Perspectives on Policing

Information Systems and the Development of Policing

By Malcolm K. Sparrow

Developments in police technology often appear to have little to do with developments in police strategy, although there are plenty of both. They frequently are debated by different audiences at separate conferences, but remarkably little literature exists that attempts to draw the two strands together.

At one time, information technology was thought to be best left to technicians so that managers could concentrate on the serious business of management. However, that might have been an effective division of labor only when computers were used solely to automate well-defined administrative functions, such as batch processing of payroll or preparation of summary financial returns. The organizational effects of information technology in that era were limited to gains in efficiency.

Now, information systems are the essential circuitry of modern organizations, often determining how problems are defined and how progress is evaluated. They frequently help determine how work gets done, often who does it, and sometimes what the work is.

Organizational strategy no longer can be separated from information technology strategy, for the organizational effects of information systems no longer are limited to efficiency gains. In information-intensive businesses (for example, the provision of medical services or insurance), information systems can make or break an executive's strategy and thus help or hinder the process of change.

Without doubt, policing is an information-intensive business. The kinds of data stored or not stored within police information systems help determine to what a police department pays attention. The way that data are arranged within data files helps determine the types of analysis that can be performed and the uses to which they can be put. The manner in which information flows around a department largely determines which matters are nominated for attention at different levels and who makes which decisions, and may have profound effects upon the relative status of different categories of employees. The content and

Community policing represents a new future for American law enforcement, changing the way our Nation's police respond to the communities they serve. This report, one in a series entitled *Perspectives on Policing*, is based on discussions held in the Executive Session on Policing sponsored by NIJ at the John F. Kennedy School of Government at Harvard University.

The Executive Session on Policing has been developed as part of the Kennedy School's Program in Criminal Justice Policy and Management and is funded by the National Institute of Justice and private sources that include the Charles Stewart Mott and Guggenheim Foundations. The success of the police mission now and in the years ahead is the common goal of those who have participated in the Executive Session. Helping to achieve that goal is the purpose of these reports.

The Executive Session on Policing has brought together police chiefs, mayors, scholars, and many others in periodic meetings to focus on modern strategies that produce better results. The rapid growth of these strategies shows the willingness of American police executives to test new approaches to crime, disorder, drugs, and fear in their communities.

We hope that these publications will challenge police executives and local officials to reexamine their approach to law enforcement, just as those who participated in the Executive Session have done.

Michael J. Russell
Acting Director
National Institute of Justice
U.S. Department of Justice

Mark H. Moore
Faculty Chairman
Program in Criminal Justice Policy and Management
John F. Kennedy School of Government
Harvard University

form of information released to the public help determine the framework within which the department is held accountable to the community, and play a significant role in fashioning public expectations.

Properly managed, information systems can serve as a powerful tool in the hands of progressive police executives. They can cut labor costs, improve resource allocation, and increase efficiency and effectiveness of existing operations. They also can help redefine the work, emphasize new values, and facilitate the development of new partnerships. If badly managed, however, they can frustrate managerial purposes, enshrine old values, emphasize outdated and inappropriate performance measures, give power to the wrong people, perpetuate old ways of doing business, create false or misleading public expectations, destroy partnerships, and impose crippling restrictions on new styles of operation—apart from their propensity to consume millions and millions of tax dollars.

Advances in technology do not inevitably advance the performance of police departments. Police departments must manage technology rather than allow themselves to be managed by it.

" Properly managed, information systems can serve ... [to] cut labor costs, improve resource allocation, and increase efficiency and effectiveness ..."

Today's 911 systems are the most pervasive example of technology driving police departments. The advent of radios, cars, telephones, and finally computerized dispatch systems was heralded as major progress for policing. But many departments currently are struggling to retake control of their resources from the insatiable demands of their systems in order to experiment with new styles of policing. Gains in technological efficiency when not properly managed easily turn into constraints. The task for this paper is to look at the continuing evolution of police strategy and the advances in police information technology, then formulate some guidance for ensuring that the latter serves the former.

Changes in police strategy

Police strategies are continuously evolving and diverse. Nevertheless, common threads are readily discernible, both within the United States and internationally. Some of the more significant trends have acquired names. Two of the most prominent are community policing and problem-solving policing. They are not the same, or mutually exclusive. However, they certainly are compatible, can be complementary, and have emerged as part-

ners in many departments. Both are regarded by many people as representing real promise for the future of policing.

The relative merits of these two strategies have been discussed elsewhere.[1] The task at hand is to look at the situation facing a police executive committed to these new strategies and deduce the implications for information technology strategy. Before discussing the kind of information support demanded by these new styles of policing, however, the essence of the two strategies should be clarified.

