Calls

Survey respondents identified many benefits of CAD systems for call takers, dispatchers, and patrol officers. Call takers were provided with efficient ways to enter information from citizens into the CAD system. Dispatchers were able to assign cars and transfer information more quickly and easily, which reduced the time needed to send officers to calls. One agency noted a 5-to-8-minute improvement in dispatch times per call because of the new CAD system. Two other agencies noted overall reductions in time spent by dispatchers per call (i.e., 5 to 10 minutes and an average of 6 minutes per call).

Improved Information for Patrol Officers

For patrol officers, the primary benefit mentioned was access to more and better information in less time. The main mechanism for saving time was a reduction in the back-and-forth voice traffic between patrol and dispatchers. Patrol officers also experienced gains in the ability to communicate and receive a wider variety of information. Several respondents stated that the CAD system freed patrol officers from time-consuming and routine communications with dispatchers. Rather than contacting the dispatcher by voice communications for making queries, officers could query the CAD system directly from the field.

Better communication for field supervisors and command staff was also mentioned. Field supervisors could communicate better with their patrol officers and with headquarters and communication personnel. One survey respondent noted that commanders "can put out directives to the whole department and be confident they will be received."

Examples of Communication Benefits: CAD Systems

"[Officers can now] talk to one another directly and to the department of transportation without having to call the dispatcher."

"School officers who had not been linked before can communicate with headquarters and other officers."

"[The new CAD system] gave officers and detectives a much greater ability to share information with each other, as well as with other departments."

"Officers can [electronically] chat about potential situations and subjects rather than having to use the radio to call each other."

COPS MORE Survey Respondents

Another way that CAD affects patrol officers' ability to be proactive is by allowing them to see calls in queue on the car terminal and take calls as they finish other tasks. As one survey respondent explained, this capability "has cleared out backups in the CAD queue—officers can scan holding calls and self-dispatch."

Officer Safety

A theme that emerged during the interviews was a deep and abiding concern about officer safety and how it could be improved through technology. Several respondents commented that officer safety was one of the main benefits of a new CAD system because officers can get more information about an address before answering the call; silent dispatching keeps police communication secure; and faster dispatching means officers feel less pressure to drive at high speeds when responding to calls for service.

Other respondents discussed silent dispatching and car-to-car messaging as major advantages of CAD systems in providing officer safety. They emphasized that silent communication and text messaging through in-car computers thwarts nonlaw enforcement individuals, both criminal and noncriminal, who monitor police radio frequencies. Others stressed the ability to get call history on specific locations and how that related to officer safety. As one respondent stated, "[Because] officers have information on any previous calls for service at a location, they are more prepared when they arrive on the scene."

CAD Benefits for Improved Officer Safety

Survey respondents noted the following benefits of a new CAD for officer safety:

- Ability to get call history and be prepared.
- Silent dispatch keeps communications secure.
- Reduced radio traffic means dispatcher can handle true emergencies more quickly.

Still others mentioned improved dispatch times with their new CAD systems as a contributor to officer safety; that is, officers can drive more safely because they are under less pressure to make up time. As one agency explained, the CAD system "improved time to dispatch an officer (faster by as much as 5 to 8 minutes) which, in turn, made response time faster."

Faster Access to Information

Assuming that a department's patrol units have mobile digital computers (MDC), another benefit of a CAD system is that it automatically interfaces with local, state, and federal information systems. With this capability, many agencies reported that patrol officers experienced faster access to information. For example, one survey respondent found that "under the new system, the average time to get information back is about 17 seconds, whereas the dispatcher would take anywhere from 35 seconds to 2 minutes, depending on radio traffic." In turn, faster response times for queries resulted in "officers running more queries, finding more individuals with outstanding warrants, writing more tickets, and ultimately making more arrests."

As in this example, faster access to information has the benefits of both efficiency and effectiveness. Efficiency improves because it takes less time to get information. Effectiveness improves because officers can access information quickly enough to take productive actions, such as arrests for outstanding warrants.

Proactive Problem Solving

Giving officers a greater quantity of information, more quickly, and while they are still in the field, translated into more time for proactive problem solving. One respondent summed up the comments of many by saying "Officers have a lot more information at their fingertips so they may be more aware of problems in the community than they would have been in the past. Can look up data on calls for service, previous reports, etc. We can also take a look at hot spots and try to address problems at certain locations. Have been better able to educate businesses and the community as a whole about crime problems and what they can do about them. Overall, officers are able to identify problems more quickly and try to address them."

Improved Communication with Field Supervisors

Field supervisors are also affected by the implementation of CAD systems. One major benefit is that they can access and send e-mail from their cars, enabling them to stay in the field with more time for direct supervision of officers. They can also track the activities of their officers more easily. Survey respondents also noted that the ability to communicate generally improved, and that field supervisors, like patrol officers, obtained much faster access to information through MDCs because of the new CAD.

Improved Queries from Detectives

Detectives derived benefits from the new CAD system in the form of improved queries for investigations while in the field. Some agencies noted that the information was of higher quality and more comprehensive. For example:

> "CAD gives detectives access to much more information from a wider variety of sources."

> "[Investigators] use it all the time. They can search seven jurisdictions' databases at one time."

Data for Crime Analysts

When discussing the benefits of technology, the focus usually is on the immediate beneficiaries—those who use the system in an operational capacity. That is only part of the story. The extent to which crime analysts can provide useful analysis depends on the timeliness, comprehensiveness, and overall quality of the data in CAD. An upgraded CAD that supplies wide-ranging, high-quality data quickly is a critical component of effective problem solving, community policing, and planning. Agencies that acquired or upgraded CAD systems reported that analysts used the improved data to accomplish the following:

- Analyze crime hot spots
- Improve deployment
- Create maps of calls for service
- Support community policing about problems in an area
- Inform problem-solving approaches.

Summary of Responses about
Computer Aided Dispatch Systems

Specific **primary** and *secondary* benefits of CAD systems for various personnel are listed below, as reported by COPS MORE survey respondents.

Patrol Officers

- **Have faster access to information**
- **See more information about calls in their patrol cars**
- **Have better communication with others**
- **Enables officers to record self-initiated activities**
- **Obtain field access to mug shots**
- **Receive call histories for a location**
- **Have decreased response time to calls**
- **Have increased officer safety**

Supervisors

- **Are able to track activities of officers more easily**
- **Have improved communication with officers**
- *Have faster access to information*

Call Takers

- **Have easier entry of citizen information.**
- *Are enabled to validate caller's address more easily*
- *Require less time to obtain citizen informatio*n

Dispatchers

- **Have reduced voice traffic**
- **Are able to keep track of officers more easily**
- **Have improved information on call locations**
- **Have automated maps of call locations**
- **Obtain call histories for locations**
- **Have improved system for call types**
- *Have faster access to information*
- *Have easier entry of information*
- *Have improved system for unit designations*
- *Acquire capability to stack calls*

Analysts

- *Have better information for patrol deployment, hot spot analysis, community policing, and incident mapping*

Outcome Measures for Computer Aided Dispatch Systems

Suggestions for measuring the efficiency, effectiveness, and enabling effects (the Three E's) of CAD systems are summarized in Exhibit 3-1. The exhibit lists the role or roles expected to be affected by the technology acquisition, suggested measures, and the type of benefit expected. The exhibit reflects measures reported by COPS MORE survey respondents and those recommended by the Institute for Law and Justice project team. It is worth noting that a technology acquisition can have an impact on more than one role in the same manner. For example, when CAD data are readily available, both command staff and crime analysts are able to conduct analyses that previously were either very time-consuming or impossible.

