

POLICE AND COMPUTERS:
THE USE, ACCEPTANCE AND IMPACT
OF INFORMATION TECHNOLOGY

by

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ABSTRACT

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In recent years the use of computers by the law enforcement community has grown at an astounding rate. Much of this rise must be attributed to the fact that federal dollars have been available through the Law Enforcement Assistance Administration to help finance the cost. This surge of technology, though, has been both praised and criticized. The basic question is whether the expansion of computer use by the police is an unnecessary waste stimulated by the existence of federal money and industrial pressure; or whether the ultimate result will be improved police efficiency, a reduction in the crime rate, and greater safety for both the citizen and the officer in the field.

Over the last decade, the scope of computer use has evolved and expanded significantly. The earliest applications were traffic accident files established in two police departments in 1960. From such initial programs for statistical and "housekeeping" administrative tasks, computer use has advanced to a number of applications related to operations, management and program planning. There now seems to be a spectrum of computer applications. At the one end are uses which are basically "structured," the routine automation of tasks which were already being performed on a manual basis prior to the introduction of information technology. These include such uses as real-time systems for police patrol and inquiry, traffic, and police administrations. At the other end are "unstructured" applications where use is more complex and the machine becomes a tool for decision making, strategic planning, and man-machine interaction. Here are grouped applications related to resource allocation, criminal investigation, and command and control.

One of the basic findings of this study is that success among computer users varies widely from department to department. The factors which seem most important in

achieving favorable computer performance are therefore outlined. It was also found that although the classification of "structured" and "unstructured" applications do not designate sharply defined categories, they provide a useful distinction when it comes to evaluating computer impact and success in implementation. Uses pertaining to routine data processing where the parameters of inquiry and retrieval can be highly structured have proven to be rather effective, and implementation can be made with relative ease although major differences still remain among departments.

However, beyond these structured areas where computer implementation begins to take on innovative, unstructured applications the design and execution becomes more difficult and the results less clear. Behavioral, political, and organizational considerations are increasingly significant; and the hope and theory as presented in the literature often far exceeds the reality that exists in the practical world.

Still, it should be realized that computer technology is in its infancy. Over time there will not only be "technical" benefits through greater speed and precision in processing and distributing information, but more subtle impacts will be felt on police task, structure, and people. Some of these trends can already be identified. They include such shifts as an increase in influence and importance of those who have technical backgrounds related to quantitative or computer skills, a movement towards greater power for those at the higher levels of police bureaucracy, and a supporting and even stimulating effect for professional police departments vs. more traditional style forces. It is these kinds of shifts that will eventually be most significant when it comes to the use of computers by the police. There is potential, then, for information technology to aid in the more effective enforcement of the law through rapid communication and a more rational, structured approach to decision making. On the other hand, these very benefits, if not properly controlled or planned, may lead to misuse and to a reinforcing of an inappropriate approach to police work.

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It is traditional to write acknowledgements, but I must admit that in the rush of completing the details that accompany the final stages of dissertation work, my first impression was that it was a tradition that might be bypassed. After only a few moments of thought, though, it became strikingly apparent that numerous acknowledgements were necessary in order to begin to express gratitude to those individuals, professors, students, and law enforcement officials who contributed to the study. Naturally the responsibility for the output of the study is my own, but without their help it would not have been possible.

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CHAPTER I

THE POLICE AND THE COMPUTER: AN INTRODUCTION

Law enforcement along with the entire criminal justice system has been thrust into the public spotlight over the last few years. According to the fashion of the times, political figures clamor for law and order in the streets of America. Although reaction has probably been heightened through exaggeration and excess publicity, citizen concern is widespread. A poll conducted by the Gallup organization in 1971 showed that a large and growing majority of Americans were doubtful that the criminal justice system was working very well.¹

This increased attention has been met with calls for a wide variety of reform, sometimes contradictory, and with growing federal support. Funding for programs administered by the Office of Law Enforcement Assistance (OLEA) and the Law Enforcement Assistance Administration

¹"The Public: A Hard Line," Newsweek, March 8, 1971, p. 39. Only 23 per cent of the adult population were found to think that the criminal justice system in the United States was working very well today, compared to 46 per cent who said they would have rated it highly five years ago. (Interestingly, there was remarkably little variation in the pattern of opinion from those who lived in small rural towns with those who lived in large metropolitan centers.)

(LEAA)² have jumped from an annual appropriation level in 1966 of \$7.25 million to an estimated \$698.9 million for fiscal year 1972.

Within this framework, the application of computer technology has been heralded as one of the potential methods by which to improve the criminal justice system. The President's Commission on Law Enforcement and Administration of Justice stated that

probably the single greatest technical limitation on the [criminal justice] system's ability to make its decisions wisely and fairly is that the people in the system often are required to decide issues without enough information.³

The report went on to indicate that "criminal justice could benefit dramatically from computer based information systems."⁴

As if in response to such statements, the computer has gained widespread use in police departments

²In 1965 the Law Enforcement Assistance Act was passed and the Office of Law Enforcement Assistance (OLEA) was established within the Department of Justice to administer programs funded under the Act. In 1968 the Omnibus Crime Control and Safe Streets Act was passed and the OLEA was replaced by the Law Enforcement Assistance Administration as the agency to administer programs under the Act.

³The Challenge of Crime in a Free Society, a Report by the President's Commission on Law Enforcement and Administration of Justice, U.S. Government Printing Office, Washington, D.C., 1967, p. 13.

⁴Task Force Report: Science and Technology, a Report to the President's Commission on Law Enforcement and Administration of Justice, U.S. Government Printing Office, Washington, D.C., 1967, p. 68.

around the country in the past five to ten years. A recent survey of 79 cities found that law enforcement was the single most recurring municipal computer application. Fifteen per cent of all the computer applications in these cities were in the law enforcement area.⁵

Since 1968 the number of computer applications reported by police departments throughout the country has more than doubled. In the summer of 1971 the International City Management Association sent a questionnaire to 498 police departments throughout the country. Of those responding, more than a third, or 38.8%, were using a computer. By 1974 the percentage is expected to rise to two-thirds or 62.5%.⁶

This growth in computer use by the police seems related to a recent surge in the overall application of technology to law enforcement. In recent years computers, helicopters, special television cameras, radar devices, and elaborate riot-control equipment have become common

⁵Municipal Information Systems: The State of the Art in 1970, Dial Kraemer, Mitchel and Weiner, Long Island University, Public Administration Center, Chapter 15, pp. 13-14.

⁶The International City Management Association survey referred to was designed by this author and provides the basis for a portion of this study. It will be described in detail later on in the chapter. The specific information cited above was obtained through the survey and is found in Tables II-1 and II-2, Chapter II.

in the equipment inventories of police departments. Industrial sources estimated that the expense of such police equipment in 1971 would soar to about \$700 million, up about 50% from 1967.⁷ This compares to an estimated annual outlay of \$6 billion for police salaries and fringe benefits.⁸ What has stimulated this rapid rise; and do the benefits of such tools justify the cost? Critics claim that many of the expenses have been a waste of money stimulated by industrial pressure and the ease of attaining federal dollars through the LEAA. On the other hand, advocates point to improved police efficiency and the potential for a decrease in the crime rate.

⁷Les Gapay, "Beyond Dick Tracy: Police Go Space Age in Big Cities and Small, To Dismay of Critics," The Wall Street Journal, August 9, 1971, pp. 1, 21.

⁸In a 1970 study by U.S. News and World Report ("Crime Expense Now Up to 51 Billion a Year," U.S. News and World Report, October 27, 1970, pp. 30-34) it was found that \$8.6 billion was spent on the criminal justice system by federal, state, and local governments, \$5 billion of which was spent on the police. Since 1970 federal support through the Law Enforcement Assistance Administration alone has increased from \$268 million to \$698.9 million per year. Based on an assumption of additional increased state and local expenditures for police activities, an estimate of a current annual outlay of \$6 billion dollars for police salaries and fringe benefits seems reasonable. (Salaries and fringe benefits usually comprise 85-90% of a police department's budget.)

This report will focus on the use of computers by the police and will begin to answer the questions raised above. The purpose of the study has been threefold:

1. To determine the state of the art regarding the use of computers by police departments around the country. (How are computers used, by whom, and to what degree?)
2. To examine certain application areas more closely and to begin to look at the positive and negative aspects of computer use. (What benefits are achieved, what costs?)
- and 3. To begin to examine and hypothesize regarding the actual impact that such automated systems might have. (What impact on police structure and task results, what behavioral and organizational influences?)

In order to achieve such purposes, it is important to provide at least an introductory understanding of police work and how it relates to the use of the computer. As a consequence, the remainder of the first chapter provides such a foundation by elaborating on the police department as an environment for computer use. The nature of police work will be discussed and a summary will be made of the basic issues which are currently faced by the law enforcement community. With this as a setting, the methods and extent of the research for the study will be outlined. Throughout the chapter, hypotheses regarding the magnitude and impact of computer use will be postulated.

THE POLICE DEPARTMENT AS A
SETTING FOR COMPUTER USE

In order to explain police departments and the environment which they provide for the implementation of the computer, three topics will be covered: 1) the nature of police work, 2) the basic issues faced by the police, and 3) styles of police operation.

THE NATURE OF POLICE WORK

As a background in examining the nature of police activity, imagine for a moment what it might be like to serve as a law enforcement officer.

Three policemen are on patrol. One spots a speeding car and hastens to stop the vehicle; another hears the crash of splintering glass, angry words, and the ringing out of a shot in the dark; a third is summoned to a local residence--his only information is a complaint of a family disturbance. At that moment each of them alone must apply the law according to his best understanding. It is up to each one to determine what the proper enforcement should be. Should a ticket be given? Was a crime committed or was it simply an accident? Can the situation be handled through reasoning and persuasion, or should an arrest be made? Their judgement, although often largely intuitive, must be

flawless. To the citizen who is stopped, at least at that moment, the policeman's action is the expression of the law. It is an oversimplification to state that the policeman's job is often ill defined and filled with judgement and discretion.

In theory, the police have almost no discretion; officers are to enforce, not interpret, the law whenever an infraction is committed. In reality, discretion is inevitable. The disparity between law and accepted social behavior, the inability of police officers to personally observe every public infraction, the lack of factual information, the need for police to overlook minor crimes in order to obtain information about more serious offenses, and the intolerance of the public towards a policy of strict enforcement of every law without exception, all merge together to necessitate the exercise of police judgement.