"Community policing," as a term, focuses attention on a police department's partnership with the communities it serves. It seeks to revitalize that partnership for two major reasons: to produce a cooperative process of identifying police priorities and to provide a more effective method of achieving the jointly nominated goals. It tends to broaden the scope of police actions and distribute more widely the responsibility for producing results.

"Problem-solving policing," as a term, focuses attention on redefining the nature of police work. It stems from a conviction that police "incidents" are symptoms of underlying problems, usually soluble, and that policing is more effective when it pays attention to the problems rather than treats each incident in isolation. It seeks to identify patterns among the myriad calls for service and emphasizes the long-term impacts and effects of police actions. It redefines the basic unit of police work from "incident" to "problem" and acknowledges a wider variety of problems as appropriate for police attention.

Problem-solving policing permits identification of problems on many different scales and in many different dimensions, encouraging creativity by officers of all ranks. It requires careful analysis of the nature of a problem, identification and weighing of all relevant interests, careful selection of the most appropriate solutions, and systematic monitoring of the effectiveness of action taken.

Many departments have embraced both of these major ideas and do not feel the need to choose between them. Use of the name "community policing" reveals an emphasis on the power of partnerships. "Problem-solving policing" reveals an emphasis on the power of thoughtfulness and analysis when applied across the whole spectrum of police activity.

The terms "community policing" and "problem-solving policing" do not cover all the types of progress that different police departments are currently making. Together, however, they capture the essential elements of a movement in policing philosophy and practice that appears to be of growing significance.

Community policing and neighborhood patrol officers

In order to support a community policing philosophy, a department needs to make some changes both in the types of information generally regarded as valuable and in the ways certain types of information flow within the department. Many departments that have embraced the strategies of community and

problem-solving policing have adopted the tactics of neighborhood-oriented policing: that is, they give individual officers primary responsibility for well-defined geographical beats. One way to determine the kinds of information that are valuable is to ask especially good neighborhood or community beat officers what information they have or use that makes them so good. When they respond to calls as well as when they perform more proactive work, excellent beat officers seem to exploit four basic types of knowledge: special skills, knowledge of resources, local knowledge, and local acquaintance.

"Special skills" refers to the range of techniques that excellent beat officers use in support of their mission. Currently, they include negotiation and mediation skills; time management skills (necessary to balance immediate tasks against more protracted problem-solving tasks); interviewing and interpersonal skills, which are not common among patrol officers; and the skills associated with mobilizing and building self-respect among communities. Eventually, they should include analytical and problem-solving skills as well.

"Knowledge of resources" refers to the resources available within the department, from outside agencies, and within the community itself. The neighborhood beat officer is, in many respects, the general practitioner of policing. The definition of competence for general practitioners includes knowing their own limitations, knowing where specialist help can be found, and knowing how to obtain it. The best beat officers know when and how to call specialist resources from the department. They frequently have useful contacts in other agencies (which they often guard jealously) and solve many community problems through the use of community resources.

"Local knowledge" covers the accumulated experience of an officer or officers in one particular area—the foibles of the community, the history of its problems, the nature of its tensions and unrest, the names of troublesome individuals or groups, the identities of active criminals and nuisances, and the locations of criminal activities.

Finally, "local acquaintance" covers the special advantages that an officer enjoys through personally knowing people within a neighborhood. Successful beat officers are able to interpret individual demands, spot and interpret anomalies in behavior, demand more tolerance from people, and enlist their support more readily—all because of personal acquaintance and the resulting accumulation of mutual respect.

These four types of knowledge are not always valued by police agencies. Furthermore, none of the types necessarily has a formal channel of dissemination within the department. Of the four, only one—local acquaintance—cannot, in theory, be passed from one officer to another. The other three—special skills, knowledge of resources, and local knowledge—can be codified, communicated, and taught. In most traditional departments, however, an air of mystery remains about these types of knowledge and skill. Some officers just have them. Others do not. Who does and who does not seems dependent more upon fate than upon the department's information and training strategies.

A community policing philosophy should, therefore, acknowledge and require support for the three transmittable types of knowledge. First, more attention needs to be paid to the "special skills" of beat policing, particularly those not formerly associated with the "fight against crime." Although some officers had these skills in the past, departments did not acknowledge or value them and thus did not establish formal channels for teaching and sharing them. The "special skills" need to be defined and taught in the academy. Use of these skills needs to be recognized, prized, and rewarded in the continuing evaluation of officers.

Second, "knowledge of resources" needs to be recognized as one of the most valuable data bases a department can build. It should be a major investment that is regularly updated and universally available throughout the department. The data base structure needs to be flexible enough to accept new types of resources, as well as new sources within existing categories. Although beat officers need a simple means of access to the data base, they may have to be trained to utilize the capacity of the system or at least to appreciate the scope of information available. Furthermore, the department should devise an incen-

" 'Problem-solving policing' reveals an emphasis on the power of thoughtfulness and analysis . . . "

tive scheme that will persuade the most experienced and knowledgeable beat officers to allow their own knowledge to be disseminated through such a system.