Exhibit 3-1: Outcome Measures for Computer Aided Dispatch Systems.

Personnel Affected	Measure	Outcome
Patrol Officers	» Elapsed time to run license plates	Efficiency
	» Elapsed time for identity check	Efficiency
	» Numbers of citations issued for traffic-related infractions	Efficiency
	» Access to information about queued calls	Efficiency
	» Response time to emergency calls	Efficiency
	» Numbers of arrests made	Effectiveness
	» Amount of information directly available to officers	Effectiveness
	» Patrol officer on-duty injuries	Effectiveness
	» Number of communications with others	Enabling
	» Number of call history queries	Enabling
	» Number of arrestees accurately identified in field because of field access to digital photos	Enabling
Supervisors	» Improved field supervision through availability of call information on MDCs	Enabling
Command Staff	» Availability of CAD data to enhance analysis capabilities	Enabling
	» Support for CompStat meetings	Enabling
	» Improved tracking of incident reports	Enabling
	» Application of CAD data for analysis of patrol allocation	Enabling
Call Takers	» Average time to process a call	Efficiency
	» Number of automatically identified caller addresses	Efficiency
Dispatchers	» Average time to dispatch patrol units to incidents	Efficiency
	» Average time spent per call	Efficiency
	» Number of calls that require additional effort to identify the location of the address	Efficiency
	» Number of emergency calls handled electronically (no voice traffic)	Efficiency
Crime Analysts	» Increased responsiveness to data requests and routine alerts	Effectiveness
	» Increased problem analysis (because of more information of higher quality)	Effectiveness
	» Availability of CAD data to enhance analysis capabilities	Enabling
	» Ability to create a hot spot analysis from CAD data	Enabling
	» Ability to create a map of CAD data	Enabling

Chapter 4

Records Management Systems

Description of Records Management Systems

Basic Functions

A police department uses a records management system (RMS) to automate the processes of data entry, storage, retrieval, and sharing of information about persons, vehicles, wanted persons, and other records. For a crime that has occurred, an effective RMS will connect all information about the case, including computer aided dispatch (CAD) information, incident report, suspects, arrests, evidence collected, and even prosecutorial disposition after arrest. In short, an RMS aims to meet all the operational needs of a police department.

A department's RMS is the primary data system accessed by patrol officers, detectives, line supervisors, command staff, crime analysts, and other personnel who need information. Many police departments share information from their RMS systems with surrounding agencies, thereby creating regional access to data of value in investigations, crime-reduction programs, problem-solving initiatives, and other applications.

A complete RMS will support the following functions of a police department:[7]

- Calls for service
- Incident reporting
- Investigative case management
- Traffic accident reporting
- Citations
- Field contacts
- Pawns
- Civil process

- Orders and restraints
- Permits and licenses
- Equipment and asset management
- Fleet management
- Personnel
- Internal affairs
- Crime analysis.

[7]For more information about these functions, see *Standard Functional Specifications for Law Enforcement Records Management Systems (RMS)* developed by the Law Enforcement Information Technology Standards Council (LEITSC) at www.leitsc.org.

Within these functions are several supporting applications such as booking, arrest, juvenile, fingerprints, mug shots, and mapping. Because of their importance to the COPS Making Officer Redeployment Effective (MORE) program, they are discussed in other chapters of this guide.

From an information technology viewpoint, one of the greatest challenges for a police department is the acquisition and implementation of an RMS. A complete installation requires considerable effort on the part of agency personnel. In addition to the functional requirements, an RMS needs to have several master indices for correlating and aggregating information such as names, vehicles, property, locations, and organizations. The various indices combine to connect records within the RMS.

Differences among Records Management Systems

Most police departments acquire their RMS from private vendors who specialize in the development of these systems. The specifications for an RMS differ across vendors, depending on what applications their product supports. Almost all vendors provide incident reporting, case management, traffic accident management, and crime analysis, which are important to police departments because they are core operational functions. Vendors may offer other applications, depending on the extent to which their products have been developed.

Another complicating factor for police departments is that an entire RMS does not have to be acquired at one time. An agency can opt to obtain the core applications with the intent of adding other functions at a later date. Funding availability can have a great effect on an agency's decision in this regard. The decisions of the COPS MORE grantees were a mixed picture—some acquired complete systems, others acquired core applications, and others added modules to existing applications.

A final difference among COPS MORE grantees was whether the RMS was acquired to upgrade a current system, replace a current system through a new vendor, or automate a manual process. The situation at a police department and the availability of funds dictated the decisions made by the grantee agencies.

Resulting Benefits of Records Managment Systems

Sixty-five agencies that received COPS MORE 2002 grants acquired an RMS. Interviews with personnel at the agencies indicated that these systems affected the greatest number of personnel—patrol officers, supervisors, investigators, command staff, records personnel, and analysts. As described in the following sections, the benefits derived from RMS depended, in part, on the extent to which other information technologies have been put in place. For example, patrol officers need to have mobile digital computers (MDC) in their patrol units in order to obtain information from an RMS in a shorter amount of time. As another example, command staff and crime analysts have faster access to crime data only if an automated entry system, such as an automated field reporting system (AFRS), has been put in place. The interconnectedness of applications must be kept in mind when developing and choosing performance measures for an RMS.

Faster Access by Command Staff

The main advantages that command staff experienced with the RMS were faster access to records and higher quality information on crime and calls for service. As a result, they were better able to answer requests for information from residents, public officials, and others. In short, RMS improvements provided efficiency, effectiveness, and enabling benefits for commanders, as these comments from survey respondents suggest:

> "Faster and more complete access to records has helped the department to look up information and do analysis that used to take 4 to 8 hours in just minutes."

> "Previously, to access a record they had to go to a filing cabinet—what once took 10 to 20 minutes can now be done automatically."

Another benefit was improved case management. Possible measures for this were suggested by several survey respondents, such as the following:

> "[We saw] a significant decrease in complaints about turnaround time."

> "[The RMS] eliminates redundant investigations from being done."

Improved Storage and Access for Records Personnel

For records section personnel, the RMS improved their efficiency through automating uniform crime reports (UCR) and data entry by officers. This combination of factors meant that information entered the system much faster and automated error checking improved the accuracy of records in the system. Agencies that used scanning technology also discussed improvements in efficiency. For example:

> "Scanning speeds up access to records and saves time for clerks because they do not have to make copies—saves about half a shift per person in copying and routing reports."

Another agency attributed time savings for records staff to "everyone being able to get reports online because of RMS." This significantly reduced the number of requests for information that records staff had to handle. Improved tracking of both crime reports and accident reports also benefited records personnel. Finally, records personnel saw a significant reduction in the amount of time needed to produce UCRs.

Better Information and Access for Patrol Officers

Most benefits for patrol officers were achieved through faster access to information and improved information for community policing and problem solving.

Improved Safety, Efficiency, and Effectiveness

For patrol officers, faster access to information meant improvements in officer safety, efficiency, and effectiveness. Examples from survey respondents included these:

> "Any time we can get information to the officers more quickly we improve officer safety because they have a better idea of the reality of the situation."

> "When officers have access to everyone else's reports it makes them more effective at working across shifts."

> "A mug shot of an armed robbery suspect was put on the new system and sent out to patrol at the start of the day shift. By the end of the shift, that person was arrested."