Discretion is a common ingredient in most public bureaucracies. However, there is something unique about the police. In most organizations as a person moves to a higher level, movement is accompanied by a greater freedom of choice and decision making. Complexity increases with responsibility. This is not the case in police bureaucracies. The lowest ranking officer--the patrolman --is often given the greatest discretion. In the daily

tasks of his work he is continually forced to make decisions that involve ambiguous conflicts among citizens, or that require intervention without witnesses or mandates regarding action. Further, this means that the police administrator is often limited in his ability to control and influence police behavior and public image.

James Q. Wilson has argued that

the principal limit on managing the discretionary powers of patrolmen arises, not from the particular personal qualities or technical skills of these officers, but from the organizational and legal definition of the patrolman's task.⁹

The nature of police work is further complicated by the fact that the police often consider their job to be an unpopular one and their behavior to be disliked by the public. As a consequence they develop a defensive posture and react by turning themselves inward, "minding their own business," "keeping their mouth shut," and "not sticking their necks out." This has been pointed out in several situations. In a study done in Chicago by James Q. Wilson it was found that even in a time of increasing morale and satisfaction with the way the department was being run, a majority of sergeants still did not think that the police department had the respect or cooperation of most of the citizens in the city (although

⁹James Q. Wilson, Varieties of Police Behavior, Atheneum, New York, 1970, p. 7.

the perception of attitude did seem to improve from 1960 to 1965).¹⁰

In Violence and the Police William A. Westley reports on the results of detailed interviews in one police department regarding the basic attitude and mental set of the policeman. His findings indicate that the police felt that the public was basically hostile towards them. This in turn seemed to stimulate an "inward movement" among the police. In fact, social cohesion in the department was derived from this perceived rejection and hostility of the public coupled with the contrasting warmth, cohesion, and security of the police force itself.¹¹ With the focus turned within, the potential for corruption seemed to increase. Secrecy became the rule, and there was a suspicion of change, particularly change introduced from the outside.

Within such an environment, one would expect potential difficulty to accompany the introduction of a computer in a police department. When relationships

¹⁰James Q. Wilson, "Police Morale, Reform, and Citizen Respect: The Chicago Case," found in David Joseph Bordna (ed.), The Police: Six Sociological Essays, John Wiley and Sons, Inc., New York, 1970, pp. 137-162.

¹¹William A. Westly, Violence and the Police, A Sociology Study of Law, Custom, and Morality (The MIT Press, Cambridge, Massachusetts, 1970), pp. 48-112.

and organization structures are formed, people learn to be comfortable with them and to use them. Security is derived from stability and cohesion. The result in such a setting is often to defend against change--change such as that imposed by the computer. The computer is an "innovation," a new approach to operation, a potential controller and revealer of valuable information. At least in some departments resistance should be anticipated and success achieved only if other factors necessary to introduce change into organizations are taken into consideration and sought out.

However, the police process large amounts of information. Whenever a call for help is requested, it is noted; if an arrest is made, a record is kept; if an officer in the field is about to stop a car which he suspects to be stolen, basic information is needed to help confirm or reject his intuition. Such information requests create a demand to process large quantities of information, and this demand is ideally suited to the capabilities of the computer. It will work in favor of utilizing automation in police departments, particularly if it is introduced with care and tact. One of the greatest abilities of the computer is to repeat itself precisely, rapidly, and without fatigue. Once programmed to perform a set of clerical tasks, it can process and

retrieve masses of individual transactions in a formal, preestablished manner without error and with great speed and precision. As a consequence, it should be expected that the computer will take over a large number of the routine information processing activities which have in the past been carried out on a manual basis. A certain improvement in police effectiveness should be expected as a result of this takeover. In fact, there is the potential that by utilizing automation to make information instantly available to the policeman on the street some of the burdens of discretion may be lifted. If a policeman knows that a person is wanted or that a car is stolen, he may behave in an entirely different manner than if such facts are unknown and unsuspected.

However, though the advantages are substantial, the use of the computer still presents certain weaknesses. Two of the most important are the difficulty of programming the machine to perceive behavioral relationships and to handle human languages. Both limit the application of computers in settings where human relations are vital, and necessitate the translation and interpretation of information before and after it is processed. This also means that when computer use by the police moves from those areas which are simply a replication of routine processing activities towards more

"creative" applications to automate such endeavors as the control and dispatch of police officers, and the application of advanced techniques to allocate patrol resources, the potential for difficulty will most likely increase. Communication between those who design computer programs and those who are to use them will be essential. If results are promised too rapidly, it is possible that implementation will take longer than expected and disillusionment will be the result.

In summary then, the nature of police work has both positive and negative aspects when coupled with the potential for computer use. On the one hand, the police task is highly discretionary and requires large amounts of information to be processed and handled. The capability of the computer to manipulate such data and to provide information with speed and precision complements these basic needs of police work. On the other hand, the police have a tendency to perceive their job to be an unpopular one in the eyes of the public, to seek privacy in their work, and to resist change. These characteristics coupled with the inability to program the computer to perceive behavioral relations and to understand and reproduce human language begin to point to potential problems which may occur in implementing computer use, particularly in areas where the machine is being

used for more than simply automating the routine processing and retrieving of specific data.

BASIC POLICE ISSUES

The next few years will be a time of pressure and possible change within the law enforcement community. The inadequacies of the present system have been characterized from all sides. On the one hand, publicity rages regarding "rising crime rates" and the need for greater safety on the streets of America. On the other hand, there is a cry for a more responsive and personal police force, one that is more fully controlled or at least influenced by the community and the needs of citizens within the community. It seems that public and private pressure will result in some change, but it is still unclear as to how much or in what direction. There are a number of issues around which discussion seems to focus, but no ultimate consensus exists. Those questions which seem most basic to the dilemmas of police administration evolve around three areas: task, structure and people. What should comprise the principle task of the police? What should be the organization and management structure of police departments? And who should

serve as a policeman and what standards should be employed in the recruitment and training of people?¹²

It is not the claim of this author that the computer will have a major influence on changing or resolving these issues, at least in the short run. The conditions of the police are to a large extent determined by the conditions of our society. As a consequence, the computer, at best, will have only a marginal impact. Still, the computer is here to stay as an aid in the law enforcement field. It is therefore important to begin to ask what influence, if any, this relatively new tool will have on the basic issues that are faced. Even if the influence to date has been small--which by the way was one of the hypotheses at the outset of this study --it may be possible to start to isolate trends and to point to future or potential impacts. In order to begin this examination of influence, the three basic issues facing the police regarding task, structure and people will be briefly outlined along with hypotheses regarding what the influence of the computer might be in each area.¹³

¹²For a similar classification of basic police issues see Thomas Repetto, The Boston Police Department, study done for the Boston Redevelopment Authority, Chapter II, pp. 34-39.

¹³These basic issues correspond directly to an organizational classification scheme developed by Harold J. Leavitt. (Harold J. Leavitt, "Applied Organizational Change in Industry: Structural, Technological and Humanistic Approaches" in Handbook of Organizations,

Task of the Police. Although the popular image would lead one to believe that the bulk of a policeman's time is devoted to crime fighting, such is far from being the case. In fact, a comparatively small part of a policeman's time is devoted to crime control and law enforcement. Instead, service activities and maintaining order occupy the largest portion of police effort.

Policemen are essentially involved in three types of work: service, order maintenance, and law enforcement. Regarding the first, service, police are often asked to provide emergency medical aid, respond to traffic accidents and other emergency needs, escort vehicles, rescue cats, direct traffic for church gatherings, etc. In essence,

James G. March, editor, Rand McNally and Co., 1965, pp. 1144-1170.)

In his paper, Leavitt discusses organizations as "complex systems in which at least four variables loom especially large: task variables, structural variables, technological variables and human variables." He goes on to suggest that this four-variable concept provides a useful approach to organizational change. A change in one of the four will influence various responses in the other three.

Leavitt's ideas are complementary to this study. The introduction of computer use in a police department is the introduction of a technological change in that organization, a change whereby influence will also be felt on structure, people, and task. One of the purposes of this report will be to examine and to comment on the impact that such technological change will have on the structure, people, and task of the police.

such activities are intended to please the recipient of the service. It is only a matter of historical tradition and community convenience that they are provided by the police. Theoretically, if society chose to do so, such services could be provided by a private firm and sold in the marketplace competitively, perhaps for less expense.

Order maintenance activities invest the police with the responsibility of maintaining peace in the community. Providing a solution to gang fights, disorderly conduct, family trouble, and neighborhood disturbances are illustrative situations in which the police are called upon to maintain order. It is in the order maintenance activity that the police find their greatest difficulties because it is in this area the greatest amount of discretion is required. In disturbance situations tempers are often on edge, and the wrong action will only bring aggravation. If the situation is volatile enough a riot may even result. The risk of physical harm is always present. An officer must often choose between making an arrest or in resolving the situation in another way. Training for these situations is not in good marksmanship or investigation, but in human psychology and group behavior.

The third police activity, law enforcement, is the one most commonly publicized, but the one where the least time is usually spent. It includes such actions as

responding to burglary calls, catching a person in the act of stealing a car while on patrol, apprehending a prowler, and making a crime related arrest. In a study in the Syracuse Police Department, for example, it was found that only 10.3% of the citizens complaints radioed to patrol vehicles were in the law enforcement category.

The percentage breakdown was as follows:¹⁴

Service (accidents, ambulance calls, animals, assistance of persons, drunk person, escort vehicle, lost or found property, etc.)	37.5%
Order Maintenance (gang disturbance, family trouble, assault, fight, neighbor trouble, investigation)	30.1
Law Enforcement (burglary in progress, check on car prowler, make an arrest, etc.)	10.3
Other (information gathering, book and check, get a report)	<u>21.1</u>
Total	100.0%

Other studies also bear this illustration out.¹⁵

Given these three areas of police service and the current distribution of police activities, the basic question is what should be the mission of the police? Should more time be spent fighting crime or in providing service and maintaining order. Some argue that police should be freed from the routine service tasks, and be

¹⁴James Q. Wilson, Varieties of Police Behavior, p. 18.

