Police and computer technology—The expectations and the results

by KENT W. COLTON
Brigham Young University
Provo, Utah

THE EXPECTATIONS—THE CHALLENGE OF THE PRESIDENT'S CRIME COMMISSION

In July, 1965, in the face of dramatic rises in reported crime and delinquency rates, the President’s Commission on Law Enforcement and the Administration of Justice (sometimes called the Crime Commission) was created. One area selected for special attention in the Commission’s final report was the potential contribution of science and technology in the generally labor-intensive field of law enforcement. Because criminal justice agencies must process enormous quantities of data, the use of computer technology— electronic computers and new techniques such as systems analysis, operations research and computer modeling—seemed particularly promising, and the use of computer technology by the police has expanded significantly since the mid-1960s.

A variety of factors have fueled this growth. The first was the report of the Crime Commission. The recommendations of such a distinctive group drew instant attention and outlined high expectations: “Modern technology can provide many new devices to improve the operations of criminal justice agencies, and particularly to help the police to deter crime and apprehend criminals.”¹ The Commission’s recommendations were fortified by the addition of large-scale federal resources to the police area through the Law Enforcement Assistance Administration (LEAA). The pressure from vendors to sell their product—enhanced as the Vietnamese War was ending and technology-oriented industries sought to increase their domestic market—also contributed to the expansion of the computer-related innovations. According to one study, $143 million, or 11.5 percent of the total LEAA block grant budget, was spent for law enforcement telecommunications during the three-and-one-half years between July 1, 1971 and January 1, 1975, and this figure did not include matching money from the states.²

The Crime Commission report was filled with enthusiasm and raised high expectations about the possibilities of such innovations. Advocates felt that computer technology would allow for the rapid processing of information, expand police capabilities and improve law enforcement services, for example by reducing response time. Some hypothesized that aspects of the technology might even improve apprehension rates, thus deterring criminal activity and reducing crime rates.

The use of computer technology by the police has expanded rapidly since the mid-1960s, undoubtedly aided by the Crime Commission’s report and federal funding. However, there is disagreement as to the utility of such computer use. Whereas proponents seek for the benefits noted above, critics claim that much of the money has been wasted, that such innovations have not increased the efficiency or effectiveness of crime control, that the proliferation of such systems represents a potential infringement on civil liberties, and that the money could be better utilized on less technical approaches to the crime problem.³

Although there has been a lot of dialogue regarding the purchase and application of computer technology in law enforcement, there has been relatively little research or evaluation since the Crime Commission concerning the actual uses, difficulties, and diffusion of computer technology by the police. Despite prestigious recommendations, the process of introducing change requires more than directives from the top. Important behavioral and power relationships are involved in the actual implementation of the technology. A decade has passed since the Crime Commission selected computer technology as an area of potential significance. The purpose of this paper, then, is to begin to evaluate what we have learned since the mid-1960s and to address the consequences and diffusion of innovation.

The paper is based on the results of research efforts which have transpired over a period of six years. The research has included two national surveys of U.S. police departments in 1971 and 1974 (designed by the author and administered by the International City Management Association [ICMA]) and a series of seven case studies in different police departments around the country.⁴ The four sections which follow will 1) review the results of “routine” and “non-routine” applications of police computer technology, 2) discuss some of the lessons we have learned and the reasons for the disappointments and problems that have arisen, 3) outline a new focus for the diffusion and application of police computer technology, and 4) discuss the change in expectations for the future.

443
THE RESULTS—THE EXPERIENCE OF THE PAST DECADE

The use and evaluation of police computer technology

The first real-time police computer system in the U.S. was installed in the St. Louis Police Department in the mid-1960s. Since then the growth of computer technology within police departments has been widespread. However, the surveys conducted as a part of this study in 1971 and 1974 revealed that implementation has been slower than expected. The 1975 survey was mailed to all U.S. police departments in cities with populations over 50,000. Of the 326 (80 percent) that responded, 193 (56 percent) were using computers. Although this was an increase of 12 percent over 1971 responses, it was only about half the growth predicted by the earlier survey.

Some of the difference may be explained by a slight variation in response rate between the two studies and by varying interpretations of survey questions. But, more importantly, estimates of future growth tend to be overly optimistic. The slower rate may also indicate that some police departments are taking a more careful and sophisticated approach to computer use.