Improvements in Community Policing

Improvements in effectively implementing community policing came through the ability to link information from a variety of sources. Officers collected a greater variety of information and then began linking people and places with one another. Perhaps the best example offered by survey respondents was the use of field identification cards as a policing tool:

> "Officers went from filling out none to doing 15 to 20 per shift because they knew they could access them later."

This statement is particularly intriguing because it provides evidence that the fastest way to improve data quality is through better data access.

Access by Investigators

Detectives also benefited from having more information and faster access to it. For example, RMS improvements included digital access to previous investigations, pawn shop tickets, criminal histories, and crime incidents. One agency described the RMS as a "great investigative tool because you can do partial names and get information about the identity of people." Detectives saw faster access to information because "reports automatically go to electronic case files." In other words, they became more efficient because reports entered the database more quickly and more effective because they could access more information about people. In general, detectives received many of the same benefits as patrol officers but applied them in slightly different ways.

Access by Field Supervisors

Similar to command staff, field supervisors also benefited from faster access to more and more accurate information. For example, one agency made this comment about the RMS's impact on efficiency and effectiveness:

"Supervisors can deploy [their officers] more effectively because they will be getting more up-to-date information on crime trends. The reports get into the system twice as fast as before. It used to take a day or two, and now [a report] is in there in a couple of minutes."

Summary of Responses about Records Management Systems

Specific **primary** and *secondary* benefits of RMS acquisitions, as reported by COPS MORE 2002 grantees, are listed by the personnel affected.

Patrol Officers

- **Have faster access to information**
- **Acquire improved information for community policing**

Detectives

- **Have improved quantity of information**
- **Have faster access to information**
- *Obtain improved access to criminal histories*

Field Supervisors

- **Have faster access to information**
- *Obtain more information*
- *Obtain more accurate information*

Command Staff

- **Have faster access to records**
- **Obtain improved information on crime and calls for service**
- **Obtain more accurate information**
- **Have improved investigative case management**
- **Obtain improved UCR reports**
- *Can track officer activities in a more efficient manner*
- *Have better management over property and evidence*
- *Obtain more information on traffic accidents*
- *Can track status of warrants in a more effective manner*
- *Obtain more information on activities of gangs*

Records Personnel

- **Develop more detailed UCR reports**

- **Require less data entry on records**

- **Have faster access to records**

- *Develop more accurate information on reports*

- *Have fewer requests for records because of automated distributions*

- *Have better tracking of traffic accidents*

- *Obtain easier access to records*

Analysts

- *Have faster access to records for analysis*

- *Obtain more accurate information*

- *Have improved access to criminal histories*

Outcome Measures for Records Management Systems

Suggestions for measuring the efficiency, effectiveness, and enabling effects (the Three E's) of an RMS are summarized in Exhibit 4-1. The exhibit lists the role or roles expected to be affected by the technology acquisition, suggested measures, and type of effect expected. It is worth noting that a technology acquisition can affect more than one role in the same manner. For example, increasing the number of data items describing incidents provides more information to line supervisors, detectives, command staff, and analysts. Doing so enables them to ask and answer questions about crime in ways that were impossible before.

Exhibit 4-1: Outcome Measures for Records Management Systems.

Personnel Affected	Measure		Outcome
Patrol Officers	»	Average time for an incident report to be accessible in the RMS	Effectiveness
Detectives	»	Average time between incident and start of investigation	Efficiency
	»	Average time for an incident report to be accessible in the RMS	Effectiveness
	»	Availability of information on pawn tickets, field identification cards, other items	Enabling
	»	Number of data items describing incidents	Enabling
Supervisors	»	Average time for an incident report to be accessible in the RMS	Effectiveness
	»	Number of errors in RMS record	Effectiveness
	»	Number of data items describing incidents	Enabling
Command Staff	»	Average time for an incident report to be accessible in the RMS	Efficiency
	»	Average number of errors per incident report	Effectiveness
	»	Number of data items describing incidents	Enabling
	»	Amount of administrative down time because of better resource management	Enabling
	»	Percentage of queries that can be done without assistance	Enabling
Records Personnel	»	Average time for an incident report to be accessible in the RMS	Efficiency
	»	Time necessary to prepare UCR reports	Efficiency
	»	Time required for data entry	Efficiency
	»	Number of requests for records	Efficiency
Analysts	»	Average time for an incident report to be accessible in the RMS	Efficiency
	»	Average number of errors per incident report	Effectiveness
	»	Number of data items describing incidents	Enabling

Chapter 5

Arrest and Booking Systems

Description of Arrest and Booking Systems

Basic Functions

An arrest and booking system allows for documentation of the arrest of an individual and the subsequent booking of the arrestee in a jail. The arrest may be from an arrest warrant issued through an ongoing investigation or from an incident observed by patrol officers that led to an on-scene arrest. Arrests and bookings may be made by patrol officers, detectives, and other police personnel.

The arrest portion of the system documents all the steps that lead to an arrest and can be useful in the future to defend the probable cause for the arrest. The booking portion of the system documents the incarceration of an arrestee at the jail. The booking process includes collection of all relevant information about an arrestee, verification of the arrestee's identity, the arrestee's fingerprints, and photo images (mug shot, tattoos, scars, for example). When a subject is released from custody, the booking record is updated, where applicable, to record all relevant information about the reasons for release along with the date and time of release.

Differences among Arrest and Booking Systems

Arrest and booking systems can be set up as two independent systems (the arrest module in the police department and the booking module in the jail), or as one integrated system with data linkages. The selected arrangement may be linked to the records management system (RMS) of an agency to facilitate linking arrest and booking information to other system modules such as the case management system. Linkages can be important in preventing errors in making positive identifications.

A booking system is often linked to an automated fingerprint identification system (AFIS). Digital fingerprints may also be sent electronically to the FBI's Integrated Automated Fingerprint Identification System (IAFIS). Linkages with AFIS and IAFIS greatly enhance the capabilities of the system and expand their applications at the local level. The submissions may benefit other agencies in the future with subsequent arrests of an individual.

Resulting Benefits of Arrest and Booking Systems

Twenty agencies acquired arrest and booking systems through COPS Making Officer Redeployment Effective (MORE) 2002 grants. Interviews with grantees indicated that patrol officers, detectives, and booking personnel were the most direct beneficiaries of arrest and booking systems, which reduced the time needed to place an arrestee in jail. The systems resulted in increased efficiency for all personnel involved in the process. Agency estimates of time savings included these:

• Saved 100,000 hours per year for both police and sheriff's personnel

• Saved 30 minutes per arrest (3 agencies)

• Reduced processing time from about 30 minutes to 10 minutes (two agencies).

A number of agencies noted that time savings increased as officers became more familiar with the process[8] and as the database grew (when a suspect is rearrested, information already in the database on that person populates fields on the data entry screens).

Automated arrest and booking systems also increase effectiveness, because arrestees can be identified more accurately. In addition, some systems are capable of flagging fingerprints that are not of high enough quality so they can be redone on the spot. Survey respondents frequently commented on the benefits of more accurate identifications. For example:

"It is now harder for people who have been arrested to hide their record."

"We can now identify John Doe's or suspects who lie about their identities."

"[The automated system prevents] "waste of countless hours changing all the paperwork when it was discovered that an arrestees had lied at the time they were arrested."

[8] The exception was one department which, at the time of the interview, reported that typing in the information took about 20 minutes longer than writing it by hand.

Digital Mug Shot Software

Arrest and booking systems can also make it easier to take and store mug shots.[9] Patrol officers, booking personnel, detectives, and records personnel benefit from this capability, depending on their roles in the arrest and booking process. Automation of mug shots gives other police personnel instant access. Detectives also benefit from the ability to use mug shots in new and more flexible ways. For example, they can create lineups or use them to identify suspects and/or victims. One unconventional use of the system is to identify homicide victims by comparing their photo with mug shots.