¹⁵See for example John A. Webster, "Police Task and Time Study," Journal of Criminal Law and Police Science, March 1970, pp. 94-102.

allowed to focus on the mission of fighting crime. Others feel that since police actually spend a majority of their time providing service and maintaining order in highly discretionary and judgement oriented situations, training should be altered to reflect this reality (for example, expansion of police training in areas of social work, family counselling training, etc.). Experimentation in both directions is being made, but the resolution of the question is still a long way off.

The basic question for this study, though, is what influence, if any, will the computer have on the performance of police task and the resolution of this issue. In developing the study the first potential impact that was expected was improved efficiency in carrying out the activities of the police. (Efficiency will be defined more precisely in Chapter III.) In addition, since the computer is so good at manipulating quantified information, it was felt that the computer would lead to a greater emphasis on quantitative data; and although the influence to date would not be overwhelming, there would be some indication that the computer would put pressure to define the task of the police in more quantitative terms. Of the three basic police tasks--law enforcement, order maintenance, and service--the first, law enforcement, seems to lend itself best to

quantification, so if anything, it was expected that the computer would lead to an increased emphasis on the law enforcement activities of the police, thus reinforcing what seems to be at least the popular image in defining police task.

Naturally there are certain risks involved in utilizing a computer and in stressing the quantitative. In keeping with this it was expected at the outset of the study that the use of the computer in the performance of police task would raise serious questions regarding privacy and the maintenance of individual rights. It was also felt that some evidence would be found in at least some cities which would show that computer use could have a somewhat depersonalizing effect on police activity (e.g., shifting people around based on needs identified through quantitative analysis, and as a consequence not leaving a man in an area long enough to really get to know the people and places so that he would be able to carry out police work in a cordial and personal manner) if special care was not taken to avoid such influence. Further, it was hypothesized that the use of the computer and the analysis which it makes possible might eventually lead to alterations in the way police work was performed (e.g., fluid patrols instead of

set districts). If such was the case it was expected that some evidence along those lines would be found.

Finally, it was anticipated that the use of the computer would lead to a greater sharing of information among various police jurisdictions at all levels (local, regional, state and national). Before undertaking the study it was clear that "networks" of computer users among various law enforcement jurisdictions already existed and it was hoped that the research would at least be helpful in documenting the extent of these "networks."

In summary then, it was the feeling at the outset of the study that the use of the computer would have had little impact to date on police tasks, but that there would be evidence of more subtle shifts to come in the future. Since it is the opinion of this author that the issues surrounding police task are the most significant faced by the law enforcement community, even such subtle shifts may be of real import. If a resolution is ever made regarding the task of the police, it will have a major impact on the other two basic law enforcement issues, structure and people.

The Organization and Management Structure of the Police. One of the basic concerns regarding police structure today is the question of centralization vs. decentralization.

In part this has stemmed from the almost unquestioned emphasis until the last few years on the "professional" model of police work as the primary key to police reform. Although "professionalization" will be defined more completely later on in the Chapter, some of the basic tenets which have been at the heart of this approach include highly centralized responsibility (greater power for the chief of police and other administrative heads of the police department), an effort to eliminate political interference and corruption both at the precinct and central headquarters level, and an attempt to reduce discretion by laying down standards and guidelines for behavior and performance.

In recent years, though, there has been a renewed emphasis on at least the rhetoric of returning greater control to "the people" and on personalizing government through more decentralized forms of control. With this movement has come varying and sometimes conflicting suggestions for decentralizing the police. These range from programs for administrative decentralization within the police bureaucracy, to proposals for citizen advisory boards, to plans for placing the police under various forms of direct "community control." At the one end is a call for the administrative decentralization of the functions of the police. This would give

component units of police departments greater freedom and would result in a shift in decision making power from centralized control at city headquarters to a greater role at the precinct and district level. At the other end of the various decentralization proposals, though, is a call for a dispersal of the authority of the police, and this is a highly different matter. The objective here is not to merely pass the power down the line within the police bureaucracy, the purpose is to pass the power from the police to "the community", and more specifically that would mean to the various groupings of political forces which might be found within the community.

In illustration of this second type of proposal, a charter amendment was proposed in the Spring of 1971 to rather drastically alter the nature and reporting responsibility of the police department in Berkeley, California. The proposal received widespread publicity, and was heralded by some to be the answer to "community control". Others accused the suggested charter amendment of being a disguised technique of bringing chaos and radical control to segments of the city. On the surface, the basic principles of the proposition seemed straightforward: 1) to form smaller police departments for what appeared to be somewhat homogeneous

neighborhoods, 2) to make these departments subject to the control of neighborhood councils, and 3) to require policemen to live within the boundary of the police department for which they worked. Criticisms were raised, though, from a variety of sources (e.g., fears that the proposal would turn Berkeley into three segregated communities with segregated police protection), and the measure was defeated on April 6, 1971 by a 2 to 1 vote. (33,726 voted no compared to 16,144 who voted yes.) It seems certain, though, that proposals with a similar intent will appear again.

Regarding the impact of the computer on police structure, it is not supposed that automation will have much to do, at least in the short run, with proposals to disperse the authority of the police to "the community" such as with the Berkeley proposal. The resolution of these issues will be primarily political. On the other hand, it is proposed that the use of the computer by the police will have some impact on the question of administrative decentralization or movements of control or influence within police departments. Specifically, two hypotheses were proposed at the beginning of the study:

1. A movement towards greater centralization of power for those at the top level. (although few people at the top will have taken advantage of the potential gain in control because of their lack of understanding of the new systems and the inability of computer people to bridge the gap between computer terminology and police management.)

and 2. An increase in influence and importance of those who have technical backgrounds related to quantitative and computer skills.

The People Who Serve as Police. The third basic issue facing law enforcement evolves around the people within the organization. What attributes must be possessed by police personnel? What criteria should be established for promotion? What deficiencies exist in the current training and selection process?

The complexities inherent in the policing function dictate the importance of an officer possessing such characteristics as intelligence, sound judgement, tact, physical courage, emotional stability, and honesty. According to the President's Crime Commission on Law Enforcement and the Administration of Criminal Justice, though,

while innumerable commissions and expert observers of the police have long reported this need, communities have not yet demanded that officers possess these qualities, and personnel standards for the police service remain low.¹⁶

As a consequence, a variety of proposals have been made

¹⁶President's Commission on Law Enforcement and Administration of Justice, Task Force Report: The Police (U.S. Government Printing Office, Washington, D.C., 1967), p. 125.

to upgrade the standards and qualities of law enforcement personnel through improved education, more careful screening of personal and psychological characteristics, new approaches to police training, reduction in police residency requirements, etc.

Many of these proposals have merit, but often they are also accompanied by certain drawbacks. For example, the President's Crime Commission recommended that in the long run all police recruits should possess a bachelor's degree. As a minimum requirement in the short run, the Commission suggested that all future personnel serving as police officers should have completed at least two years of college at an accredited institution.¹⁷ This proposal was intended to upgrade police performance, but if implemented it may also work at cross purposes with another goal of police staffing --the recruitment of police officers from minority groups where the opportunity and/or ethic for a college background may be less.

This is an illustration of the type of questions that must be resolved by the law enforcement community regarding the people who serve as policemen and the standards of recruitment and training which are utilized to obtain

¹⁷Ibid., p. 126.

them. However, this report will not attempt to elaborate further on other "people" issues which exist. The focus, instead, will be to begin to examine the relationship, if any, between police personnel and the influence of computer use.

Regarding the influence of the computer on police personnel it is hypothesized that technically educated people will gain in power and influence in police departments. In keeping with this, there is also the potential that as the computer and the type of analysis it may bring increases in importance in police departments, there will be an increase in the quality of people who are holding positions of responsibility within the department, at least an increase in the quality of educational backgrounds of those people. Finally, it is hypothesized that although the computer will bring a shift in the work activities of those doing routine and recording tasks in police departments, it will not bring about a loss of jobs.

Perhaps the most important impact related to people, though, will not be the impact of the computer on police personnel, but the reverse--the impact that police personnel will have on computer use. Right from the start of the study it has been anticipated that the actions and reactions of various people involved in the

implementation of electronic data processing in police departments would have a significant influence on the "success" or "failure" of any given computer application. Primarily due to this fact, it is further expected that the "success" and "influence" of computer use will vary widely from police department to police department throughout the country.

STYLES OF POLICE OPERATION

Police work in the United States is mainly fragmented and local in character. When we refer to police, we usually speak of separate police forces in each of thousands of local law enforcement jurisdictions in the United States. Certainly there are federal police systems (the Federal Bureau of Investigation and the Secret Service) and networks of state troopers in each of the fifty states. However, the guiding principle in the United States is that police work is almost entirely a local function, and that recruiting, training, and levels of compensation are determined and provided under local control.¹⁸ As a consequence, the police system in the

¹⁸ Gerald Leinwald, The Police (Pocket Books, New York, March, 1972), pp. 18-19.

United States is best described as a nonsystem.¹⁹ There are no national standards as to entrance qualifications, salaries, conditions of employment, processes of lateral movement between departments, and standards for promotion.

Even given the fact that police departments are basically different, it is still possible to identify common groupings or styles of police work. James Q. Wilson has identified three such styles: 1) the legalistic or professional style, 2) the watchman or traditional style, and 3) the service style.²⁰ This classification system is useful both in understanding the operations of various police departments and in hypothesizing regarding the potential of computer use in various police departments depending upon their style of operation.

The first, the legalistic or professional style, is characterized by a strict interpretation and enforcement of the law. The administrator tries to influence patrolmen to handle discretionary situations in a "professional" manner and to treat every case in an identical way. If a person is speeding 10 miles over the limit, for

¹⁹Thomas F. Adams, Law Enforcement (Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1968), p. 81.

²⁰James Q. Wilson, Varieties of Police Behavior, particularly pp. 140-226. Wilson does not use the terms "professional" and "traditional," but they are used by other authors in similar contexts, so it seemed appropriate to add the additional terms to foster the readers' understanding.

example, he gets a ticket, no matter what the circumstances. Legalistic or professional departments are usually further characterized by a centralized organization structure, formal lines of authority, specified standards for recruitment and training, continuous evaluation, technical efficiency, and good record keeping.