Third, "local knowledge" has to be recognized as a valuable asset. The department cannot afford to lose vast stores of local knowledge every time an officer is moved from one beat to another, is promoted, or retires. Moreover, a beat officer's local knowledge should be accessible to others even when he or she is off duty.

To make local knowledge accessible, police departments need to design instruments for collecting and codifying it, which will then serve as effective frameworks for communicating it. For example, some departments already have asked beat officers to produce "beat profiles." The job of designing information frameworks (whether automated or not) will demand both the experience of the best beat officers and the skills of the best analysts. Once done, the job will need to be redone, probably many times. The science of information support for community policing is in its infancy (some would say it has not even been born yet) and so will probably develop fast if appropriately supported.

Community policing and partnerships

Community policing, insofar as it points towards the power of partnerships, demands a reevaluation of a department's policies regarding data and information sharing, with both the community and other government agencies. Parochialism, possessiveness, and the clutching of information as a source of power will all have to diminish. Also, issues of confidentiality and privacy and public fears about government aggregation of data from different agencies will need to be addressed.

Emerging notions of police as the "eyes and ears" of urban government, as a motivator of and partner with the community, and as a coordinator of the delivery of government services will have profound ramifications for the types of information a department keeps, as well as the way information flows, is analyzed, and is disseminated.

Information support
for problem-solving policing

Herman Goldstein, in *Problem-Oriented Policing*, describes the range of problems that can be nominated for police attention and offers some useful definitions of "problem": "a cluster of similar, related, or recurring incidents rather than a single incident," "a substantive community concern," and "the unit of police business."[2] He makes it clear that problems may or may not be crime-related. He also points to several dimensions in which incidents may be clustered. They might reveal common types of behavior; they might all occur in the same geographic location; they might all involve a similar type of offender or victim, or repeat offender or repeat victim; or they might be clustered around a particular time of day, week, or season.[3]

" . . . information and data are different commodities. Information products are as different from raw data as a table is from a plank of wood."

Problems also can be nominated at different levels within the department, and might be called projects or programs if they are large enough. At one extreme, a small localized problem might be handled by one patrol officer and be resolved within a week. At the other extreme, a large problem might necessitate a major program that requires considerable departmental resources over a protracted period, spans several different districts or regions,

and requires senior management direction and control. However, whatever the scale or type of problem, the framework for resolution, which Herman Goldstein so clearly describes, is the same. The task here is to identify the information support that problem solving requires and note any special difficulties or opportunities for providing it.

Four principles regarding information support for problem solving now are clear. First, the clustering of incidents to form a problem might occur in any one of several different dimensions—geographic, temporal, offender class, victim class, behavior type, weapon type, and so on. Thus, analyzing the incidents that a problem comprises will require the facility to aggregate and disaggregate incident data along one, or any combination, of these dimensions. That process requires flexible data base structures with versatile access and analytic capabilities. Probably, it also will require expert system management.

Second, information and analytic support for problem solving might be required at many different levels within the department—ranging from support for quick street-level problems to major and protracted investigations or programs. Third, the department's information and analytic support must be available for problems whether they are crime-related or not.

Fourth, information and analytic support will have to be provided for problems that never have been identified before, that might not look like any previous police business, that might not have any data readily available, and that might in fact be unique. Provision of the appropriate information support will require unprecedented creativity, improvisation, and innovation.

The problem-solving police department, therefore, needs to build the capacity to produce a wide variety of information products, some of which may have to be tailor-made for particular problems. These products will have to be available in a wide range of scopes (from street level to departmental level) and timeframes (from short term to long term), utilizing data from a variety of sources, many of them unconventional and some from outside the department. Also, they will need to be presented in a variety of forms to make absorption and comprehension of the information possible for not-so-analytical officers.

If a computer-aided dispatch (CAD) system remains the information entry gate to the police department (and thus the principal repository of call-related data), then the demands of problem-solving policing will have profound ramifications on the types of data stored, their availability within the department, and their uses. CAD systems may not be the best vehicle for analysis, however. With their primary emphasis on supporting dispatch, CAD systems probably will always retain attention to incidents rather than problems as their organizing logic. They may be philosophically unsuited to supporting problem solving, in which case the analytical capabilities will have to lie elsewhere within a department and the CAD system must feed the call-specific data to other systems.

The shift in focus from provision of data to the manufacture of information products is important since information and data are different commodities. Information products are as different from raw data as a table is from a plank of wood. Data are the ingredients, the raw materials. Information, on the other hand, is the final product. Information products, like chairs and tables, have form and style; have been designed for a purpose, with a user or class of user in mind; often incorporate raw materials from many different sources; and have been crafted by a great variety of tools and methods.