Evidence Management and Other Benefits

Survey respondents also noted that booking personnel and detectives benefited from an improved ability to track and manage evidence. One respondent stated that booking personnel now "know where evidence is located and when it can be discarded. The whole process is better organized." Another said that detectives benefited from a reduction in "duplicate entry of information" that was necessary under the agency's old system.

In addition, several agencies noted that detectives are now better able to identify suspects through latent prints. One respondent reported a dramatic reduction in the time necessary to run prints against the state system: response time was 6 to 8 months when hard copies of prints were sent to the state for processing; today, response is almost instantaneous.

Finally, several agencies mentioned that arrest and booking systems convey benefits to agencies outside of law enforcement. Court personnel achieve greater efficiency because they will eventually have a "direct port between the police (arrest and booking) and the judicial system," which "saves time for courts" because they do not have to reenter information or struggle with illegible handwriting.

[9]Not all arrest and booking systems acquired by the grantees came with digital mug shot software.

Summary of Responses about Arrest and Booking Systems

The specific **primary** and *secondary* benefits of arrest and booking systems, as reported by COPS MORE survey respondents, are listed below by type of personnel affected.

Patrol Officers

- **Book arrestees in less time**
- **Obtain more accurate identification of arrestee**
- *Take and store mug shots more easily*

Detectives

- *Make more flexible use of digital photos*
- *Have improved tracking of evidence*
- *Obtain more accurate identification of suspects and victims*

Booking Personnel

- **Take and store mug shots more easily**
- **Book arrestees in less time**
- **Obtained more accurate identification of arrestees**
- *Had improved tracking of evidence from arrestees*

Records Personnel

- *Retrieve mug shots more quickly*

Outcome Measures for Arrest and Booking Systems

Suggestions for measuring the efficiency, effectiveness, and enabling effects (the Three E's) of arrest and booking systems are summarized in Exhibit 5-1. The exhibit lists the role or roles expected affected by the technology acquisition, suggested measures, and type of result expected.

Exhibit 5-1: Outcome Measures for Arrest and Booking Systems.

Personnel Affected		Measure	Outcome
Patrol officers	»	Time to book an arrestee	Efficiency
	»	Time to retrieve a mug shot	Efficiency
	»	Time to retrieve arrest reports and mug shots from files	Efficiency
	»	Ability to create digital lineups	Enabling
	»	Percentage of the department with access to digital photos	Enabling
	»	Percentage of the department with access to digital photos in the field	Enabling
Detectives	»	Ability to create digital lineups	Enabling
	»	Percentage of the department with access to digital photos	Enabling
	»	Percentage of the department with access to digital photos in the field	Enabling
Booking personnel	»	Time to book an arrestee	Efficiency
	»	Incidence of lost evidence	Efficiency
	»	Time to retrieve a mug shot	Efficiency
	»	Time to log evidence	Efficiency
	»	Time to retrieve arrest reports and mug shots from files	Efficiency
	»	Time needed to retrieve evidence from storage	Efficiency
	»	Time elapsed until positive identification of arrestee	Efficiency
	»	Number of evidence items lost or misplaced	Effectiveness
	»	Time elapsed until correct identification of arrestee	Effectiveness
	»	Number of evidence items lost or misplaced	Effectiveness
	»	Percentage of the department with access to digital photos	Enabling
Records personnel	»	Time to store arrest reports and mug shots	Efficiency
	»	Time to retrieve arrest reports and mug shots from files	Efficiency

Chapter 6

Automated Fingerprint Identification Systems

Description of Automated Fingerprint Identification Systems

Basic Functions

An automated fingerprint identification system (AFIS) uses digital imaging technology to obtain, store, and search fingerprint data. An AFIS can develop digitized fingerprints in two ways. The first way is to digitize ink-and-roll fingerprint cards into the system and the second is to use a live scan device that captures finger images on a glass platen and submits the images to AFIS for developing and storing.

An AFIS has two important applications. The first is the positive identification of an individual. Positive identification is facilitated by comparing the digitized fingerprints of an individual against fingerprints in the system, a search that can be made in a matter of minutes. The second application involves searching an AFIS database with digitized latent fingerprints taken from a crime scene. Matches with latent fingerprints can provide valuable leads to investigators for solving cases.

An AFIS does not attempt to make an exact identification of an individual through its searches. Instead, it provides a list of candidates with scores that reflect the match between the images in question and the records on file. Latent print examiners must then manually check the comparisons to make a final determination in identifying a specific individual.

Differences among AFIS Versions

Most versions of AFIS are maintained at the state level with police departments within the state contributing digitized fingerprints to the database. The FBI maintains the Integrated Automated Fingerprint Identification System (IAFIS), which contains fingerprints and corresponding criminal history information for more than 47 million subjects in its Criminal Master File. A few large police departments maintain their own independent systems.

An emerging application that some states have added to their systems is the capability of capturing palm prints in AFIS for storing and subsequent searching. The addition of palm prints has the potential to greatly expand latent print searches. Finally, some systems are linked to computerized criminal history files, which allow users to obtain information quickly on an individual's past arrests.

Digital vs. Ink-Based Fingerprinting

While the process is certainly neater with digital fingerprinting, the main improvements are:

- Reduced wait time to positively identify a suspect
- Fewer erroneous releases
- Less duplication required (no need to take multiple fingerprints)
- Faster fingerprinting process and easier subsequent retrieval of information
- Ability to check latent and partial prints
- Better-quality fingerprints

Outcome of Automated Fingerprint Identification Systems

Twenty-six of the COPS MORE 2002 grantees acquired equipment to support automated fingerprint identification systems. With most grantees, the grant funds went for the purchase of live scan equipment with links to the state AFIS and to the FBI's IAFIS. A key benefit reported by these agencies was a reduction in the time to fingerprint arrestees. One agency reported that the time dropped from 30 minutes to 10 minutes after AFIS was installed.

Grantees reported another result: improvements in the positive identification of arrestees. Identifications were made quickly and accurately by improving access to records in AFIS and IAFIS. As one survey respondent noted, "It is now much easier for officers and detectives to positively identify suspects who use aliases." In short, AFIS increases both efficiency (less time to print and identify an arrestee) and effectiveness (fewer identification errors).

Another major benefit, especially for investigations, is the matching of latent prints from a crime scene against AFIS databases. Latent prints from a crime scene can be digitized and submitted to AFIS databases to determine whether they match anyone in the system. This procedure has resulted in numerous arrests that would otherwise not have occurred because it would be impossible to manually search the fingerprint files. Even when a match is not made immediately, the latent print becomes part of the system and may be matched in the future from subsequent arrests.

Advantages over Ink-Based Fingerprinting

Digital fingerprinting in AFIS has many advantages over manual, ink-based fingerprinting systems. The quality of the fingerprints is quickly determined as a part of the scanning process. Several survey respondents reported that the "quality of fingerprints has improved." Another respondent stated that digital filing of fingerprints and associated mug shots "reduces errors due to human filing" and speeds the retrieval of records.

With some grantees, under the previous system, a fingerprint card had to be mailed to the state agency for entry into AFIS or for matching against existing records. This process was obviously slow, sometimes taking weeks or even months. By having live scan capabilities at the local level, the turnaround time was changed to minutes. The faster turn-around time meant that arrestees with outstanding warrants are not inadvertently released before information became available. Several agencies made comments similar to this one: "[We] have had several people who were using aliases, and we found out they were wanted when they were fingerprinted."