In the second style of department, the watchman or traditional style, the authority structure is weaker and each patrolman handles situations more or less as he feels best. The focus is primarily that of maintaining order rather than of strictly enforcing of the law. "Little stuff" is ignored, patrolmen are encouraged not to create too much publicity, more "home town" boys are hired, formal training is at a minimum, and in general there is a smaller staff/population of civilian and technical employees than in professional police departments.

The third style, service style, is oriented towards service to the small homogeneous community. In fact it is unlikely that this style could exist or be effective in any large urban community. Law enforcement and the maintenance of order are taken seriously, but police avoid making arrests or imposing formal sanctions where possible. The police are there to maintain law and order, but they know most of the citizens personally, and their existence is primarily to provide service and security.

It is interesting to postulate what relationship if any, the type of police department (whether legalistic, watchman, or service oriented) will have on the use and application of the computer. At first examination it seems that computer application would be particularly well-suited for the legalistic department. The tendency towards technical efficiency is illustrative of the basic desire in such a department to move towards the more "precise" enforcement of the law. As a consequence it can be hypothesized that the computer will be well received in a legalistic department to the extent that it can aid in this task, both through helping to make performance more efficient and through providing for more accurate reporting, record keeping, and ultimately better evaluation. On the other hand, it can be hypothesized that the computer would be of less utility in a police department with a traditional or service style of operation where improved efficiency or the ability to measure strict enforcement may not be considered major benefits.

RESEARCH METHODS

Two research tools have been utilized to document the growth, extent and influence of computer use by police departments: 1) a questionnaire sent to police departments throughout the country, and 2) site visits to fourteen selected police departments.

A National Survey of Police Departments. In the summer of 1971 a questionnaire designed by this author was sent to a total of 498 police departments throughout the country under the sponsorship of the International City Management Association (ICMA). (The questionnaire can be found at the end of the thesis as Appendix A.) This sample included all police departments in cities over 50,000 and 25% of police departments between 25,000 and 50,000. 376 or 75.5% responded, and Table II-1 tabulates this response.

The survey consisted of two parts. The first part (identified as Part A) was brief and primarily for evaluative purposes. It consisted of twelve questions, eight to be filled out if the department was using a computer and four if it was not. Part A was to be filled out by the chief of police. The second part (identified as Part B) was to be filled out by all police departments that were either using a computer or punch card equipment. This portion of the survey was longer and more technical, and the directions indicated that it should be filled out by the data processing manager or by a comparably qualified individual. Only Part A was sent to the 25% sample of cities between 25,000 and 50,000 in population, both both parts were mailed to all other cities. A second mailing was sent to cities

that did not respond initially. Results from both the first and second mailing are included in the analysis of the survey results.

Site Visits To Selected Police Departments. Site visits were conducted in fourteen selected police departments in order to supplement information gathered from the mailed survey. Interviews were held with 143 law enforcement officials in these cities, 127 sworn police officers and 16 civilian police employees. A formal questionnaire was not administered, but an effort was made to ask a fairly common set of questions to each person regarding how his department used the computer; whether he felt various applications had been successful; how automation had been introduced and implemented; and what he saw as the major effects on the people in the department, the structure of organization and decision making, and the police task. Some numerical tabulations of the responses have been made and will be included in the report later.²¹

The fourteen police departments were selected to obtain variety in terms of city size and geographic

²¹The site visits were conducted by the author and several students at the Massachusetts Institute of Technology. The related costs were supported in part by the MIT Undergraduate Research Commission, in part by the International City Management Association, and in part by the Joint Center for Urban Studies of MIT and Harvard. The students who participated in the study were Jim Ebright, Dan Greenbaum, Richard Prather, Roger Waldon and Roger Jeanly.

location. They include Boston, Massachusetts; St. Louis, Missouri; Wichita Falls, Texas; Tulsa, Oklahoma; Springfield, Massachusetts; Hartford, Connecticut; Atlanta, Georgia; Dayton, Ohio; Kansas City, Missouri; four cities in California: Los Angeles, Long Beach, San Francisco and Oakland; and Denver, Colorado.

Based on the distribution of geographic regions utilized by the International City Management Association, three of the police departments were in the northeast, three in the north central region, three in the south, and five in the west.²² One police department was in a city with a population over one million, six were in cities in the 500,000-1,000,000 population category, four were in cities with a population of 250,000-500,000, and three of them were in cities from 100,000-250,000.²³

Three to four days were spent in each of nine police departments (Boston, St. Louis, Wichita Falls, Tulsa, Dayton, Kansas City, Los Angeles, Long Beach, and Denver). In each of these cities interviews were

²²The breakdown of cities by region is as follows: Northeast: Boston, Springfield, Hartford. North Central: Kansas City, St. Louis, Dayton. South: Atlanta, Wichita Falls, Tulsa. West: Los Angeles, Long Beach, San Francisco, Oakland, Denver.

²³The breakdown on cities by population size is as follows: Over 1,000,000: Los Angeles. 500,000-1,000,000: Atlanta, Boston, Denver, Kansas City, St. Louis, San Francisco. 250,000-500,000: Dayton, Long Beach, Oakland, Tulsa. 100,000-250,000: Hartford, Springfield, Wichita Falls.

held with a broad spectrum of people from the chief of police to a sampling of patrolmen in the field. No precise attempt was made to select interviews according to any random sampling process, but it is felt that a broad range of people and opinion was solicited. In the other five departments where briefer contacts were made (Springfield, Hartford, Atlanta, San Francisco, Oakland), interviews focused on questions more specific to that department.

For comparative purposes it was hoped that the stages of computer implementation to date would vary among the departments visited. With this in mind it was learned that St. Louis, Los Angeles and Denver had been utilizing a computer for some time, so these departments were placed on the list of cities to visit. In turn, people in the St. Louis Police Department strongly recommended that Kansas City be included in the study because of the success in computer use which that department had achieved to date. Wichita Falls, Long Beach and Dayton were of particular interest because they were participating in a federally assisted experiment in urban information systems under the direction of a consortium of federal agencies chaired by HUD, the Urban Information Systems Inter-Agency Committee (USAC). San Francisco and Oakland were selected because they

were experimenting with the use of computer terminals in patrol cars.

The site visits to these various departments provided very valuable information and insights into the state of the art and influence of computer use by the police. The visits were made in the spring and summer of 1971, though, and it is likely that changes have occurred since then regarding the status of the various computer applications examined and described in this report. Since the topic selected for this thesis is one that is rapidly changing and expanding, it is almost impossible to constantly remain up to date. In writing the thesis, then, a research cutoff date of the summer of 1971 was selected. Computer applications will generally be described as they existed during the summer of 1971, and in most cases no attempt has been made to update or sort out changes which have taken place since then.

Also it should be made clear that enough time was not spent in every city to do a detailed case evaluation of computer impact. Instead, site visits to cities will be used as a basis from which to draw specific "mini-case" illustrations of the costs, benefits, and influences of certain computer applications. Based on an analysis of the I.C.M.A. questionnaire, specific

conclusions can be drawn regarding the state of the art of computer use. Based on a coupling of the I.C.M.A. survey with the site visits preliminary conclusions regarding the costs, benefits, and influence of computer use can be drawn. Perhaps at some future date further research in this area will turn these preliminary conclusions into more final ones.

OUTLINE OF THE THESIS

Relying on the purposes of the thesis stated earlier in the chapter, the remainder of the report will focus on three areas: 1) outlining the state of the art regarding the use of computers by the police, 2) examining certain computer applications more closely to begin to look at some of the costs and benefits of computer use, and 3) analyzing and hypothesizing regarding the influence that such automated systems might have.²⁴

Chapter II will concentrate on reporting some of the results of the I.C.M.A. survey and will outline how

²⁴Throughout Chapter I various hypotheses and expectations regarding the magnitude and impact of computer use have been outlined. In the course of the thesis each of these will be discussed or dealt with in one way or another. For the reader who is interested in seeing these expectations in summary fashion they have been listed as Appendix B at the end of the thesis.

computers are being used by the police and by which departments. Chapter III will provide a brief framework for the analysis performed in the remaining portions of the report.

Chapters IV and V will examine various computer applications in police departments around the country, relying heavily on case illustrations developed from the site visits. Chapter IV will look at computer applications being used to carry out somewhat routine, structured activities, and Chapter V will begin to examine computer use in more "creative," unstructured application areas.

Chapters VI and VII will expound and hypothesize regarding the current and potential influence of the computer in the law enforcement field. Chapter VI will review the impact of the computer on police task, structure and people; and Chapter VII will summarize and conclude.

CHAPTER II

THE EXTENT OF COMPUTER USE BY POLICE¹

The police first used computers in the early 1960's, and in 1964 St. Louis installed the first real-time police computer system in the United States. Since then the growth of police computer use has been widespread. The 1971 I.C.M.A. survey found that more than a third, or 38.8% of the police departments were using a computer (Table II-1).² In addition, 11% of the 230 police departments indicating that they were not using computers acknowledge that punch card equipment was used, bringing the percentage of police departments who were using either computers or punch card equipment to 45.5%.³ Future growth will continue

¹This chapter is in the main adapted from several recent articles by the author: "Police and Computers: Use, Acceptance and Impact of Automation," 1972 Municipal Year Book, International City Management Association; and "Use of Computers by Police: Patterns of Success and Failure," Urban Data Service, International City Management Association, April, 1972.

²Because of the large number of figures and tables in this chapter, they will be found at the end of the chapter. In other chapters in the thesis, figures and tables will be included with the text.

³In the survey a distinction was made between electronic data processing (EDP) and automated data processing (ADP). EDP equipment refers only to computer equipment whereas ADP is a broader term and includes not only computer equipment but punch card equipment (referred to as electronic accounting machinery and abbreviated EAM).

at a rapid rate. According to the indications from the I.C.M.A. survey, two thirds (62.5%) of the police departments will be using a computer by 1974 (Table II-2).

In order to understand this growth and to describe the extent of computer use by the police, five topics will be covered in this chapter. First, it is necessary to explain just how police departments use computers and to classify various law enforcement applications into basic categories. Second, the evolution of computer use in police departments over the last ten years will be outlined. Next, the primary reasons for computer use will be discussed. The question will then be raised as to how police departments who use computers differ from those who do not. And finally, some comments will be made as to the general acceptance and satisfaction of computer use to date and the problems which have been encountered.