When surveyed, police departments with computers were asked to identify which of 24 applications they were using. The 24 applications were grouped into eight areas: police patrol and inquiry, traffic, police administration, crime statistical files, miscellaneous operations, resource allocations, criminal investigation and command and control.

In evaluating use and impact, it has been useful to draw a distinction between “routine” and “non-routine” applications of computer technology. Routine applications involve the relatively straightforward, repetitive manipulation and inquiry of prescribed data, often by means of a definite procedure. The same manipulation was usually done by hand before the advent of the computer. Technology simply makes the process quicker and easier. For example, although police patrol and inquiry applications were technically advanced and provide rapid retrieval of information to the field officer, such inquiry systems are relatively straightforward and the tasks can be labelled routine. Other routine application areas comprise traffic files, crime statistical files, police administration and miscellaneous operations.

In non-routine applications the machine becomes a tool for decision-making, strategic planning, and person-technology interaction. There are no absolute methods for handling problems, either because the area is complex or because they require custom-tailored treatment. The human decision-maker plays a vital role in judgment, evaluation and insight. Non-routine application areas in law enforcement include resource allocation, investigation of crime, and command and control—including computer-aided dispatch and automatic vehicle monitoring. (See Figure 1.)

Rather than view routine and non-routine categories as sharply distinct classifications, though, they should be regarded as delimiting the two ends of a continuum. As applications move toward the non-routine end of the continuum, systems design becomes more intricate, and behavioral, personality and organizational considerations become more significant. Several applications fall between the two extremes. The best example is crime statistical files, which though generally routine in collection and processing, provide the basic data for a number of non-routine activities, such as resource allocation. Command and control applications also have both routine and non-routine dimensions.

As the use of computer technology has evolved since 1960, successful implementation has often been limited to the routine areas. Traffic, police administration, and crime statistical files have all remained important; and the expansion of police patrol and inquiry records—especially in the late 1960s and early 1970s—has been almost phenomenal. In the non-routine areas, though, results have been far more disappointing. For example, in the previously referenced 1971 survey, 61 departments predicted they would implement a computer-aided dispatch system. However, only 15 such systems had been installed by 1974—less than one percent of the computer applications reported in the 1974 survey.

Resource allocation has been the only non-routine computer use where the number of applications actually implemented has exceeded expectations. The 1971 survey results indicated that in three years 12 percent of all computer allocations would be in the resource allocation area; the actual percentage was 16. An additional question in both the 1971 and 1974 surveys asked police departments to rank the relative importance of different computer allocations. There was little shift between the two years, and in both 1971 and 1974, resource allocation applications were ranked first.

Although the actual level of implementation has been below earlier expectations in a number of areas, the computer, with all its interesting implications and problems, has unquestionably become a permanent part of law enforcement technology after a decade and a half of use. The issue now is not will computers be used, but how and with what impact?

Computer impacts

The impact of routine applications. Although experiences vary from city to city, there is evidence that routine computer applications provide a number of benefits, particularly when benefits are defined in a narrow, technical sense. For instance, numerous police patrol and inquiry applications and crime statistical files are working around the country today. Seven-second retrieval of information to the officer in the street has been a reality in Kansas City, Los Angeles, and other police departments for a number of years. In terms of “technical impacts”—benefits resulting from improvements in the input, processing, and output of information—the technology has provided a number of positive advantages. In at least some departments, extensive amounts of new or better information are available more rapidly for broader distribution, although results again vary among police agencies. Further, if one views the service delivery impact of such routine applications from a more narrow “process”-oriented perspective, a number of routine applications have improved service to the public and have been
Routine

Police patrol and inquiry (including →
  warrant, stolen property, and vehicle registration files)\textsuperscript{b}

Traffic applications (including ↓
  traffic accident, citation, and parking violation files)

Miscellaneous operations (including ↓
  intelligence compilation and jail arrest records)

Crime statistical files
  (including crime offense, criminal arrest, juvenile criminal activity, and offender based files)

Police administration (including ↓
  budget analysis and forecasting, inventory control, vehicle fleet maintenance, payroll preparation, and personnel records)