<div style="background:#bfe0f0; padding:1em;">

Ease of Use = Greater Use

Polaroid mug shots were hard to store and retrieve and thus were underused.

</div>

Combining AFIS and Digital Mug Shot Capabilities

Several grantees mentioned the benefits that accrued when digital fingerprinting and digital mug shots were available. These agencies saved additional time because the electronic photo of an arrestee was easier to store and retrieve at a later date. Once in the system, the photos can be used to assist in identification and to create photo lineups as an investigative aid. The ability to create photo lineups quickly and easily saves time for patrol officers and detectives.

Summary of Responses about Automated Fingerprint Identification Systems

Specific **primary** and *secondary* benefits of AFIS, as reported by COPS MORE survey respondents, and the personnel affected are listed here.

Patrol Officers

- **Improved positive identification of subjects**
- **Faster fingerprinting**
- **Faster identification of suspect**
- *Faster creation of digital lineups*
- *Better communication with other agencies about suspects*

Detectives

- **Improved identification of suspects through latent prints**

- **Elimination of suspect as perpetrator**

- **Verification of suspect as perpetrator**

- *More flexible use of digital photos*

Booking Personnel

- **More accurate identification of arrestee**

- **Faster fingerprinting**

- **Less time to book an arrestee**

- **Improved tracking of evidence**

- *Easier to take and store mug shots*
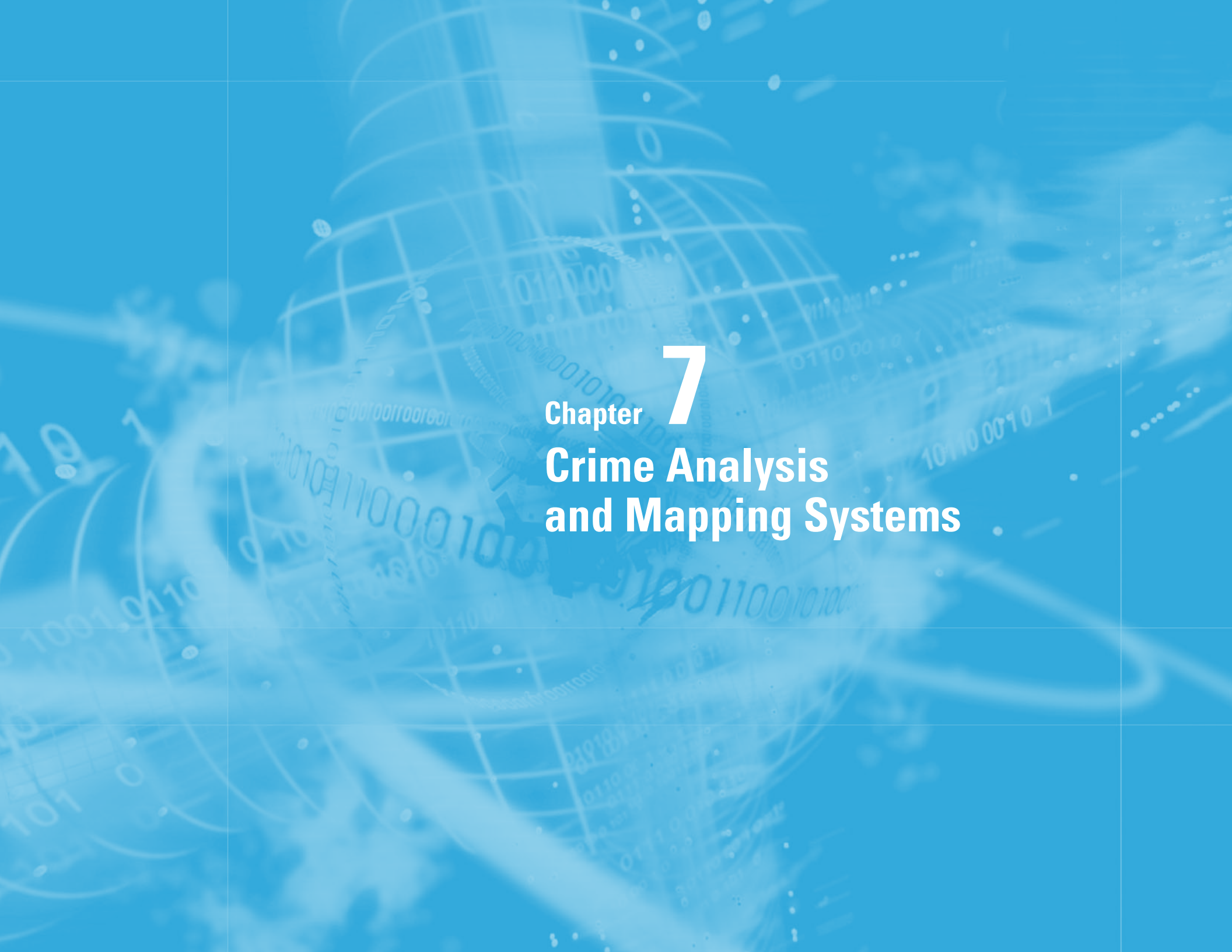
Records Personnel

- *Improved storage of fingerprint information*

- *Identification of suspects through latent fingerprints*

Outcome Measures for Automated Fingerprint Indentification Systems

Suggestions for measuring the efficiency, effectiveness, and enabling effects (the Three E's) of AFIS are summarized in Exhibit 6-1. The exhibit lists the role or roles that could be affected by the technology acquisition, suggested measures, and the type of outcomes expected. The measures are those reported by COPS MORE survey respondents and those recommended by the Institute for Law and Justice project team. It is worth noting that a technology acquisition can affect more than one role in the same manner. For example, the increased number of hits from latent prints that result in identifying a suspect and eventually leading to a prosecution makes police officers, booking personnel, and detectives more effective in their jobs.

Exhibit 6-1: Outcome Measures for Automated Fingerprinting Identification Systems.

Personnel Affected	Measure		Outcome
Patrol Officer	»	Time spent taking prints	Efficiency
	»	Time spent transmitting prints	Efficiency
	»	Elapsed time—identity check	Efficiency
	»	Elapsed time—latent check	Efficiency
	»	Proportion of arrestees released who had outstanding warrants that were not caught	Effectiveness
	»	Proportion of arrestees who gave false information and were correctly identified through AFIS	Effectiveness
	»	Proportion of latent prints that identified a suspect who was later prosecuted	Effectiveness
	»	Improved clearance rate because of latent print hits	Effectiveness
	»	Proportion of hits for latent prints	Enabling
Detectives	»	Elapsed time—latent check	Efficiency
	»	Improved clearance rate because of latent print hits	Effectiveness
	»	Proportion of latent prints that identified a suspect who was later prosecuted	Effectiveness
	»	Improved assistance to other departments on investigations and identifications	Enabling
	»	Proportion of hits for latent prints	Enabling
Booking personnel	»	Time spent taking prints	Efficiency
	»	Time spent transmitting prints	Efficiency
	»	Elapsed time—identity check	Efficiency
	»	Elapsed time—latent check	Efficiency
	»	Proportion of arrestees released who had outstanding warrants that were not caught	Effectiveness
	»	Proportion of arrestees who gave false information and were correctly identified through AFIS	Effectiveness
	»	Proportion of latent prints that identified a suspect who was later prosecuted	Effectiveness

Chapter 7

Crime Analysis and Mapping Systems

Description of Crime Analysis and Mapping Systems

Basic Functions of Crime Analysis and Mapping Systems

Crime analysis has been defined as "the study of police incidents; the identification of patterns, trends, and problems; and the dissemination of information that helps a police agency develop tactics and strategies to solve patterns, trends, and problems."[10] Automated systems support the analytical functions that are necessary for crime analysis. Crime analysis systems usually include a mapping capability as a way of displaying police incidents in an easily understood manner. Core products from crime analysis systems include the following:

- Regular bulletins (daily, weekly) about crime in an area
- Crime summaries for a particular area and time
- Reports on crime trends during an established period (days, weeks, months)
- Identification of related crimes (serial crimes)
- Comparisons of crime changes
- Preparation of annual reports on crime.