CLASSIFICATION OF COMPUTER USE

Computers receive a wide range of use in police departments. The I.C.M.A. survey identified twenty-two specific police computer applications. These can be grouped into eight basic application areas (Figure II-1):

1. Police patrol and inquiry. These applications allow a police officer to make rapid

"real time"⁴ inquiries about the identification of people or property to see if they are wanted, stolen, etc. If a policeman stops a speeding automobile and wants to know if the car has been reported stolen, he can call the license plate number into a dispatcher. The dispatcher or a special terminal operator types the number into the computer terminal in front of him and reads back a response to the inquiring officer. Depending upon the computer hardware/software configuration and the load on the machine, the response will be displayed on the terminal in a time ranging from a fraction of a second to half a minute. Quick response allows an officer to know whether or not he should approach the driver with special caution. Applications included in these areas can relate to people, such as automated files of outstanding warrants, or articles, such as stolen property files. They can also relate to a combination of the two, such as files providing listings and cross-references for registered vehicles and their owners.

⁴Real-time or on-line access refers to direct access, through a terminal, to computer files at any time so that all inquiries will receive almost immediate response--for example, real-time access to a file of stolen vehicles through a video display terminal.

2. Traffic applications. Computers are used to provide automated records of traffic accidents, traffic citations, and parking violations. Traffic citation and accident information can then be used to provide basic information necessary to fill out state and federal traffic reports (e.g., National Safety Council Reports), and for determining the allocation of police resources for best meeting local traffic needs. Computerized files of parking violations can also be kept. In some cities such records are used to spot check cars to see if they have an excessive number of unpaid parking tickets. If they do, the vehicle will be towed.

3. Additional police operations. Applications included in this classification are files pertaining to jail arrests and files related to intelligence records. Jail arrest files are used primarily to monitor the process of admitting and releasing prisoners. Such files can also be tied to a court scheduling system so that when a person is jailed a time can automatically be set for his appearance before a judge. Also, a judge can be provided with a printout on each of the cases he will handle in a given day. Files

related to intelligence records contain information on police records and other activities of individuals suspected or "known" to be associated with organized crime or with groups considered to be subversive, revolutionary, or dangerous.

4. Computer aided dispatch. In order to speed up and more effectively handle the dispatch of patrolmen to requests for police service, computers are used to provide for the automated command and control of units in the field. In some departments elaborate command and control systems have been proposed to have cars dispatched on an almost fully automated basis. In other departments, less ambitious efforts are intended where the computer would "interact" with the police dispatcher by suggesting alternative patrol units that could be sent to a particular call. The final choice between units, though, would be left to the decision of the human dispatcher.

5. Criminal investigation. Computers provide officers and detectives with supporting information for investigation and solving crimes. Files may include information on individual or group crime patterns (method of operation or

modus operandi files), automated access to field interview reports (police reports prepared of interviews held in the field with suspicious characters, individuals stopped but not arrested, etc.), nickname files, and special automated routines to match fingerprints. Another use of computers on criminal investigation which has been suggested in several departments is the use of the computer to assign various cases to particular detectives on the basis of information available, the detective's previous experience, time initially allotted to work on the case, etc.

6. Crime statistical files. Here are included basic files on the type and number of criminal offenses and arrests and on juvenile criminal activity. Both personal and aggregate statistical information may be kept in such files. These records often provide the basic data base for the police department and receive a wide variety of use in filling out reports, supplying historical records, providing basic information for planning, and supplying background data for criminal investigation.

7. Police administration. Computer use here corresponds closely to administrative uses in other government and business organizations. Personnel records, payrolls, budget analysis and forecasting systems, inventory control files, and fleet maintenance records all can be automated to aid in the administrative operation of the police department. The majority of these applications are routine activities, but they do provide very useful administrative aid. Also, the computer is being used more and more as a device for planning, particularly for budget analysis and forecasting.

8. Resource allocation. Computer programs are widely used to analyze police service more effectively and to provide for the effective allocation and distribution of patrol units. In some cities, programs have been developed which can help to predict workloads as they vary on an hourly, weekly and seasonal basis. This information, in turn, is used in formulas or algorithms to alter police deployment so as to more effectively meet changing crime and workload patterns.

These eight applications areas can be linked to the basic operations of a police department. This is demonstrated in Figure II-1 where the application areas are grouped to show their relationship to police patrol and daily operations, criminal investigation, administration and management, and program planning and evaluation.

EVOLUTION OF COMPUTER USE

The scope of computer use in police departments over the last five to ten years has evolved and expanded significantly. The earliest computer applications reported in the I.C.M.A. survey were traffic accident files established in two police departments in 1960. From such an initial use for statistical tabulation and "housekeeping" administrative tasks, the computer has advanced to a number of applications related to operations, management, and program planning. Specifically, there seem to be three distinct eras in the evolution of computer use by the police: 1) 1960 to around 1967, when traffic and crime reporting applications were most prominent; 2) 1967 to 1971, highlighted by the rapid expansion of systems for police patrol and inquiry; and 3) 1971 to a more hazy future, with an increasing focus on the more difficult and perhaps potentially more beneficial applications related to resource allocation, criminal investigation, and command and control.

1960-67. This was the initial era of computer use by the police. First applications began in the traffic area, and were closely followed by the development of crime-related files so that the computer could be used as a tool in filling out local, state, and national crime reports (e.g., the FBI Uniform Crime report). By 1967, according to the I.C.M.A. survey, almost half of all computer applications (46.4%) were devoted to either traffic or crime related files. (Figure II-2A indicates the average percentage of computer applications found in each area at that time.) The chart clearly illustrates the early emphasis on traffic and crime reporting uses.

This initial emphasis of computer use by the police is also confirmed by a survey conducted by the Institute for Police Studies at California State College, Long Beach, during the summer of 1968. In that survey it was found that the five most common police computer applications at that time were traffic accidents, parking citations, traffic citations, files on arrested persons, and files on records of criminal offenses.⁵

1967-1971. In the middle 1960's a shift in focus began to develop. Police departments continued to install

⁵Paul M. Whisenand and John D. Hodges, Jr., "Automated Police Information Systems: A Survey," Datamation, Vol. 15, No. 5, May 1969, pp. 94-95.

traffic and crime related files, but the development of real-time computer systems capable of providing a rapid feedback of information to the inquiries of patrolmen in the field became popular. In 1964 the St. Louis Police Department installed the first real-time police computer system. Soon other cities joined St. Louis, and in the last few years the growth of computer applications related to police patrol and inquiry has been remarkable. In 1971 one out of every five computer applications was devoted to the rapid retrieval of information pertaining to outstanding warrants, stolen property or vehicle registration (Figure II-2B, Table II-3A). The cumulative total of certain application areas for each year since 1960 is illustrated in Figure II-3. Note the relative "leveling off" of traffic uses and the doubling of police and inquiry applications between 1969 and 1971. Figure II-3 also demonstrates the continuing importance of crime statistical files among law enforcement computer users.

As one would suspect, the emphasis in the establishment of police patrol and inquiry systems has been on rapid inquiry and response. If a policeman stops a speeding car it is extremely helpful for him to know if the car is stolen before he approaches the driver so that he can anticipate the latter's potential reaction rather than waiting

until it is too late. Thus, one would expect a majority of police patrol and inquiry systems to be "real-time" to facilitate a response in seconds rather than minutes. And indeed, such is the case. Of the 180 applications reported 150, or 83.3%, were real-time. Real-time applications related to police patrol and inquiry made up close to half (46.7%) of all real-time police computer applications in 1971 (Table II-4).

During the period of 1967-1971 major steps were also made to provide access for local police departments to regional, state, and national real-time computer networks. The establishment and development by the FBI of the National Crime Information Center (NCIC) occurred during this period. In addition, numerous state and regional law enforcement computer systems primarily for police patrol and inquiry were established.

The Future. Police department responses indicate that there will be another shift in the future regarding the utilization of computers by the law enforcement community. Police departments were asked to indicate in the I.C.M.A. survey what their specific plans were for computer use by 1974. Apparently, real-time systems will continue to be important, but the emphasis is shifting toward police resource allocation. Further, there will be a rather

striking increase in the installation of systems to aid criminal investigation and computer aided dispatch.

The significance of police resource allocation has already begun to appear. Figure II-3 indicates the rising utilization of applications in this area. Whereas police patrol and inquiry uses increased by more than five times between 1967 and 1971, the percentage rise in applications for resource allocation was only slightly smaller, with a fourfold jump. More important, though, the projected increase in 1971 to 1974 in police resource allocation was 118.0%, while the increase in police patrol and inquiry was only 76.7% (Table II-3A). If estimates from the I.C.M.A. survey are valid, the average percentage of total computer use devoted to resource allocation will actually be slightly greater than that devoted to real-time inquiry (see Figure II-2C). Crime statistical files are predicted to have the highest average use, by 1974, closely followed by resource allocation. Use of police patrol and inquiry applications will be third with traffic uses remaining fourth.

Though the use of the computer for criminal investigation and dispatch has received little attention to date, the mailed survey indicates that this will change in the future. Uses for computer aided dispatch are predicted to increase by more than six times between now

and 1974, going from an average of 3.2% to 9.7% of total computer use; and applications for investigations will more than quadruple, rising from 3.7% to 8.8% of the average total police computer use (Tables II-3A and II-3B, Figures II-2B and II-2C).

However, such predictions of the future should be qualified. These estimates are based on the responses of police departments to the I.C.M.A. survey. They represent informed opinion, but should be viewed with certain skepticism. Estimates often tend to be overly optimistic. It is also possible that federal sources of funds may decrease in the next few years, thus causing the realities of the future to be less than currently anticipated.

It is interesting to note, however, that the predicted emphasis on resource allocation applications in the future corresponds directly with the attitude of law enforcement personnel. In the mailed survey police departments were asked to indicate which three applications they considered the most significant. The ranking of importance for each area is provided in Figure II-4. Police deployment and resource allocation was clearly regarded as the most important computer use, with crime related files (used for investigation and analysis as well as reporting) second and police patrol and inquiry third. Although the police utilize the computer principally

in areas related to daily police operations, they still consider resource allocation to be the most important application. It is also significant that although computer aided dispatch and criminal investigation applications receive relatively little use by police departments now, they were still ranked in importance above traffic, police administration, and miscellaneous operations.