Good-quality data only have to be accurate, up to date, and maybe, in some sense, complete. Good-quality information has to be relevant, useful, comprehensible, well-designed, appropriately structured, appropriately presented, and placed in the right hands. Problem-solving policing cannot be supported adequately by a "data warehouse." Police departments are already awash in data. Problem solving has to be supported by an "information craft shop" and by "information craftspeople."

The role of analyst

Where will we find the information craftspeople within the department? A few (often civilians) already exist, usually called analysts. The analysts are the people who identify sources of data relevant to an investigation, integrate the data in some useful way, apply various analytical methods (statistical or graphical) to deduce relevant information from them, and then employ various methods of presenting the resulting data to others in a meaningful way (graphs, printouts, Anacapa charts, PERT charts, etc.).

Some problems would have to be overcome in order to deploy such people in support of problem-solving policing. First, the number of analysts is small, and the relevant skills are rare. Few police officers have the appropriate skills or quantitative and technological background to become expert analysts.

Second, analysts customarily have had a specific focus on serious crime. They have been employed to maintain specialized data bases relating to specific categories of crime. Thus, they often have been assigned to a unit, such as the armed robbery unit or the sex crimes unit, and occasionally to specific investigations. Their periodic assignment to particular investigations— where they make the whole range of their analytic skills available to the investigating officers—most closely parallels the kind of deployment that problem-solving policing would require.

Third, they traditionally have been valued for their knowledge rather than for their skills. By remaining with one investigation or in one unit for long periods, they become valuable sources of knowledge. The focus, therefore, has been upon their capacity to absorb and regurgitate data, rather than upon their ability to design and create new information products through use of creative analytical skills.

Fourth, they have become comfortable with the types of analysis traditionally performed by police departments. Having absorbed the traditional values and culture of the department, they may not be ready to stretch their imaginations to new forms of analysis or be readily motivated to think creatively. Fresh perspectives on analytical opportunities might be easier to find outside the department than inside.

" Fresh perspectives on analytical opportunities might be easier to find outside the department than inside."

Problem-solving policing demands that the skills of analysis be given a higher profile, more akin to the recognition afforded analysis as a basis for professional judgment in the fields of medicine, defense, and intelligence. The organization has to learn how to recruit and train people who can look at a problem and answer the following questions:

● What data would support analysis of this problem?

● Where can we get the data?

● How do we get the data?

● How can we usefully integrate the data?

● What kinds of analysis are needed?

● What type of information technology will best help?

● Who needs the resulting information?

● In what form can they best use it?

In fact, analytical skills should be regarded as an essential part of the problem-solving toolkit. As such, they probably should be taught to the patrol officers who will bear the major responsibility for identifying and solving problems. Nevertheless, a place will remain for specialist analysts within the department—those who, operating as internal consultants, will offer expert guidance and assistance to patrol officers engaged in analytic problem solving.

The department has to convince the expert analysts that their skills are more important than their knowledge—so that they will accept assignment on a project-by-project basis rather than being assigned permanently to a unit. The department has to

convince its analysts that their status is not being diminished when they lose their exclusive focus on serious crime. To reorient expert analysts to the needs of problem-solving policing, the department must design educational programs and structural reorganization that will make the skills of "information craftsmanship" broadly available and appreciated throughout the ranks.

Developments in police information technology

The development of police technology during the late 1980's focused principally on the acquisition by police departments of two major types of systems: CAD (computer-aided dispatch, sometimes "enhanced") and AFIS (automated fingerprint identification systems). CAD systems often have been augmented by the use of mobile display terminals (MDT's) in patrol cars, by automatic vehicle locator systems, and by integration of geographic information system (GIS) capabilities into CAD control systems.[4] AFIS frequently has been tied to existing criminal histories data bases.

Proponents of community policing and problem-solving policing might be tempted to downplay the significance of these developments, or even dismiss them, on the basis that both CAD and AFIS can be seen as serving the "reform" model of policing, with its reliance upon rapid response to calls for service and its emphasis on retrospective crime solution. It certainly is true that CAD has been marketed largely on its capacity to reduce response times, and that AFIS primarily serves retrospective crime solving.

Still, there are good reasons to embrace both. Nothing in the concepts of community policing or problem-solving policing suggests that solving crime is not important. They only acknowledge that it is not the sole purpose of policing. The new styles of policing do not deny the importance of responding quickly to emergencies. Rather, they recognize that only a few calls require emergency response[5] and acknowledge the importance of leaving discretion for the allocation of patrol time in the hands of patrol officers and their local supervisors.