Crime analysis systems are greatly dependent on data from computer aided dispatch (CAD) and record management systems (RMS). A crime analysis system may be able to link directly to CAD and RMS, or data from these systems may be imported for analysis.

The role of mapping systems in conjunction with crime analysis cannot be underestimated. Many reports prepared through crime analysis systems include maps showing where incidents occurred and the relationships between incidents. These maps are invaluable for conveying the results of the analysis and have proven beneficial for police personnel and for citizens in understanding crime problems.

Differences among Crime Analysis and Mapping Systems

[10]See *Exploring Crime Analysis: Readings on Essential Skills* by The International Association of Crime Analysts, p. 411.

The differences among crime analysis and mapping systems are due to the broad definition of crime analysis. In some departments, crime analysis is restricted to the

analysis of Part I crimes, while in other departments, crime analysis includes analysis of all crime types, traffic accidents, and other incidents handled by patrol officers as reflected in the department's CAD system. Crime analysis systems may incorporate data from other sources, such as arrest reports, local demographics, field interview reports, or criminal histories. The incorporation of data from other sources may be especially beneficial for supporting a department's problem-solving activities.

Computer mapping is especially effective at assisting with problem solving because it facilitates the integration of data from a variety of sources based on its geographic location. More specifically, using computer mapping, analysts can see information about vacant housing (from the housing department), drug arrests, and disturbance calls on one map. This enables them to make connections among seemingly unrelated pieces of information to solve a problem, rather than continuing to respond to calls for service about the same issue.

Impact of Crime Analysis and Mapping Systems

Of the grantees interviewed for this project, 13 acquired computer mapping systems and 13 acquired crime analysis systems. Interestingly, respondents indicated that crime analysis and mapping systems benefited command staff most often, followed by patrol officers, crime analysts, and detectives. The major benefit for command staff was better information for patrol allocation. They could obtain more information about patrol activities and more complete information on crime patterns and trends.

Crime Information for Command Staff

Some systems allow command staff and other users to generate their own crime analysis and mapping through interactive features that let them specify a geographic area, crime types, and dates. Command staff with these capabilities expressed a high level of satisfaction with the systems that had been installed under the COPS MORE grants. By having information more readily available, they became more efficient and effective in their patrol allocations.

Benefits of Mapping Systems

- Provide visualization of crime patterns and trends
- Ensure that community and police are operating from the same "map"
- Give an ability to integrate nonpolice data for problem solving
- Enable cross-jurisdiction analysis
- Automate creation of pin maps

In addition, enabling end users to conduct their own analyses improves response time tremendously. One respondent reported that "crime analysis is two weeks behind and only two people have access to the system." By opening access to other police personnel and the public, they reduced the crime analysts' workload and the response time for analysis.

Access of Crime Data for Patrol Officers

Most of the reported benefits for patrol officers were related to having better ways to communicate with the community in the field (e.g., the ability to create and show maps and to display crime information easily). As one respondent stated, crime analysis systems provide "one-stop shopping for crime information (instead of having to look in multiple places)." Officers also received more and better quality information about crimes. Finally, the mapping system improved their problem-solving capability by allowing them "to conduct their own mapping and analysis from their cars." For another agency, this capability had an unusual outcome: it helped officers quickly apprehend a homicide suspect (see sidebar).

Crime Analysis Systems Provide Broader Access:

- Patrol and community policing officers can:
  - » Answer citizen questions immediately
  - » Conduct problem-solving analysis in the field
- Command staff can ask and answer questions about patrol allocation
- Citizens can have direct access to crime data

Information for Crime Analysts

Overall, the benefits for analysts reported by survey respondents were improved efficiency (less time to produce an analysis) and effectiveness (greater variety of reports). This was true whether the agency had acquired a crime analysis system or a mapping system.

Summary of Responses about Crime Analysis Systems

Specific **primary** and *secondary* benefits of crime analysis and crime mapping systems, as reported by COPS MORE survey respondents, are listed by the personnel experiencing the benefits.

Command Staff

- **Better information for allocation of patrol**
- **More complete information about crime patterns and trends**
- **Increase in breadth and depth of information**
- **Use of maps for better information on patrol allocation**
- *Quicker turnaround on requests*
- *Mapping: Integration of data from other agencies*

Patrol Officers

- **Improved communication with community**
- **Increased information on crimes**
- **Mapping: Improved problem-solving capability**
- *Improved crime-prevention activities*
- *Mapping: Improved crime-prevention activities*
- *Mapping: Information about crime patterns across districts*

Analysts

• **Increase in variety of products**

• **Increase in usefulness of products**

• **Less time needed to produce reports**

• **Mapping: Less time needed to produce maps**

• **Mapping: Increase in variety of map products**

Many of these improvements have direct a bearing on the ability to conduct community policing and problem-oriented policing. Better information about crimes and calls for service is essential for improving response, no matter what the policing strategy. Crime analysis systems and crime mapping systems add the ability to analyze large amounts of information quickly and in new ways.

Outcome Measures for Crime Analysis Systems

Suggestions for measuring the efficiency, effectiveness, and enabling effects (the Three E's) that result from computer mapping and crime analysis systems are summarized in Exhibit 7-1. The exhibit lists the role or roles expected that can be affected by the technology acquisition, suggested measures, and the type of outcomes. It is worth noting that a technology acquisition can affect more than one role in the same manner. For example, the integration of multiple data sets that is achieved through crime analysis and/or geographic information systems makes both crime analysts and command staff more effective. Command staff have more information with which to make decisions; crime analysts have more information with which to identify problems (i.e., serial crimes, repeat calls, and hot spots) and crime trends.

Exhibit 7-1: Outcome Measures for Crime Analysis and Mapping Systems.

Personnel Affected	Measure	Outcome
Patrol officers	» Ability to generate maps "on the fly" during community meetings	Enabling
	» Ability to answer questions about crime during community meetings	Enabling
Command staff	» Time to generate reports necessary for deployment decisions	Efficiency
	» Timeliness and completeness of data used for decision-making.	Effectiveness
	» Number of data sets available for analysis	Effectiveness
	» Elapsed time between crime analysis request and product delivery	Effectiveness
Crime Analysts	» Time needed to generate a report	Efficiency
	» Time needed to generate a map	Efficiency
	» Number of reports available to run	Effectiveness
	» Number of data sets available for analysis	Effectiveness
	» Number of map analyses available for routine creation	Effectiveness
	» Ability to identify repeat locations	Enabling
	» Ability to identify repeat offenders	Enabling
	» Ability to produce complex analyses from multiple data sources	Enabling

Appendix A

Information Technology in Policing

This appendix briefly describes the core functions of police operations with the aim of illustrating the supportive role of information systems. Information technologies directly related to each function are included, along with a sense of how information can flow between functions.