When considering the overall development of computer use in other fields, the various shifts in emphasis of use by the police seem logical. Computers have traditionally been used first to replace "housekeeping," record-keeping activities within an organization, activities which were formerly performed using desk calculators and key punch equipment, hence the initial emphasis on traffic and reporting uses. However, with the advent of third generation computers (utilizing integrated circuits to facilitate increased computation speed) and real-time concepts, it seems reasonable that the police would take advantage of this tool to implement real-time systems. Still, from a technical point of view, such inquiry systems to handle wanted warrants, stolen property, and motor vehicles are relatively straightforward. In fact the applications which have received greatest use to date (police patrol and inquiry, traffic, police administration, and crime statistical files) would in general have to

be classified as somewhat "routine" uses involving the straightforward manipulation and retrieval of prescribed data. For the sake of identification they can be classed as applications to "structured" problems or situations.

However, there is another area in which applications become more elusive and complex. It is in this "unstructured" area that the machine becomes a tool for decision making, strategic planning, and man-machine interaction. In law enforcement this includes such application areas as resource allocation, the investigation of crime, and command and control. (Figure II-5 illustrates how the eight application areas outlined in the first part of the chapter relate to the categories of structured and unstructured.)

Naturally, it would be a mistake to consider "structured" and "unstructured" categories as sharply defined classifications.⁶ It is more reasonable to consider them as opposite ends of a spectrum. For example, moving toward the unstructured end, systems

⁶The distinction between "structured" and "unstructured" problems related to computer applications first came to the author's attention in G. Anthony Gorry and Michael S. S. Morton, "Management Decision Systems: A Framework for Management Information Systems," Working paper Number 458-70, Alfred P. Sloan School of Management, MIT, April, 1970. (The terms "programmed" and "unprogrammed" have also been used by Herbert A. Simon in The New Science of Management Decision, Harper and Rowe, 1960, p. 6, to draw a similar distinction.)

design becomes more difficult; and behavioral, personality, and organizational considerations become increasingly significant. For more unstructured applications to be successful there must be an effective interaction between man and machine. Establishing the proper balance is often the key to successful implementation. It is also in this more "complex" area that the consideration of costs and benefits often becomes more difficult.

To date, police use of computers has been almost entirely in structured applications. However, since it seems likely that in the future increased emphasis will be placed on the more unstructured application areas, it is important to consider the relative influence of both. Only time will tell the ultimate effect, but later chapters (Chapters IV and V) will begin to outline some of the possible advantages and disadvantages of structured and unstructured uses.

REASONS FOR COMPUTER USE

Police use computers for a number of different reasons. Each department is unique and a variety of motivations are often involved.

First, police departments process large amounts of information, and for this processing speed and precision is often required. The computer is ideally suited

for such purposes. When asked in the mailed survey to indicate their major reasons for using a computer, the most common responses were to improve service to the public, to improve the patrolman's ability to rapidly identify and apprehend criminals, and to make internal operations more efficient (Table II-5). All three of these reasons reflect a desire to increase police efficiency and effectiveness through the use of the computer to more rapidly process information.

However, computers are also being installed because large amounts of money are presently being spent by the federal government to support police and criminal justice operations. One of the primary areas for the allocation of these dollars has been the improvement of police hardware and technical innovations. In some instances the primary reason for installing a computer is simply that the money is there. In the I.C.M.A. survey it was found that four out of ten of those departments who were using computers had received funds from the Justice Department's Law Enforcement Assistance Administration (LEAA) to aid in their automation effort. Another two out of ten indicated that they had not yet received aid but had applied or were planning to do so. In addition, more than half of the non-users planning to transfer to computer use (51.6%) indicated that they were hoping to receive aid from the LEAA. Among those departments

receiving federal aid, seven out of ten indicated that LEAA funds had made a difference. Five out of ten said that they would not have had a computer without assistance. Only one out of ten indicated that computer usage would have been the same without the LEAA (Table II-6).

The importance of money in the minds of the police (and as a consequence the significance of LEAA funding) was also demonstrated when those departments who were not using a computer were asked in the I.C.M.A. survey to explain why. Financial constraint was the dominant reason provided (Table II-7). Approximately three-quarters of the non-users felt that they had not been able to afford such facilities, with this reason being cited over 3-1/2 times more frequently than the second ranking factor. This response, though, did not seem to be tied significantly to size, as non-users from all size cities indicated that finances represented their primary problem. (The second and third ranking reasons cited for lack of use were the small size of the department and the belief that the costs outweighed the benefits. In addition, about one-tenth said that they were not using a computer because their present operations were satisfactory.)

In reality, the emphasis of police departments on the "inability to pay" seems to be one of the basic myths

that has surrounded the application of research and technology to police problems. Traditionally the police have spent very little on research and technical improvements. In the past the response to increased crime rates and added demands for service has primarily been to hire additional policemen to get more men "out on the street" instead of trying to employ new techniques to use existing personnel in a more efficient and effective manner. In a recent book Richard Larson estimated that less than one tenth of one per cent of the budget of law enforcement agencies was devoted to research compared with 2 to 4 per cent in industry and 10 to 13 per cent in defense.⁷

As an illustration, approximately \$250,000-\$500,000 is needed to run a small real-time computer operation.⁸ By comparison it costs a similar amount to simply maintain

⁷Richard C. Larson, Urban Police Patrol Analysis, The MIT Press, Cambridge, 1972, p. 4.

⁸It is figured that the hardware computer costs for a small real-time computer system--say 50,000 records with 52 characters/record--would be somewhere around \$12,000-\$14,000/month. Further, it is usually estimated that such hardware costs--rental or purchase of the computer--usually run about 1/3 of the costs of the overall computer operation--computer, personnel, overhead, etc. Assuming conservatively that hardware computer costs of \$12,000-\$14,000/month will range from 1/3 to 1/2 of total costs, the annual budget for such a police computer facility would range from \$250,000-\$500,000.

two two-man police patrol cars around the clock for one year.⁹ This is not to say that in a small or medium size police department \$250,000-\$500,000 is not a significant cost or that in every case a computer should be purchased instead of personnel. However, the point is that there is a tradeoff between the use of technology and hiring more men, and although budget constraints may be real, before a police department simply rules out the use of the computer due to an "inability to pay," the benefits and costs of improved technology vs. increased personnel should be carefully considered.

As this report goes on it will try to assess more thoroughly some of the benefits and costs of computer use, and hopefully this type of analysis will be helpful to a department making choices regarding limited resources. Still, at this time the fact remains that the primary perceived constraint hindering computer use is the inability to pay, and this is one of the main reasons why

⁹According to Richard C. Larson, Urban Police, p. 3: "To fill one post 24 hours a day, each day of the year, requires approximately five individuals (considering days off, vacations, and sick leave). Thus, one two-man post such as a two-man patrol car requires approximately ten individuals. Conservative estimates of salary and direct benefits yield an annual cost exceeding \$10,000 per officer in most cities, thereby giving a total annual cost per patrol car in excess of \$100,000."

the influx of funds from an outside source, the federal government through the LEAA, has had such a stimulus on computer use.

In fact, visits to police departments confirm the importance of LEAA backing for police computer use. In several cases department personnel reported that computer development took place as long as federal money was available. One civilian employee went so far as to say that his work (primarily related to resource allocation and scheduling) was considered a "luxury" in the department: as long as outside sources could fund the effort, the work could continue; but if such sources were to dry up, his work would almost certainly cease.

This influx of federal dollars into the law enforcement field over the last several years now raises a new issue regarding technology and the police. It seems appropriate that LEAA dollars should be used to open the door to research and technology in the law enforcement field. The question being asked currently, though, is whether or not the door has been opened too wide, thus leading to the possibilities of waste and misuse. One of the primary criticisms of LEAA funding to date has been that the emphasis has been on funding projects devoted primarily to better police hardware, and that little evaluation has been made as to the utility and

benefits of such expenditures. In the view of some critics, the principal result of the Safe Streets Act of 1968

has not been a reduction in crime, but the proliferation of crime fighting equipment into a fast-growing industry. . . . Many of them believe it would have been wiser to spend more of the federal funds on courts, correction systems, and social programs to prevent crime.¹⁰

One of the primary purposes of this study then will be to begin to assess what the impact of the computer has been to date. Perhaps it is easier to invest money in hardware because the product is easily defined, whereas ultimate solutions to the major police issues raised in Chapter I are far less clearcut. However, if the computer is sometimes considered an unnecessary "luxury," or if we do not make an effort to evaluate the actual utility of the hardware expenditures such as the computer, then there is always the possibility of waste and that a better use of expended dollars exists.

The fact then, that the use of computers by the police has been strongly motivated by LEAA funds and the overall hardware approach to the solution of law enforcement problems does not deny the possibility of a positive impact for automation. It

¹⁰Les L. Gapay, "Pork Barrel for Police," The Progressive, March 1972, p. 33.

does mean, though, that there is a greater need for evaluation.

COMPUTER USERS AND NON-USERS--HOW ARE THEY DIFFERENT?

Based on the I.C.M.A. survey, computer use among police departments is apparently related to size, form of government, type of city, and to a less extent geographic distribution. A discussion of the difference between police computer users and non-users will help explain these relationships.¹¹

Size. As one would expect, the most significant factor separating police computer users and non-users is size of city. While only 17.3% of the police departments in cities between 25,000 and 50,000 were using a computer, the percentage rose to 25.7% in cities between 50,000 and 100,000, and to 58.4% in cities between 100,000 and 250,000 (Table II-2). All police departments in cities over 500,000 that answered the questionnaire indicated that they were using the computer. City size will continue to be an important factor in influencing computer use in the future. As Figure II-6 graphically

¹¹Computer users are those police departments who indicated in the I.C.M.A. that they were using a computer whether it was owned by the police department, the city, or a service bureau.

illustrates, the percentage of police departments who plan on using the computer by 1974 increases sharply as the population category rises.

It is interesting to note the point at which size becomes a determining factor in influencing computer use, a point somewhere around a population of 100,000. Whereas less than a quarter (23.2%) of the police departments in cities with a population below 100,000 are using a computer, more than half (58.5%) of the police departments in cities from 100,000 to 250,000 are utilizing electronic data processing equipment and better than two thirds (69.8%) of departments in cities over 100,000 were using computers. In other words, any police department in a city of over 100,000 that is not using a computer is definitely in the minority.