Computer-aided dispatch

Police executives wishing to pursue the new styles of policing should not miss the opportunities afforded by CAD systems. While it clearly remains important to get to real emergencies fast, intelligent dispatching should be able to treat urgent and nonurgent calls differently. Indeed, modern CAD systems can be used to implement differential police response strategies, thereby helping to make available the resources required for proactive policing by restricting rapid response to only the most urgent calls.[6] Also, CAD systems might be able to help provide the information support and analytic capabilities needed for problem-solving policing, as described above.

Despite the potential benefits, the dangers are also considerable. Installation or use of CAD systems without adequate managerial attention paid to organizational consequences can cripple the new styles of police operations. It is essential to make sure that any CAD system serves the organization's strategy, rather than vice versa.

The Houston experience

The Houston Police Department discovered how difficult it can be to reconcile a CAD system, basically designed around more traditional forms of policing, with the neighborhood-oriented policing philosophy (which pursues most of the central elements of community policing and problem-solving policing).

The department purchased a state-of-the-art CAD system in the mid-1980's at the same time that then-Chief Lee Brown was implementing the strategic change toward neighborhood-oriented policing. By the end of 1989, it became clear that there were real difficulties in making the CAD system serve the new philosophy.[7]

Three apparently technical problems stood in the way of making the new CAD system fit the new style of service. The first was the question of whether "call stacking" should be allowed. Neighborhood-oriented policing demanded that local beat officers attend as many of the nonurgent calls on their beat as possible, both for continuity and to utilize and supplement their local knowledge. Stacking calls—holding them for beat officers to deal with in turn rather than assigning them to the first available cars—was one way to accomplish that. However, the CAD data processing staff opposed call stacking on the basis that allowing calls to "sit" for long periods—hours, even days in some cases—would cause irreparable damage to average response times, which were the single most visible performance measure for the system.

" . . . technical problems stood in the way of making the new CAD system fit the new style of service."

Second, the CAD system had no way of recording the patrol car status known as "checking by" (which meant that officers were available for urgent calls, but were using their time in proactive work in a particular area and should not be interrupted for unimportant calls). The CAD system distinguished only between available and not available, and recognized nothing in between.

Third, a dispute arose about expanding the system's management information capabilities. It concerned the amount of memory space available within the system's address files for premise and location information pertinent to particular calls. Data processing staff suggested 3 days as a period of information retention, whereas Chief Elizabeth Watson (who succeeded Lee Brown) thought that a 6-month history was the minimum required for officers to be able to understand the real context of many calls.

Another information-related issue was more a policy question than a technical issue. The question was whether or not patrol officers should be allowed to see the list of "calls waiting." By using the mobile digital displays in their patrol cars, officers would be able to see the list and take calls that they knew were important or about which they had some previous or background knowledge. Seeing the list also would enable officers to spot patterns in the calls that would signal a common or familiar cause—in other words, a problem.

However, the dispatching office opposed release of the information, believing that patrol officers would "cherrypick"—that is, take the good calls and leave the uninteresting, unpredictable, or unpleasant ones. From the dispatcher's perspective, cherry-picking would degrade both service and response times. Furthermore, allowing officers access to the calls waiting list would constitute a significant shift in power from the dispatchers to the patrol officers, with the role of dispatcher diminishing in "control" and increasing in "provision of information."

These four issues (call stacking, checking by, call histories, and cherrypicking) at first look somewhat technical, at most procedural. In fact, they all reveal fundamental dilemmas about the nature and strategy of policing.

The call-stacking issue pits the drive for faster response times against the useful employment of patrol officers in proactive policing and problem-solving activities. It also questions reliance upon the performance measures that are easiest to count. The checking-by issue begs acceptance or denial of the existence of any useful police work other than answering calls and significantly affects perceptions of the proportion of patrol resources devoted to emergency response. The extent of call histories that a department uses reveals whether it regards the fundamental units of police work as incidents or problems.

Most striking of all is the issue of cherrypicking, which questions the status and nature of patrol officers. On the one hand, patrol officers are viewed as pins on an automated map, who go where they are told, who require constant centralized direction, and who cannot be trusted to make their own judgments for fear of messing up the system. On the other hand, a neighborhood-oriented patrol strategy assumes patrol officers to be mature, responsible, creative, capable of making their own resource allocation decisions, and honorable enough to subjugate their own personal preferences to the professional demands of their job. Within the neighborhood-oriented strategy, transgressions

in these areas are personnel and management issues to be dealt with by more sophisticated means than eliminating discretion and hiding information.

These four issues, therefore, are important strategic issues, not merely technical or insignificant. As with many information systems issues, however, the debate about them tends to gravitate to the technical domain (and is often left to technical specialists typically unfamiliar with police roles and tasks) rather than being confronted as major questions about strategy that

"Many officers feel that genuine localized control requires the use of separate radio channels ... or some other device that makes precinct communications private from the rest of the world."

require senior management attention. Fortunately, in Houston, senior management recognized the import of these questions and became directly involved in managing the difficult search for an appropriate resolution.