As discussed in Chapter 1, an information system can affect many activities in a police department. An arrest and booking system, for example, assists patrol officers with arrests, provides a means for investigators to generate lineups, and serves as a source for analysts to examine arrest patterns. Ideally, information should flow directly from one system to another—for example, from a computer aided dispatch (CAD) system into a records management system (RMS)—thereby using the information to expand support for police operations. When this ideal is not achievable, departments sometimes develop ways to export and import data from one system to another.

This overview is organized around the core functions of a police department:

- Call taking in a communications center
- Patrol response to citizen calls
- Crime analysis and intelligence
- Problem solving
- Crime investigations
- Arrest and booking.

Police Communications Centers

The starting point for most police responses is the call that a citizen makes to the communications center. The responsibility of a call taker is to record information and forward it to a dispatcher. The dispatcher sends one or more patrol units to the scene and maintains contact with units in the field throughout the shift.

CAD System Role in Police Operations

The role of a CAD system is to support call takers and dispatchers by recording information about each call and tracking the activities of patrol units in the field. For dispatched calls, the CAD system also captures details that are useful for other purposes, such as analyzing crime, disorder problems, and officer workloads. Patrol officers also conduct self-initiated activities, such as traffic stops, that can be recorded in a CAD system. The system can provide reports on the volume of such activities and the amount of time required on the part of patrol officers.

Staff Roles Affected by Communications Centers

Examples of Information Captured by CAD Systems

- Address of call
- Patrol unit(s) dispatched
- Time of arrival at the scene
- Time call was completed
- Call disposition (report taken, arrest made)
- Self-initiated activities, such as traffic stops

Patrol officers and supervisors, as well as call takers and dispatchers, are directly involved in, and affected by, the functions of a communications center. Patrol officers at a scene conduct preliminary investigations and prepare incident reports based in part on information from the CAD system. Supervisory personnel, usually sergeants, may have access to CAD information through mobile digital computers (MDC) to assist them in overseeing field activities by showing lists of calls and assignments to patrol units.

In addition, a CAD system provides management reports for commanders and analysts. Commanders can track the volume and types of calls that patrol officers are handling and the amount of time that these calls are consuming. Analysts can take advantage of CAD data for problem solving and for restructuring patrol beats.

Patrol Operations

Patrol operations are the backbone of a police department, usually accounting for at least two-thirds of its personnel and budgetary resources. An important role for officers is to respond to citizens' calls for service, especially concerning crimes. Response activities include interviewing victims and suspects, conducting preliminary investigations, making arrests, preparing incident reports, and other activities.

CAD and RMS provide support to patrol officers during the course of their daily activities. The CAD system tracks the activities of all officers in the field, and an RMS captures information on incidents and arrests. Once in an RMS, the information is available to patrol officers, investigators, commanders, analysts, and others.

Last, an automated field reporting system (AFRS) can be critical to patrol operations. A fully implemented AFRS includes the preparation and approval of incident reports. Traditionally, officers had completed handwritten reports that were later entered into a system by clerks. Using an AFRS, report entry is accomplished either through an MDC in the patrol unit or on a computer workstation in a precinct or district station.

An AFRS also incorporates an approval process for each report, starting when an officer sends a report electronically for supervisory review. If approved, the supervisor transmits the report into an RMS repository, where it can be made available for other functions such as problem solving and investigation. If the supervisor disapproves the report, it can be sent back electronically to the officer for corrective action. The approval cycle continues until the supervisor is satisfied with the report.

Crime and Intelligence Analysis

A crime analysis and intelligence system draws on records from the CAD system, crime and arrest records from an RMS, and external data from other agencies and consolidates these records for analysis. Depending on the specifics of the system, a variety of other software programs—such as the following—may be integrated to analyze the data.

• Geographic Information Systems (GIS) provide spatial analysis (e.g., create crime maps and hot spot maps that convey analysis results).

• Social networks can be examined via link analysis (associating arrestees or other persons of interest).

• Statistical packages allow time series analysis (e.g., identification of crime trends) and pattern analysis (e.g., robberies occurring in an area during the same hours of the day).

In most police departments, the results are summarized in some form, such as alert bulletins, for dissemination to patrol officers, supervisors, and others. Actions such as directed patrol may be taken on the basis of the summaries, and the crime analysis unit may be asked to provide additional support for these activities.

Problem Solving

The problem-solving process aims at identifying and solving problems in a police area of responsibility. One excellent resource for information about problem solving is the Center for Problem-Oriented Policing (POP Center) which, in conjunction with the Office of Community Oriented Policing Services (the COPS Office), produces problem-specific guides for police.[11] Problem-oriented policing is defined by the POP Center as an organizing strategy that clusters similar incidents (which could be criminal or noncriminal) for further examination. These sets of incidents are then subject to detailed analysis. Experience in dealing with problems is documented so that a body of knowledge can be developed for addressing the same set of problems in different areas or addressing similar problems. In this way, problem-solving deals with problems in the broadest sense rather than limiting police efforts to those associated with crime. While this approach has great potential, it also requires large amounts of information about people and places.

Problem-Solving Steps

There are several essential steps in the problem-solving process, especially as it relates to information technology support. A key step in the process is gaining a complete understanding of a problem that has been brought to the attention of the police. Information from CAD, RMS, and the community plays an important role in this process.

In this context, "community" is viewed in a broad perspective. The POP Center's problem-specific guide published by the COPS Office, *Assaults In and Around Bars*, for example, suggests that the department obtain information on environment characteristics such as the nature of surrounding area and whether the bar is on a

---

"What Is Problem-Oriented Policing?"

Problem-oriented policing is an approach to policing in which discrete pieces of police business (each consisting of a cluster of similar incidents, whether crime or acts of disorder, that the police are expected to handle) are subject to *microscopic examination* (drawing on the especially honed skills of crime analysts and the accumulated experience of operating field personnel) in hopes that what is freshly learned about each problem will lead to discovering a new and more *effective strategy* for dealing with it.

See www.popcenter.org.

[11]See www.popcenter.org for further information.

major roadway. CAD and RMS information provides insight into the times of the assaults and characteristics of victims and suspects. When combined with community information, a complete picture of the problem emerges.

Developing an action plan to address the problem is the next step in the process followed by executing the action plan and assessing the results. Revisions to the process can be made as the department learns more about the problem and the impact that their actions have on it. As with understanding the problem, assessing the results will almost always depend on community input and CAD and RMS information.

Relationship between Crime Analysis and Problem Analysis

Two important caveats should be considered about the crime analysis and problem-solving processes as we have described them. First, we have separated the two processes to assist in describing the roles that information technology can play, although in many departments the two processes are intertwined; that is, personnel responsible for crime analysis may, either explicitly or implicitly, be doing problem analysis with crimes as a part of their total picture. Second, we have greatly oversimplified the problem-solving process. Excellent books are available that provide much more detail than we can present in this publication.

Investigations

With investigations, we move into another area in which information technology plays an important supporting role. Most RMS applications include a case management module (software) that assists in managing the investigators (e.g., controlling caseloads) and provides direct support for investigations (e.g., capturing supplemental reports and information on physical evidence). Indeed, a case management system starts with assignment of a case to an investigator and supports the investigation to its judicial conclusion.

An automated fingerprint identification system (AFIS) is an integral part of investigations because it assists in matching fingerprints against known offenders. An AFIS serves investigations in two ways. First, fingerprints from suspects may be checked against prints recovered at the scene to determine if there is a match. In this regard, an AFIS may provide exculpatory information about a suspect. Second, latent prints taken at the scene can be processed by AFIS to determine whether they match prints in both local and national systems.