Non-Routine

Command and control (including
  computer aided dispatch and automatic vehicle monitoring)

Criminal investigation (including
  automated field interrogation reports, modus operandi and automated fingerprint files)

Resource allocation (including
  police patrol allocation and distribution, police service analysis, and traffic patrol allocation and distribution)

Figure 1—Routine and non-routine uses of police computer technology.\textsuperscript{a} The terms “structured” and “unstructured” have also been used to draw a similar distinction. See, for example, G. Anthony Gorry and Michael S. S. Morton, “Management Decision Systems: A Framework for Management Information Systems,” Working Paper No. 458-70, Alfred P. Sloan School of Management, MIT, April 1970. Also, Herbert A. Simon originally used the terms “programmed” and “unprogrammed” to make a related characterization. See Herbert A. Simon, The Science of Management Decisions. New York, Harper & Row, 1970, p. 6.

\textsuperscript{a} The dotted arrows reflect the fact that routine and non-routine categories are not sharply defined classifications. Rather, they should be regarded as converging from opposite ends of a continuum.

shown to be cost-effective, though full-scale analysis of costs and benefits were not covered in this project. For example, in Tulsa, Oklahoma, an additional $180,000 in estimated revenue was returned after the first year’s operation of a new automated traffic citation system. In Long Beach, California, membership in an automated want/warrant system in the Los Angeles area increased the number of 1970 warrant arrests 31.5 percent over 1969 figures.\textsuperscript{a} In Kansas City, Missouri, the ALERT (Automated Law Enforcement Response Team) system was installed in 1969, and the number of monthly inquiries per police officer concerning stolen cars or wanted persons rose from 36 in January to 90 in May 1971, and in 1975 police officers were averaging 250 inquiries per officer per month. In Oakland, California, after digital computer terminals were installed in half the patrol cars in 1971 and 1972, units with terminals in their cars made more than seven times as many information requests, received more than three times as many “possible hits,” and were three times as productive in warrant arrests and vehicle recoveries as nonequipped units.\textsuperscript{a}
However, when one examines the actual service results or outcomes of such routine applications the benefits of the technology are more uncertain and unexpected impacts and influences begin to emerge. For example, a former Kansas City Chief of Police reported that after installing their ALERT system, one of the most advanced police patrol and inquiry systems in the country, the police department experienced an overload of police officers making stolen car checks, thereby creating a potential manpower drain and shifting concentration from other vital police tasks such as preventive crime patrol.10

Further, as far as service impacts are concerned, it seems that routine computer uses by the police have almost entirely been devoted to the crime control and law enforcement functions of the police.11 By over emphasizing the application of technology to crime control, law enforcement agencies may neglect possible applications to social service activities; for example, computer files to assist with referral information, medical assistance, or listings of agencies and names of people who might provide social service assistance.

Finally, large resources from the LEAA have in some cases served as a "seductive stimulant" for police departments to get involved with computer technology in the absence of an intrinsic desire for understanding. As one police data processing manager put it, "Millions of dollars have been spent, but there's still an awful lot of garbage coming out of police computer systems." Although no one knows how much waste and misuse exists, police computer hardware has undoubtedly been sold to police departments that don't know how to use it, or for nonessential applications.

The impact of non-routine applications. Although the service and power shifts of routine computer applications raise certain questions and concerns, overall a number of routine applications have been successful, especially in terms of operational performance and technical impacts. However, non-routine uses of computer technology bring greater complexity both in terms of implementation and evaluation. In this study, case studies have been conducted in two areas of non-routine use—resource allocation and command and control. Each will be discussed.

As noted above, in surveys in both 1971 and 1974, police departments considered resource allocations to be their most important areas of computer use. Resource allocation was also the only area in which the number of applications reported in the 1974 survey actually exceeded 1971 predictions. All police departments must make deployment decisions and the interest in the use of technology to aid in this allocation process is growing. However, the interest in automated police deployment should be placed in the context of a realistic understanding of the law enforcement environment. The resource allocation applications noted in surveys generally refer to using tabulations of crime statistics to determine deployment, not to more sophisticated models.12

Even where modeling work has been tried, many of the efforts have met with only limited success as the three cases examined as a part of this study indicate.13