Control over patrols

Another issue that frequently arises around CAD systems is that of who has control over patrols. Many departments refer to their centralized dispatching operation as the "control room." For the sake of dispatching efficiency, as well as procurement and technical efficiencies, CAD systems tend to be regionally structured with one dispatch area covering multiple precincts.

Local commanders are right to ask, therefore, how they can assume control of their local resources when their patrol cars appear to be under central direction. They also ask how they can be expected to tailor differential police response to local conditions when they have no control over the CAD system's call prioritization categories.

Some CAD systems make it possible for calls to be shunted electronically over a network. Thus nonurgent calls, received and logged into the system centrally, can be passed to decentralized radio control stations (at the precinct or district level) for allocation. That way control over resources is held at the precinct level except for genuine emergencies.

The technical ability to shift calls over a network raises questions about privacy and control. Many officers feel that genuine localized control requires the use of separate radio channels, or trunk radio, or some other device that makes precinct communications private from the rest of the world. To them it seems unnatural for several different "controls" to share the same frequency.

In fact, there is no reason that multiple controls should not all use the same channel (assuming that decentralizing control does not increase the aggregate radio traffic, and there is no reason that it should). Nevertheless, it is perfectly natural for the precinct or district controllers to be uneasy about such an arrangement.

Their unease reflects the adage "information is power." In general, if a senior manager has access to a junior manager's information, and just as quickly, then the junior manager may not feel that he or she is truly in control. Similarly, district dispatchers, whose radio conversations are overheard constantly by a regional dispatcher, probably will not feel comfortable about their status, power, or usefulness. Such reservations are natural, need to be acknowledged, and may constitute a sizable hurdle to be overcome—either by providing the confidentiality that decentralized controllers will request, or by restoring their feelings of autonomy through explicit protocols or memorandums of understanding. The use of MDT's also can provide privacy, as well as decreasing the volume of radio traffic.

Minimal requirements for CAD systems

Experiences with CAD systems in Houston and other progressive departments enable us to prescribe some minimal requirements for CAD systems that can support rather than frustrate the new styles of policing:

1. The entire dispatching operation (system and people) has to learn to regard patrol officers as autonomous professionals—rather than as unthinking pins on the dispatcher's automated map.

2. The efficacy of the dispatching operation must not be measured solely by aggregate response times. Information about average response times should be generated and communicated only for the subset of calls that actually require rapid response. (Appropriate implementation of differential response strategies should, of course, improve the performance on high-priority calls.)

3. The CAD system must allow for decentralized control over all resources, with the possible exception of genuine emergencies and coordinated team operations (such as crowd control, civil disturbances, etc.).

4. Patrol officers and lower level managers should, if it is technically possible, be able to see the list of calls waiting. They should be allowed to make decisions about which to attend, based on their own knowledge and judgment.

5. Address files (call histories) must be adequate in size, format, and ease of access to support the information needs of problem-solving and community policing. The best and most committed of the neighborhood beat officers should be enlisted to help draw up the specifications.

6. Call categorization under differential response schemes must allow for local variations in priorities. They should also be readily changeable from one week to the next.

7. If a CAD system is to provide real help for problem-solving policing, the data base of recorded incidents must have a form and structure capable of supporting the many kinds of analysis that problem-solving policing requires. The data base in the CAD system will need to be sufficiently flexible and indexed to facilitate a much broader range of analytic approaches than the simple generation of geographic incident patterns or of standardized aggregate management information reports.

" Very few departments have the in-house technical knowledge to compare the accuracy and reliability of [fingerprint] systems."

This list is not by any means exhaustive. It is only a start. As more departments experiment with both CAD systems and new styles of policing, the best fit will become clearer. At this point, however, it is necessary to emphasize the importance of paying high-level managerial attention to the operational, strategic, and philosophical consequences of these systems and of investing intellectual capital in their design, testing, and evaluation.

Automated fingerprint identification systems

Apart from CAD systems, the other major technological investment being considered by many police departments is automated fingerprint systems. Their impact on the strategy and philosophy of policing is much less than that of CAD systems, but the investment is enormous.

The advantages of automated fingerprint identification systems (AFIS) have become clear to many of the agencies that have procured them. They have solved many cases for which manual searches never would have been attempted. However, AFIS cannot be a major subject of this paper. Extremely complex and technically sophisticated systems, they are a huge subject in their own right.

Briefly noted, the major managerial issues currently facing law enforcement agencies with respect to AFIS include the following:

1. Cost-benefit analysis, justifying the not-inconsiderable cost of these systems. Any such analysis would need to take into account the solvability of various crimes without AFIS (i.e., how likely that they would be solved without AFIS), and how much their solvability would change with the addition of AFIS. It would also need to take into account the value of rapid identification of dangerous offenders once in custody.