Arrest and Booking

The arrest process may be initiated either as part of a patrol response or from the results of an investigation. In some instances, an arrest warrant may have to be obtained. In addition to the arrest of a person, the arrest process may include the collection of physical evidence and other property relevant to the incident.

Information systems play an important role in supporting arrests and jail bookings. An RMS assists in these steps by capturing information on arrestees, warrants, physical evidence, and other property. Further, an AFIS supports the booking process by assisting in the positive identification of the arrestee and storing digital fingerprints in the system for future use. The booking process usually takes place at a central facility. It has several steps, including but not limited to the following:

- Collection of personal property
- Positive identification of the arrestee
- Fingerprints
- Mug shots.

The process ends when all arrest paperwork has been completed and associated property has been documented and properly stored.

Summary

The description provided in this appendix is, of course, an oversimplification of patrol operations; however, it offers an overview that emphasizes where information technology fits into routine law enforcement processes (e.g., handling citizen calls for service, investigating crimes, or making arrests) and discusses the information technology infrastructure needed to accomplish those processes.

Appendix **B**

Assessing Information Technologies

The effects of information technologies can be assessed by examining their efficiency, their effectiveness, and their enabling benefits (the Three E's). This appendix defines these concepts and provides some examples of how technology outcomes could be measured.

Efficiency

Efficiency means getting a task done with the least expenditure of resources. It can be measured through direct observation of the time required to accomplish a task, or through surveys asking about the amount of time required for a task or the number of activities accomplished. As an example, introduction of a computer aided dispatch (CAD) system should reduce the amount of time taken to dispatch a patrol unit to the site of an incident. Compared to a manual process, the time savings should be considerable. This could be determined by observing the call processing time under the manual system before introducing a CAD system and repeating the observations after the CAD system has been introduced.

Effectiveness

Effectiveness means getting the job done better (although not necessarily more efficiently). Measures of effectiveness include improving the quality of reports, achieving higher clearance rates, and improving the flow of information among operational units. Usually, it is more difficult to measure evidence of changes in effectiveness. Measures could include determining if the quality of the crime reports resulted in providing better information to investigators or assisted in identifying crime patterns to help officers resolve problems more quickly. The introduction of an AFRS, for example, should improve the quality of crime reports. That improvement could be measured by analyzing a sample of reports before and after the introduction of the system.

Enabling Benefits

Finally, technologies frequently enable a police department to do something that it could not do before. A good example is the capability of an automated fingerprint identification system (AFIS) to conduct open-ended searches against a database of partial (latent) fingerprints. Such a search would not be possible prior to the implementation of an AFIS because of the immense amount of manual effort that would be required to compare latent prints against all the prints in a manual filing system. Enabling effects can be measured by analyzing the application of the technology after its innovation.

Relationships among the Three E's

The relationships among the Three E's are complex because improvements in one area do not necessarily lead to improvements in the others. For example, introduction of mobile digital computers in patrol units with an automated field reporting system (AFRS) may actually increase the amount of time that officers need to complete a crime report because more information may have been captured than on the handwritten reports. On the other hand, the quality of information should improve, and this might lead to increased apprehensions on the part of offenders. In this scenario, efficiency has decreased while effectiveness has increased.

Extending this example, the automation of reports may lead to identifying hot spots of crimes and quality-of-life problems that can be addressed through problem solving and community policing. Such an analysis may not have been possible by a police agency in the past because the reports were not sufficiently automated for analysis. The enabling effect in this scenario may lead to a change in patrol officer activities from general patrolling during idle time to problem solving or directed patrol activities. This ability to undertake more focused policing potentially could increase the effectiveness of officers by improving their ability to solve problems or reduce crime.

Outcome Measures to Capture the Three E's

As part of the survey of COPS Making Officer Redeployment Effective (MORE) 2002 grantees (see Chapter 1), police agencies were asked to identify measures they were using to assess the efficiency, effectiveness, and enabling benefits (the Three E's) of the technologies they acquired. Unfortunately, relatively few agencies were measuring the effects of technology implementations. The lists of potential performance measures for gauging improvements that are listed in this guide were compiled from those conversations and their responses about the effects of the information technologies that were acquired.

With CAD systems, for example, key measures would include the average time that call takers need for obtaining information from callers and entering the information into the CAD system. The average time to dispatch patrol units to incidents, especially

to high-priority incidents, would also be important. These measures address improvements in efficiency and the expectation is that the times needed will be reduced as a result of the CAD system.

Effectiveness measures would include improved quality of reports, improved clearance rates, and improved flow of information among operational units. As previously mentioned, a good example of an enabling measure is the number of latent print hits after an AFIS has been implemented.

Other enabling measures, however, depend in part on a department's capabilities before a technology was implemented. For example, a department may not have been able to produce hot spot maps of crimes before acquiring a crime analysis system. Implementation of the system, therefore, provides a new tool in the arsenal, enabling the department to do something it could not do before. On the other hand, replacing a system with the same capabilities as the old system simply results in continuation of earlier capabilities. In most cases, however, replacement may include new capabilities that result in positive changes for efficiency, effectiveness, and enabling measures.

Benefits for Officer Safety

Officer safety is one of the underlying threads that run through any acquisition in law enforcement. Technology acquisitions have the potential to increase officer safety through the mechanisms of increased effectiveness, increased efficiency, and improved enabling. Many measures that improve the efficiency of officers also make them safer. For example, getting information to officers more quickly translates into more time for them to process the information before answering the call so that they are better prepared for what they might face. In both cases knowledge is not only power, it is increased safety, too. The silent dispatch option that is part of CAD systems makes officers safer by keeping police communication secure. Officer safety is also affected by improvements in the efficiency of supporting roles such as call takers and dispatchers. Making these people more efficient at routine work frees them to take more active roles in a crisis. Additional connections between enhanced

officer safety and effectiveness and enabling outcomes from those acquisitions are highlighted throughout the technology sections of this document. Even though it is extremely difficult to measure improvements to officer safety as outcomes of a technology acquisition, the case for the existence of such a relationship is strong.

Faster Access to More Information

Most agencies reported that an AFRS increased the quantity of information available to police officers, as well as the speed with which officers could access the information in their patrol cars. Obtaining access to more information improved officer effectiveness and often enabled them to be better informed about the people and places in their community.

Benefits for Officer Safety

Getting information more quickly was most often associated with officer safety; more specifically, it gave officers a better idea of the situations they were entering. Safety benefits of an AFRS were frequently mentioned in the context of traffic stops and officers' ability to more quickly "run people, plates, warrants, etc.," and identify drivers. One respondent saw a decrease in inquiry time from 5 to 10 minutes to 1 to 2 minutes; another reported saving 5 minutes per inquiry.

Another important outcome of faster inquiry response time is that officers were more willing to run checks when they did not have to wait for a dispatcher to run the information and return with an answer.

AFRS Benefits for Officer Safety

"Officers would have to wait for dispatchers to check plates before they would know who they were stopping. Now an officer can run the plate and know, prior to approaching the vehicle, who might be driving."

"Those officers that are comfortable with the system are doing more inquiries."

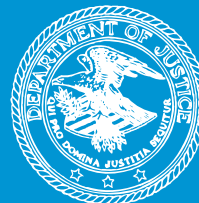**Faster Responses to Inquiries Stimulates Proactive Policing**

After an AFRS was installed, one agency found that compared to the same 8-month period prior to AFRS, self-initiated activities doubled overall while the number of offense reports stayed the same.

COPS MORE Survey