In St. Louis the use of a computer model that was implemented in the late 1960s is purely optional as of 1977, and
models have failed to achieve any notable level of use for policy decisions. 16

The potential for automating aspects of police command and control were first pointed out by the Crime Commission in 1967. Computer-aided dispatch (CAD) systems provide the framework for bringing together many of these new tools through the partial automation of the call-answering and dispatch process. Other command and control technological changes that have been considered or tried include mobile and portable digital terminals to allow officers in the street to communicate digitally with headquarters, automatic vehicle monitoring (AVM) systems to keep track of the location and monitor the status of police units, and 911 emergency telephone services. A CAD system may include an AVM system, 911 telephone service, or mobile digital terminals. 17 Some of these innovations in command and control are routine; the technology basically replaces a previously manual activity such as with digital terminals or the automated transfer of information from the telephone operator to the dispatcher. However, CAD also provides the framework for a number of non-routine activities, such as tracking and monitoring vehicle location, automatically timing the lengths of calls and raising a “flag” if a call takes over a specified time (say 30 minutes), or providing new information to be used for management. Command and control as discussed in this report, then, relates not only to dispatch deployment, but to the ability of police administrators to control and modify the manner in which police operations are conducted.

In the study providing the basis for this study, three cases were examined in the command and control area, and in San Diego and New York City working systems have been developed, although in Boston the problems of introducing the new technology have been more significant. 18 The success and failures of these three cases provide certain insights for the future. First, it is possible to establish ongoing, operational CAD systems. The SPRINT system in New York City has been working since 1970, and the CAD system in San Diego has been operating since 1975. Both cities have achieved technical benefits from CAD such as the availability of new and better information, rapidity in matching addresses with geographic location, the effective transfer and recording of data in the dispatch process, and the retrieval of data from the dispatch process.

Secondly, both cities have experienced positive service impacts in terms of process-orientated measures. Some of these process service benefits include: telephone calls are answered and serviced more rapidly (telephone talk time in San Diego has dropped from three minutes to 77 seconds, and the average time required to answer the telephone is 2.5 seconds); standards can be set for communications and field backlogs (New York City has met its standard of answering 98 percent of telephone calls within 30 seconds, and radio airtime and field backlogs are monitored and recorded daily); and the workload has been more evenly distributed within communications divisions.

Thirdly, when it comes to measuring the actual service “results” attributed to CAD, the findings are inconclusive. In the New York City and San Diego police departments there is a general feeling that dispatch time has been reduced, but the data are inadequate to prove or disprove such a hypothesis. In fact, to the extent that data exist, they seem to show that the impact on response time has generally been negligible or modest at best. 19 Further, the police departments have essentially not analyzed the influence of the CAD systems in such areas as improving police productivity by enabling patrol officers to respond to more calls per shift or providing a better match between police service needs and available resources.

The question remains, then, as to whether the benefits of CAD justify the costs. Although the expenses of much of this technology seem high, when placed in the overall context of the costs of police operations, the comparative magnitude of the dollars seems to diminish. In New York City, for example, the annualized costs for developing and operating the SPRINT system are about $2.7 million. Because the 1975 police budget in New York City was approximately $625 million, only 0.4 percent of the annual budget was devoted to the CAD system. Stated in another way, the costs of operating SPRINT are roughly equivalent to maintaining 10 police patrol units on an annual basis.

In both New York City and San Diego, technical and service benefits have been achieved to help offset such costs, and it seems highly likely that the use of CAD systems will continue to expand. Whether their full potential is achieved, though, will depend on the skills of the management personnel. Both New York City and San Diego provide a wide range of new information for managers. However, police chiefs have seldom considered themselves as managers in the past; rather, their responsibility has been to balance pressures within and without the city and to promote the need for law enforcement and police resources. Consequently, it is still unclear as to whether they or their assistants will be able to channel the potential technological talents of the computer to do more than simply perform routine operations.