This notion was further confirmed by the qualitative judgement of those departments not using computers. Chiefs of Police were asked to select their reasons for non-use from a series of alternative choices (Table II-7). Of the 48 departments indicating that their main reason for not using a computer was because their department was too small, a very large majority (96%) were from cities with a population below 100,000. On the other hand, police departments in cities over 100,000 which were not using a computer did not indicate that size was the problem

per se. In other words, there seems to be a psychological cut-off around 100,000 which corresponds with the numerical cut-off indicated above.

Type of City¹²--Form of Government.¹³ Previous studies by the I.C.M.A. have shown that use of data processing equipment is related to both types of city and form of government.¹⁴ Central cities tend to use computers more than suburban or independent cities, and council-manager cities display a greater amount of EDP use than do cities with mayor-council, commission, or town meeting forms of government. This same pattern seems to hold true for police departments (Table II-1).

Among computer users, 70.5% are from central cities, while only 26% are from suburban and 3.5% from independent cities. On the other hand, among non-users 45% are from suburban cities, 43% from central cities, and 12% from independent cities. Much of this difference can be attributed to the fact that the great majority of the larger cities are also central cities.

¹²Type of city is used by the I.C.M.A. to refer to three major classifications: central, suburban, independent.

¹³Form of government includes five classes according to the I.C.M.A.: mayor-council, council-manager, commission, town meeting, representative town meeting.

¹⁴See for example, "Municipal Use of Automated Data Processing," Municipal Year Book, 1971, pp. 36-50.

However, this is not the case regarding form of government. The fact that police departments in council-manager cities seem more prone to utilize a computer stands by itself, and does not relate solely to the influence of size of city. More city manager cities use computers despite the fact that most large cities (which are prone to use computers) are mayor-council cities.

Overall, it was found that of all the police departments in mayor-council cities reporting, 35.1% (47 of 134) used the computer. Of all the police departments from council-manager cities reporting, 42.2% (89 of 211) were using the computer. 100% of the cities over 500,000 use computers (20 of 20 reporting). The large majority of these (75% or 15 of the 20) are mayor-council cities. As a consequence this has a tendency to bias the statistics in favor of mayor-council cities. Still, even considering this, the percentage of police departments using computers in city manager cities is slightly higher than the percentage in mayor-council cities (see Table II-8).

When cities with a population of 500,000 and over are removed from the comparison, the difference is far more dramatic. Of the 206 police departments in city manager cities below 500,000 in size reporting, 84 were

using computers or 40.8% (a slight 1.4% drop from 42.2%). Of the mayor-council cities reporting, though, the drop was a major one. Only 32 of 119 or 26.9% were found to use computers (a 8.2% drop from 35.1%). Figure II-7 illustrates the influence that size of city has on the percentage of mayor-council and council-manager cities using the computer. The evidence seems clear: police departments in cities with a city manager form of government seem more prone to use a computer than police departments in cities with a mayor-council form of government. The possible significance of this finding will be discussed later in Chapter VI.

Geography. Computer use is greatest in the southern part of the United States with the west and north central regions a very close second and third, respectively. What is striking is the lack of use in the northeast region of the country, the New England and the Mid-Atlantic States (Table II-1). Only 9% of the departments using computers are found in these regions, while 34% of the non-users are found here. Only one out of seven police departments in the northeast indicated that it was using computers; the national average is more than one out of three.

Patterns of Computer Users in the Future. Survey results suggest that computer use will expand rapidly over the next three years. More than one out of every three departments are now using a computer (38.8%). The survey response indicates that by 1974 that number will have grown to almost two out of every three (62.5%) (see Table II-2).

Basic distribution patterns of use will continue. The increase will be greatest among larger cities, and central cities will continue to dominate the field of users. Police departments in council-manager cities will continue to have a greater percentage of computer users than departments in mayor-council or commission cities. Geographically, police departments in New England and the Atlantic States will continue to be the smallest users of computers, and growth will be greatest in the west and the south.

It is anticipated that more departments will be giving up the operation of punch card equipment by itself. A greater number of departments will also be moving toward the use of remote access real-time terminals and files. Among departments responding, 43.3% indicated that they were currently using remote terminals. Of the total number of EDP applications in responding police departments, slightly over a third were real-time (35.4%). However,

according to future estimates, this percentage will more than double by 1974, with three quarters of the planned computer applications being real-time (75.5%) (see Table II-4).

A certain amount of skepticism should be expressed, though, about the predictions for future use. As a rule, implementation of computer applications almost always takes longer than expected, and such estimates tend to be optimistic. Also, although a response rate of 75% is considered good, one must still remember that one-fourth of the cities surveyed did not reply. Departments that use computer and punch card equipment are probably more likely to respond to such a survey than those who do not. As a consequence, the numbers given for current and predicted use may be slightly high.

National, State, and Regional Computer Systems.

Police computer use is not limited to local departments. In fact, one of the most striking aspects of police computer use is the strength and growth of law enforcement information system networks throughout the country. National, state and regional systems are in operation all over the United States, and non-computer-users have access to many of these facilities. Such networks have numerous implications, and their impact is discussed in several sections later on in the thesis (e.g., the impact on police task is discussed in Chapter VI, and the relation to issues of privacy is referred to in Appendix C).

On January 27, 1967, the FBI established the National Crime Information Center (NCIC) as a pilot record index and inquiry system on wanted persons, stolen property and criminal events. Initially, 16 law enforcement agencies throughout the country were on-line with an FBI computer in Washington, D.C. By January 1, 1970, over 2,000 law enforcement agencies had direct access to the NCIC through local or state computer terminals.¹⁵ More than 1,737,500 active records were stored on wanted persons, vehicles, boats, license plates, articles, guns, and securities.

Many states have established, or are in the process of establishing, state information systems. For many small police departments the link to NCIC will come through a state computer system. In addition, regional systems have been established in some metropolitan areas to store information on local warrants, stolen automobiles, stolen property, dangerous persons, etc., at a central computer facility. Access is then provided to surrounding localities, usually through real-time direct terminal to computer hookup. As an illustration, the Los Angeles Police Department and the Los Angeles City Data Service Bureau have established an "Automated Want Warrant System" which services over fifty associated law enforcement agencies in the greater Los Angeles area and provides a

¹⁵"The FBI's Computer Network," Datamation, June 1970, pp. 146-147, 151.

response to inquiries within seven to ten seconds. Such a service may be "free of charge" as it is in Kansas City or St. Louis, or it may be maintained on a "shared cost" basis as in Los Angeles and in northern California.

The number of non-computer user police departments who are tied to one or several of these national, state or regional networks is striking. More than three-quarters have direct terminal access to information generated from NCIC and state police information systems (Table II-9). Regional systems are often the most useful on a day-to-day basis, and over one-third of the non-users are tied to a regional network.

Among non-users the west and the north central regions have the greatest access to NCIC, while the northeast and north central regions have the greatest tie to state systems. (The state systems in the northeast may compensate, at least in part, for the lack of municipal police computer users.) Police departments in the west, particularly those of the Pacific Coast States, clearly have the greatest link to regional hookups.

One of the biggest debates over the use of computers in law enforcement today is whether police departments should own and/or control their own computer or whether EDP facilities should be owned and controlled by the municipality, with the police system only one part of

an integrated urban information system. Table II-10 shows that the majority of police computer systems are owned and controlled by the municipality. The question of computer ownership will be discussed more fully in Chapter IV; however, it is worth mentioning here since the fact that there are extensive regional, state, and national computer networks in law enforcement particularly complicates this issues. For example, policies have been under consideration in the FBI to allow state and city computers to interface directly with NCIC (National Crime Information Center) only if the computer is dedicated solely to criminal justice purposes and only if such dedicated computers are managed and operated solely by law enforcement personnel. In other words, a police computer system utilizing the city's data processing facilities could not interface directly with NCIC. It now appears that the policy will be somewhat less strict, requiring only that partitions of computers rather than the entire machine be dedicated to law enforcement. However, the resolution of this issue has far reaching consequences for the development of state and municipal information systems.

THE ACCEPTANCE AND PROBLEMS OF COMPUTER USE

In general it was found in the I.C.M.A. survey that the overall level of satisfaction with the computer within police departments was good, although in the site visits it was discovered that response varies widely from department to department. In the mailed survey police chiefs were asked to indicate if the police computer system had met their original expectations. More than half (54.2%) indicated that the computer had either met or exceeded their expectations. Specifically, over four out of ten said their expectations had been met and one in ten said they had been exceeded. Only one in seven actually indicated that their expectations had not been met (Table II-11).

In regards to a question as to whether the benefits of the computer justified the cost the response was even more positive. Even where expectations had not been met, many chiefs felt that the benefits justified the cost, or at least that they would in the future. In the I.C.M.A. survey only 2% of all respondents said that they did not think that the computer was worth the cost (Table II-12). Even among those chiefs who said their expectations had not been met, only 10% said that the costs outweighed the benefits. In the site visits the same phenomenon was

found to be true. In St. Louis where the computer has been used for a number of years, six out of every ten policemen interviewed indicated that their expectations had not been met. However, three quarters of them still went on to say that the benefits justified the costs.

One possible explanation for such reactions is the traditional human nature feeling that even if something is worthwhile, performance can always be improved, thus expectations are never fully met. More likely, though, is the general tendency to rationalize the wisdom of a decision that has been made, even where supporting facts and figures are not clearly available. On the one hand, it is interesting to realize that the police overwhelmingly feel that the benefits of the computer justify the costs. On the other hand, many police personnel find themselves in the position now where a decision to spend the money has already been made. Honestly speaking, the issue is no longer one of questioning the benefits and costs, but of justifying expenditures that have already been made.

It also should be pointed out that as phrased in the I.C.M.A. questionnaire the meaning of the word "costs" is somewhat ambiguous, therefore making a precise interpretation of the survey results related to the cost-benefit question very difficult. Costs are mentioned in a general way, but the issue of "whose costs" is never

clarified in the survey form (see Appendix A, Part A, Question 3). In other words, the federal government is responsible for supporting many of the police computer efforts around the country. The importance of the LEAA as a financial resource in stimulating computer use has already been documented. If approved by the LEAA, the implementation of computer technology is done according to a 75:25 federal to local share formula. 75% of project costs are paid by the federal government and 25% by the state and/or the local police department. This means that when queried about benefits vs. costs a local police department may be encouraged to respond affirmatively because the large majority of the costs are really not their own; for example, they do not require a departmental budget decision to purchase or rent a computer instead of hiring more men. If more local money were actually involved, perhaps police response to the I.C.M.A. questionnaire would have been less affirmative.¹⁷

¹⁶In fact, the actual local "cash" contributions have been far less than 25%, since according to past policy much of the local share could be in the form of "in kind contributions" of current police and civilian staff resources that were assigned to work on the project. In fact, according to the estimate of one staff person in the New England Region LEAA office, 99% of the local share in the past has been in the form of "in kind contributions." However, as of the 1972-73 fiscal year which began July 1, 1972, this policy has changed somewhat. Now, 10% of the local share must actually be contributed in the form of cash. Whether or not this will alter the pattern of LEAA projects remains to be seen.