2. Compatibility and data exchange standards, the fact that different vendors' systems are not compatible, despite the formulation of an American National Standard for fingerprint data exchange. The different systems use different types of data from fingerprints (some spatial, some topological, some a mixture of the two), and run fingerprint-matching algorithms that can work only on their own particular kinds of data.

3. Benchmarking and testing, the considerable difficulty that police departments face in acquiring the expertise to test systems adequately prior to purchase. Very few departments have the inhouse technical knowledge to compare the accuracy and reliability of different systems. They remain hostage to a variety of misleading performance measures devised by vendors. Police departments seem reluctant, compared with their military or intelligence community counterparts, to budget for the requisite professional expertise.

The first and third of these issues (whether to buy and which to buy) go to the heart of a department's procurement practices. These questions often are decided on political or pragmatic grounds rather than on sound statistical analysis.[8] Often the selection of a vendor is made on the basis of the need to be compatible with neighboring jurisdictions.

Malcolm K. Sparrow, formerly Detective Chief Inspector of the Kent County Constabulary, England, is a Research Fellow in the Program in Criminal Justice Policy and Management and a Lecturer in Public Policy, John F. Kennedy School of Government, Harvard University.

Editor of this series is Susan Michaelson, Assistant Director, Program in Criminal Justice Policy and Management, John F. Kennedy School of Government, Harvard University.

Opinions or points of view expressed in this document are those of the author and do not necessarily reflect the official position or policies of the U.S. Department of Justice or of Harvard University.

The National Institute of Justice is a component of the Office of Justice Programs, which also includes the Bureau of Justice Assistance, Bureau of Justice Statistics, Office of Juvenile Justice and Delinquency Prevention, and the Office for Victims of Crime.

Selection on the basis of compatibility will become progressively less critical over time, because the compatibility problem does have a solution that now is becoming apparent. Data exchange between systems will be achieved by concentrating on the exchange of the gray-scale images (essentially digitized photographs of the fingerprints, usually using 64 levels of gray), rather than through exchange of the subsequently extracted minutiae data.

Exchange of minutiae data (the positions or relationships of the ridge-endings and bifurcations revealed in a fingerprint) once seemed to be a more fruitful avenue because the memory requirements per print, and thus the data transmission speeds, were so much less than for the gray-scale images. However, two things have changed. First, mass memory space and bulk data transmission become easier and cheaper every day, making longer term storage and high-speed transmission of the scanned (digitized) images more feasible and less expensive. Second, it is now clear that the methods of extracting and recording minutiae data are almost infinitely variable, making it unlikely that AFIS vendors will ever agree on one format. Even if they could agree on the best method currently available, insistence on compliance would preclude development of more accurate systems.

Both of these factors highlight the need for establishing standards for gray-scale data exchange at sufficient resolution to serve all of the different matching systems. The process of establishing those standards is well under way.[9]

Conclusion

It is clear that the design and implementation of information systems should not be left to technologists. They are matters for strategists and managers. If these matters are neglected, they can undermine the best intentions for strategic reform.

In many departments these matters now are urgent. In some departments, however, debate about these issues is being conducted in the wrong quarters. In order for the full potential of the emerging strategies of policing to be realized, executives will have to ensure that their information support fits their policing strategy.

9

Notes

1. For a discussion of what these new strategies offer to policing, see Malcolm K. Sparrow, Mark H. Moore, and David M. Kennedy, *Beyond 911: A New Era for Policing*, Chapters 1–4, New York, Basic Books, 1990. For a detailed discussion of problem-solving policing, see Herman Goldstein, *Problem-Oriented Policing*, New York, McGraw-Hill, 1990.

2. Goldstein, note above: 66.

3. Goldstein: 67–68.

4. GIS has the capacity to handle, manipulate, and display spatial coordinate data in a variety of formats, including maps.

5. See Kansas City Police Department, *Response Time Analysis*, Volume II, *Part I Crime Analysis*, Washington, D.C., U.S. Government Printing Office, 1980.

6. See Richard Larson, "Rapid Response and Community Policing: Are They Really in Conflict?" Community Policing Series No. 20, East Lansing, National Center for Community Policing, School of Criminal Justice, Michigan State University, 1990.

7. For a fuller account of these difficulties and how the Houston Police Department approached them, see David M. Kennedy, "Computer-Aided Police Dispatching in Houston, Texas," John F. Kennedy School of Government Case Study C16–90–985.0, Harvard University, Cambridge, 1990.

8. This overview paper is not the place to provide the requisite analytical training for more scientific decisions.

9. This work is being conducted by the National Institute of Standards and Technology and is actively supported by the SEARCH group.