THE CRIME COMMISSION REVISITED (OR SOME OF THE REASONS WHY THE RESULTS OF POLICE COMPUTER TECHNOLOGY HAVE BEEN MIXED)

When the Crime Commission issued its report in 1967 it was optimistic about the use of science and technology in law enforcement. It set forth a far-ranging program of application and experimentation. Some of these experiments have worked, but a number of others have failed, and whether explicitly or implicitly, the Commission oversold the potential impact of such innovations on reducing crime and increasing arrests. It also seemed to assume that innovation would occur automatically from the top down, that little attention was required for the diffusion process, that the only motives for implementation would be altruistic, and that vendors of technology would be neutral and pressure-free in their “unbiased advocacy.” Finally, they recommended so many possible experiments that it was difficult to select and focus priorities and to follow through. What
have we learned from our experience over the past decade and what recommendations can be made for the next few years?

Firstly, it should be clear that it is extremely difficult to measure the effectiveness of technological innovations in confronting crime. In a number of cases, particularly as reported in the overall study report, allocation and command and control projects failed to demonstrate clear improvements in a department’s patrol performance, particularly in the area of crime control. Perhaps the greater failure was the original expectations which were built in the 1960s that we might be able to establish such linkages. Criminal activities are based on a wide range of factors only a small portion of which are influenced by police activity. Changes in deployment patterns or response rates may have some modest influence, but criminal statistics are far too imprecise to measure these differences or to isolate the portion of the change attributed to police allocation or technology as opposed to changes, for example, in the weather or the unemployment rate.

Secondly, it should be apparent that a number of the original specific objectives of the Crime Commission will not be met, and expectations for the future must be altered. The best illustration of this is related to response time. Based on the evidence to date it would be a mistake to maintain hope that response time benefits will justify command and control and resource allocation technological innovations. As noted earlier in this report, the CAD system did not achieve response time benefits. Further, in St. Louis tests of a Phase I A VM system, it was found that A VM did not bring the expected reduction in response time. In fact, although the question will be examined again closely in a Phase II experiment, current findings lack any evidence to suggest that travel time reductions due solely to A VM will significantly improve police operations or reduce costs. The entire response time system includes a number of components, not the least of which is the time it takes the victim to call the police after a crime has occurred. In the past, excessive attention has been focused on the elements of the response system which can be influenced by technology. In fact it seems that at least one of the major reasons for the disappointment of the Crime Commission was its failure to recognize many of the complexities and motivations concerning the implementation of technology and the interaction between the context and nature of police work and the technology. Police organizations have a number of characteristics that are quite different from those of other public and private institutions. In most industrial organizations and public bureaucracies, movement to higher levels of power and status is accompanied by greater discretion or freedom of choice in decision-making. Complexity of task increases with responsibility. By contrast in police bureaucracies, the lowest-ranking officer—the patrol officer—is often given the greatest discretion, being forced to continually make decisions without direction from superiors, and consequently the administrator’s ability to control and influence police behavior is severely limited.

A further complication in understanding the police is the local and fragmented nature of law enforcement and the fact that police departments have a variety of different tasks and styles of operation. The popular conception of police work, often supported both by news media and by movies and television, is one which assumes that the bulk of a policeman’s time is devoted to the exciting and dangerous job of crime-fighting. In fact, a comparatively small part of a policeman’s time is devoted to crime control and law enforcement. Instead, service activities and order maintenance occupy the largest portion of police time.21 and different police departments have different styles of operation depending on whether their orientation is, for example, legalistic (identified by strict interpretation and enforcement of the law and strong centralized authority), watchman (characterized by a more traditional approach, greater discretion and weaker centralized authority) or service-oriented.22

In summary, then, the eventual influence and impact of technology in policing will not come from the technology per se, but from an interaction between police work, the nature of a particular department, and any specific innovation. When the Crime Commission set forth its recommendations in 1967, it apparently assumed, at least in part, that police administrators would have strong centralized control and that the diffusion of innovation in the form of computer (and other) technology would be primarily an act initiated from above with effective communication from higher to lower echelons of the police department providing the linkage for implementation. The primary problem recognized by the Commission was monetary,23 and in failing to more specifically address the diffusion of technology, many of the obstacles such innovations have met over the past decade were overlooked. Given such factors as the fragmented nature of police work and the variety of police departments around the country, the use of technology may have an important influence on power and prominence within orga-
nizations. Behavioral factors have proved essential in achieving acceptance and success, and the nature of innovation and change is a long-term and deeply-rooted process. With this in mind, the next section of this paper will examine a new focus for the diffusion of police computer technology.

THE DIFFUSION OF POLICE COMPUTER TECHNOLOGY—SOME DIRECTIONS FOR THE FUTURE.

There is a human tendency to seek direct solutions and to try to classify actions as either failures or successes. When it comes to the diffusion of technological innovation there seems to be no single prescription that will guarantee success. It is possible, though, to identify what not to do, particularly with the benefit of hindsight. Based on such hindsight and the analysis of the cases noted above, a series of "necessary-but-not-sufficient" conditions in the implementation process have been identified. The factors can be divided into two categories—those related to the nature of the environment of the innovation, and those related to the project management of the innovation. In essence, they are built upon and serve to summarize many of the common themes which have emerged from the case studies: the need for understanding the environment and motivations for change, the long term nature of innovation, vendor pressures and the temptation to oversell or overestimate a project's potential, the necessity of setting priorities and outlining clear performance guidelines in advance and the importance of human and behavioral considerations such as the continuity of personnel and the involvement of police officers at all levels to the extent possible. Listed in Figure 2, they serve as a "check list" for future consideration—not as a magic formula for success.

Obviously, it is impossible to expect that all of the factors relating to the nature, environment and project management of change can be achieved whenever computer technology is implemented. There is no simple answer to assure success. It is clear, though, that in the past we have failed to devote adequate attention to the implementation and diffusion of innovation not only in law enforcement but in almost all areas of urban service delivery. While trying not to raise our expectations beyond reach, it should be possible to concentrate our efforts at more effective evaluation and transfer, where appropriate.

The diffusion of innovation basically involves four steps:

**Inventing**—The creating of ideas, technologies, models, etc.
**Informing**—Publicizing the technology and educating the law enforcement community concerning the technology and its possible advantages and disadvantages.
**Implementing**—Introducing the technology into a law enforcement agency.
**Integrating**—The overall social and economic acceptance and adjustment to the innovation by the agency.

In developing a more realistic and productive outlook and direction for the diffusion of law enforcement technology, and for that matter, diffusion related to all urban services, all four deserve consideration.

**Inventing—The need for better technology**

Although this report has neither the space nor the capacity to be too specific, "better technology" improvements can and should be made in the quality of law enforcement computer applications. For example, in the modeling area we must build better models. Over the last decade, progress has been made. The Hypercube and PCAM Models offer better options to police users than those available six or seven years ago. Further, it may be possible, within the professional community of computer technology, engineering and operations research, to establish high standards and criteria by which inappropriate innovations can be weeded out.

**Informing—The need for "truth in technology"**

One of the greatest failings related to computer technology in the past decade is the tendency to overpromise. Expectations have been raised only to be dashed, due to a whole range of technical and behavioral factors. The primary change agents in law enforcement technology are vendors. However, they have a vested interest in selling their product and this interest has sometimes tended to focus sales literature on the advantages of technology as compared to the drawbacks. As noted earlier, the time is ripe to develop realistic performance guidelines and to try to assure that in the informing and educating process that the costs of technology, as well as the benefits, receive ample publicity.

**Implementing—The need for "policy management"**

The implementation process is not simply a matter of policy choice, but a process of conflict resolution requiring the understanding and management of different values and perspectives. It has become apparent in analyzing the implementation of law enforcement technology, that a new breed of police officers is emerging. These are officers who have "come up through the ranks" and have, therefore, "paid their dues" and are respected within the policy community. At the same time, they have had some experience with both the advantages and limitations of new technology and may be helpful in this process of conflict resolution. Rather than try to teach outside engineers about police work, it may be profitable to cultivate this inside set of "police technology experts." As long as they maintain this independence they could become a "pool of resources" to aid in the diffusion process.
1. **Conditions related to the nature and environment of the innovation:**

   A clear and realistic understanding at the outset of the project of the policy issues involved. Multiple, even conflicting objectives are often involved. For example, when Los Angeles first began the LEMRAS project, they failed to appreciate the policy conflict between the model and team policing.

   A perceived need for change among those influenced by the innovation -- both police administrators and officers in the street. Effective change must usually build from within an organization. If innovation becomes an "idea in good currency," its chances for success will rise significantly. One of the indicators of this perceived support is a willingness to pay for change. Both San Diego and New York City "used their own money," when installing CAD systems. Although projects funded from the outside may still succeed, often there is less commitment and support than in self-funded efforts.