The Executive Session on Policing, like other Executive Sessions at Harvard University's Kennedy School of Government, is designed to encourage a new form of dialog between high-level practitioners and scholars, with a view to redefining and proposing solutions for substantive policy issues. Practitioners rather than academicians are given majority representation in the group. The meetings of the Session are conducted as loosely structured seminars or policy debates.

Since it began in 1985, the Executive Session on Policing has met 12 times; some of the members changed in 1990. During the 3-day meetings, the participants energetically discussed the facts and values that have guided, and should guide, policing.

NCJ 139306

The 1990–91 Executive Session on Policing

convened the following distinguished panel of leaders in the field of policing:

Camille Cates Barnett, Ph.D.
City Manager
Austin, Texas

Cornelius Behan, Chief
Baltimore County Police Department
Baltimore County, Maryland

Lawrence Binkley, Former Chief
Long Beach Police Department
Long Beach, California

Robert C. Bobb
City Manager
Richmond, Virginia

William Bratton, Superintendent-in-Chief
Boston Police Department
Boston, Massachusetts
Former Chief, New York City Transit Police Department
New York, New York

Alvin Brooks, President
The Ad Hoc Group Against Crime
Kansas City, Missouri

Lee P. Brown, Former Commissioner
New York City Police Department
New York, New York
Former Chief, Houston Police Department
Houston, Texas

Charles B. DeWitt, Director
National Institute of Justice
Washington, D.C.

Daryl F. Gates, Former Chief of Police
Los Angeles Police Department
Los Angeles, California

Herman Goldstein, Evjue-Bascom Professor of Law
University of Wisconsin Law School
Madison, Wisconsin

Daniel P. Guido, Commissioner (Retired)
Suffolk County Police Department
Suffolk County, New York

Francis X. Hartmann, Executive Director and
   Senior Research Fellow
Program in Criminal Justice Policy and Management
John F. Kennedy School of Government
Harvard University
Cambridge, Massachusetts

George L. Kelling, Professor
College of Criminal Justice, Northeastern University
Boston, Massachusetts, and
Research Fellow, Program in Criminal Justice Policy
   and Management
John F. Kennedy School of Government
Harvard University
Cambridge, Massachusetts

Robert B. Kliesmet, President
International Union of Police Associations, AFL–CIO
Alexandria, Virginia

Richard C. Larson, Professor and Codirector
Operations Research Center
Massachusetts Institute of Technology
Cambridge, Massachusetts

George Latimer, Dean
Hamline University School of Law
Saint Paul, Minnesota
Former Mayor, Saint Paul, Minnesota

Alex Longoria, Chief
McAllen Police Department
McAllen, Texas

Edwin Meese III, Distinguished Fellow
The Heritage Foundation
Washington, D.C.
Former Attorney General of the United States

Mark H. Moore, Daniel and Florence Guggenheim Professor
   of Criminal Justice Policy and Management
John F. Kennedy School of Government
Harvard University
Cambridge, Massachusetts

Patrick V. Murphy, Director
Police Policy Board
U.S. Conference of Mayors
Washington, D.C.

Ronald J. Ostrow, Reporter
Los Angeles Times
Washington, D.C.

Oliver B. Revell, Special Agent in Charge
Federal Bureau of Investigation
Dallas, Texas
Former Associate Deputy Director–Investigations
Federal Bureau of Investigation, Washington, D.C.

Michael E. Smith, President
Vera Institute of Justice
New York, New York

Robert L. Smith
Public Safety Administrator
Tampa, Florida

Malcolm K. Sparrow, Lecturer in Public Policy
John F. Kennedy School of Government
Harvard University
Cambridge, Massachusetts

Darrel Stephens, Executive Director
Police Executive Research Forum
Washington, D.C.

James K. Stewart, Principal
Justice Systems Technology
Booz-Allen & Hamilton, Inc.
Bethesda, Maryland
Former Director, National Institute of Justice
Washington, D.C.

Robert Trojanowicz, Professor and Director
National Center for Community Policing
Michigan State University
East Lansing, Michigan

Mack M. Vines
St. Petersburg, Florida

Robert Wasserman, Research Fellow
Program in Criminal Justice Policy and Management
John F. Kennedy School of Government
Harvard University
Cambridge, Massachusetts

Elizabeth M. Watson, Chief of Police
Austin Police Department
Austin, Texas
Former Chief, Houston Police Department
Houston, Texas

Gerald L. Williams, Director
Administrative Officers Management Program
North Carolina State University
Raleigh, North Carolina
Former Chief, Aurora Police Department
Aurora, Colorado

Hubert Williams, President
Police Foundation
Washington, D.C.

Willie L. Williams, Chief of Police
Los Angeles Police Department
Los Angeles, California
Former Commissioner, Philadelphia Police Department
Philadelphia, Pennsylvania