   Effective timing and system design so as to meet user needs and resist the temptation to oversell and therefore build impossible expectations. The first attempt at CAD in San Diego failed miserably because those involved in the design failed to identify the needs of users. The second effort focused special attention on user concerns and was implemented at a time when change seemed essential. The outcome was far more successful.

   The proper selection of priorities in implementing computer technology. The most important formula seems to be to start with routine innovations that assist the officer in the street; more nonroutine innovations can be developed later to serve a more narrow range of officer needs. Also, the focus has been on crime and law enforcement activities. Perhaps if greater attention were devoted to service or order maintenance objectives, acceptance would increase.

2. **Factors related to the project management of innovation:**

   Establishment of a clear set of performance guidelines at the beginning of a project. Such guidelines serve as a framework for clear understanding between the vendor and user. They were invaluable, for example, in San Diego, and their absence in other cities has been at the root of many difficulties.

   A long-term framework and perspective. Eight years were spent in the implementation of the ADAM historical reporting system in Los Angeles, and the New York City SPRINT CAD system has evolved significantly within a seven year period. Such projects inevitably take longer than initially planned, and if an adequate time-frame is not allowed, frustration and rejection will ensue.

   Emphasis placed on human-computer interaction. There is sometimes a tendency to consider computer technology as a replacement for people. This is both unrealistic and inefficient. One of the most critical variables for the efficient operation of any computer system is the development of the proper balance in the interaction between people and machines.
Effective training, education, and information dissemination. The process of communication is often at the heart of effective innovation. Carefully designed training programs provide an important link in such communication. However, innovators must be careful not to oversell and be prepared to listen to feedback. The dialogue process must be two way.

Continuity of personnel. Experience has shown that, as advocates for technological innovation move, the innovation often dies. Change in personnel is inevitable, but at the same time, a certain degree of continuity must be maintained.

Involvement and quality of top-level leadership. Police departments tend to be fairly rigid organizations with well established chains of command. Understanding, involvement and support from the top is essential if technological innovations are to be implemented and used. More than support from the Chief is required, though. In addition, a core of agency leaders is necessary if commitment is to be maintained over time.

Involvement of other police personnel. Besides the top commanders, police at the operating level must be involved in the design and development of computer technology. One reason the resource allocation system faltered in St. Louis was because the field officers strongly resisted a shift of only one hour in their daily schedules because it would have required them to commute to work during the normal rush hour traffic.

Caliber of computer systems and technical staff. Individuals are required who have both technical skills as well as a broad perspective which will allow them to see beyond computer technology to law enforcement needs and to communicate successfully with the police department. In order to attract such individuals, cities must be willing to pay competitive wages.

Unbiased evaluation. A careful (and, if possible, independent) evaluation should be an integral part of any implementation effort.

Conclusions—Changing expectations for the future

There are a range of views about the use of computers and technology in our society. At one extreme are those who see the increasing movement towards a technological society as dangerous, a movement that will take us away from the “good life.” Scientific rationality and technological progress may have questionable results and set up a chain reaction which we may not be able to reverse. At the other extreme are the technologists and the vendors who sell their products. They argue that the benefits of technology outweigh the costs and tend to oversell their products and to promise more than they can deliver. It is the opinion of this author that the truth lies somewhere in between. On the one hand computer technology has become a part of law enforce-
In summary, most arguments against the computer are made on the grounds that too much money is currently being spent on law enforcement technology, particularly when it is not clear that the benefits of such technology justify the costs. However, this study has found that in many routine applications the benefits can justify the costs, particularly if benefits are defined in narrow, process-oriented terms. Further, this efficiency may continue to develop with time as computer technology becomes more sophisticated and police departments get better at handling the organizational and behavioral problems which often accompany the introduction of technology and the implementation of change.

More importantly, though, there are other issues surrounding the use of the computer that have greater significance than questions of costs and benefits. The use of computer technology by the police must be placed in perspective. Although many aspects of computer technology in law enforcement are well established and expanding, it would be a mistake to think such innovations will play a major role (at least in the short run) in revolutionizing the police or many of the issues they face. Police work, to a large extent, is determined by the conditions of our society and its people. Crime and law enforcement have a momentum of their own. Computer technology may have a marginal role in influencing and shifting relationships, but the major law enforcement issues must be resolved in the context of society as a whole. For example, some of the most pressing law enforcement questions at this time are to define the basic task of the police, to identify how the officer’s time is really being spent, to determine the correct allocation of resources and to determine if current recruiting and training practices complement the basic needs and priorities of the police. The computer (along with proper analysis) may help in a small way to resolve these sorts of issues, but until such questions are addressed the implementation of the computer may also serve to reinforce the status quo, to lock in and substantiate our present approach, and to indirectly countermand other innovation.

The greatest strengths of computer technology seem closely related to its greatest weaknesses. Computers have the potential to aid in criminal justice activities through rapid communication, accurate and complete information, and perhaps a more rational approach to decision-making. We must realize that there are limits to this technology, though, and not overestimate the potential. These very benefits, if not properly controlled or planned, may result in misuse, unintended consequences, wasted resources and frustrations. Expanded computer use by the police is at a crucial point and now is the time to point to a new direction, one slanting toward attention to evaluation and implementation, stressing performance standards and transfer, and realizing that police play a broader role in society than simply fighting crime. Such a new direction requires careful consideration so that the strengths of technology can be judiciously marshalled and the weaknesses and potential risks prudently forestalled.

NOTES


7. For a detailed discussion and documentation of the routine and non-routine applications referred to in this paper, see Colton, K. (Ed.), Police Computer Technology: Implementation and Impact, Lexington Books, Lexington, Massachusetts, 1978; especially Chapter 3 for routine applications and Chapters 4-11 for non-routine applications.

8. Since warrants in the Los Angeles automated warrant/warrant system include both traffic and criminal warrants, it is likely that a majority of the 31.5 percent increase in warrant arrests was for traffic offenses.

9. Information concerning the computer system in Tulsa, Long Beach, Kansas City, and Oakland are found as a series of “mini-case studies” on

10. Phone conversation in 1973 between the author and Robert McNamara, former Chief of Police of the Kansas City Police Department.

11. Only a small portion of police time is devoted to law enforcement activities such as burglary in progress, check on car, make an arrest, etc. Rather, the large majority of police time is devoted to service (personal requests, animals, ambulance calls, utility problems, accidents, lost or found property, etc.) or order-maintenance activities (family trouble, gang disturbances, neighborhood trouble, fights, etc.) See for example: Wilson, J. Q., Varieties of Police Behavior, Atheneum, New York, 1970; and Webster, J. A., “Police Task and Study Time,” Journal of Criminal Law and Police Science, March 1970, pp. 94-102.

12. Of the police departments surveyed in 1974, 48 percent indicated that they use no mathematical techniques in deployment, 34 percent said they relied on some version of a hazard or straightforward quantitative formula, and only 18 percent responded that they used an advanced mathematical method, such as a computer simulation or computer-aided resource allocation approach. For a more detailed discussion of police deployment techniques see Larson, R. C. (Ed.), Police Patrol Deployment: New Tools for Planners, Lexington Books, 1977.

13. For a complete documentation and analysis of the three resource allocation cases see Colton, K. (Ed.), Police Computer Technology: Implementation and Impact, Lexington Books, 1978, Chapters 4 (St. Louis), 5 (Boston), and 6 (Los Angeles).


18. The three complete cases are found in Colton, K. (Ed.), Police Computer Technology: Implementation and Impact, Lexington Books, Lexington, Mass., 1978, Chapters 9 (Boston), 10 (New York City), and 11 (San Diego).

19. Ibid., especially chapters 10 and 11.


24. See, for example, Hough, Granville W., Technology Diffusion, Federal Programs and Procedures, Lomond Books, Mt. Airy, Maryland. 1975.

25. Space and the focus of this report preclude a full discussion of the importance and process of communication and integration in professional practice. For a thought-provoking and worthwhile treatment of this subject, see Argyris, Chris, and Donald A. Schon, Theory in Practice. Increasing Professional Effectiveness, Jossey-Bass, San Francisco, 1974, especially Chapters 4 and 5.