¹⁷For example, while the author was riding patrol in Kansas City, one patrolman was asked whether he felt the

Still, although interpretations of response must be qualified, the overall rating of performance of the computer by the police was higher than originally expected, particularly when considering that the use of such technology is still quite new and a panacea should not be expected overnight.

The questionnaire went on to ask if the information provided by the computer system was felt to be accurate (Table II-13), if the system provided the chief with the information which he needed to make decisions (Table II-14), and whether or not the response received from the computer was fast enough (Table II-15). Regarding the accuracy of information, three out of four (76.4%) felt that the data in the computer system was accurate, and less than one out of ten (8.6%) felt that it was not. Better than half of the police chiefs responding (55.4%) indicated that the computer system provided them with information which they needed to make decisions, and an additional third (31.7%) indicated that it did some of the time. Again, only one out of ten (9.4%) indicated a lack of decision making information obtained from the computer system.

benefits of the computer justified the cost. His response was strongly affirmative. However, when he was told that in Kansas City the annual cost of the computer would probably be enough to hire 30 new police officers, his opinion switched. To ask a general question of benefits vs. costs brings one response. To clarify that question in the form of an actual budget choice may bring an entirely different reaction.

Interestingly enough, speed was the area where the computer systems received the comparatively lowest rating by police chiefs. Only four out of every ten (41.6%) gave an unqualified yes to the question as to whether or not the response of their computer system was fast enough to meet their needs. On the other hand, three out of every ten (28.5%) indicated that it was not. (Another three out of ten said sometimes.) In the site visits some explanation was found for responses along these lines. Speed is one of the primary reasons for installing a computer. However, in some cities due to a variety of operating procedures, an overload of use, or excessive time when the computer is not operational, it was found that policemen were dissatisfied with the response speed of their automated system. From looking at the I.C.M.A. survey about a third of the police departments in the country probably are suffering from these same dissatisfactions in one way or another.

Problems that Hinder Computer Operations. In the mailed survey, departments were asked whether any of eleven specific problems of computer implementation were bothering them now and which, if any, had caused difficulties in the past. In the site visits to individual departments, questions were also raised about the most pressing problems encountered. The striking conclusion from both sources is that it is not technical difficulties

that are holding back development but rather behavioral and people-oriented difficulties. However, enough departments are having success that even these sorts of problems do not seem insurmountable. In fact, the results of the mailed survey indicate that in the eyes of respondents overall problems are decreasing (Figure II-8).

The two most significant problems seem to be in determining priorities for computer use and in integrating the computer operation and quantitative decision making with the rest of the department. In the mailed survey, the number one difficulty expressed was scheduling and the determination of priorities. What is more, the magnitude of this difficulty has increased over time (Figure II-8). Visits to the police uncovered the same difficulty in several departments. In one city, nine officers out of the eleven interviewed volunteered that their primary problems were with agreement on priorities. The city data processing personnel, they claimed, were not giving police systems sufficient attention, and further, when time was spent on police work, they were implementing the wrong applications first. Instead of concentrating on those applications that would aid police operations, such as resource allocation or better feedback for investigations, the EDP personnel gave priority to applications that would raise revenue, such as more

efficient parking ticket and traffic citation systems. On the other hand, the EDP people who were interviewed in the same city felt that the main problem was a lack of understanding of computer operations on the part of the police. Both sides were sincere, but an obvious gap existed.

Such a situation highlights what was perhaps the greatest difficulty discovered when visiting police departments--communication between police and data processing personnel and the overall integration of the operations of the computer with the rest of the department. Two of the departments included in the site visits seemed to have particularly smooth running computer operations. In both, not a single person felt that there was a gap between EDP and operating personnel. On the other hand, in one of the departments visited that was having problems, more than seven out of every ten officers interviewed said that there was such a gap. Difficulties revolved primarily around policemen feeling that data processing personnel did not understand their problems or how the police system operated, and in turn, around data processing staff believing that the police were unwilling to understand and evaluate computer applications. Training sessions were regarded as essential since in most departments there was a widespread lack of understanding

regarding what the computer could do and how it could improve police work. The use of "User Committees" of police and civilian personnel to determine the utility and priority of various applications also were found to help. Perhaps even more important was an honest commitment on each side to understand the position of the other.

Another problem which seemed to be significant was "oversell." This was particularly true in the departments that seemed to be having problems in implementing computer use. When the computer was initially introduced extensive promises were made by both salesmen and police personnel as to the benefits automation would bring. Interviews with department personnel showed that expectations were not always met. Implementation of computer applications almost always takes longer than expected, and if too much is promised initially, disappointment will result. In fact these very factors--initial oversell and longer than anticipated time for implementation--seem to be the reasons for the unmet expectations regarding computer use in the St. Louis Police Department which were discussed several pages earlier in this report.

Other problems mentioned in visits to police departments were the design of forms and reports that were difficult or impossible for operations people to read or use, computer systems that were too slow and

inaccurate, and problems with the computer being "down" or out of order. In part, the difficulties expressed over "down time" reflect expectations. Once a police officer has become used to receiving information in thirty seconds, it becomes a major imposition when the computer is down to have to revert to a manual back-up system, if one exists, that might take from fifteen to thirty minutes. Still, comparatively speaking, such technical problems as equipment performance, reliability, and maintenance seemed to be of only moderate concern, and according to the mailed survey, are generally declining (Figure II-8).

In conclusion, then, it seems that the use of the computer by the police has come a long way in a relatively short period of time since the early stages of implementation about a decade ago. Use has evolved from structured and routine applications to more creative unstructured approaches to applying technology to police situations. And although a number of issues and problems still remain, the computer has unquestionably become a part of current and future law enforcement technology. The questions now are not will the computer be used, but how and with what implications.

COMPUTER USE BY THE POLICE

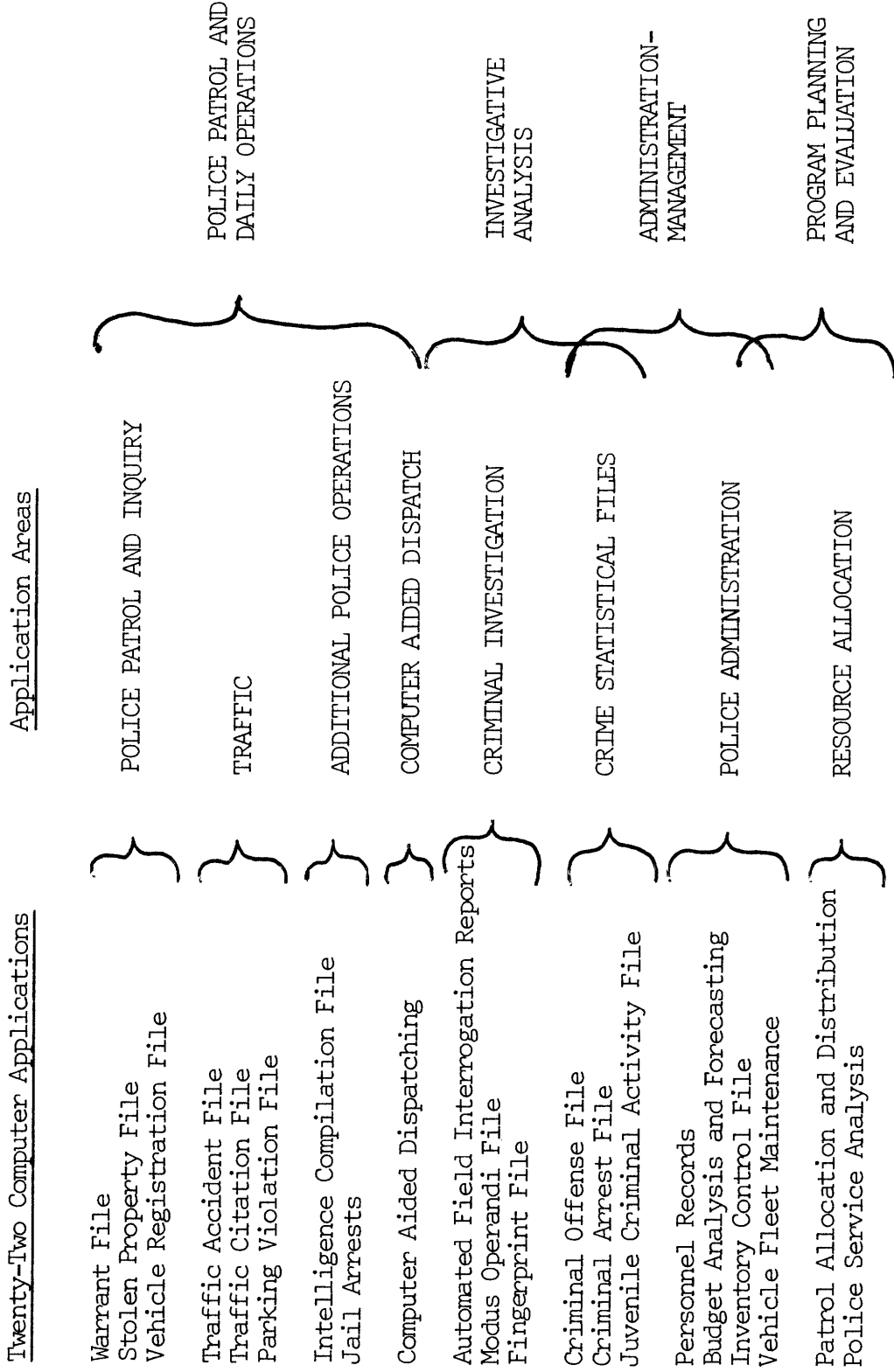
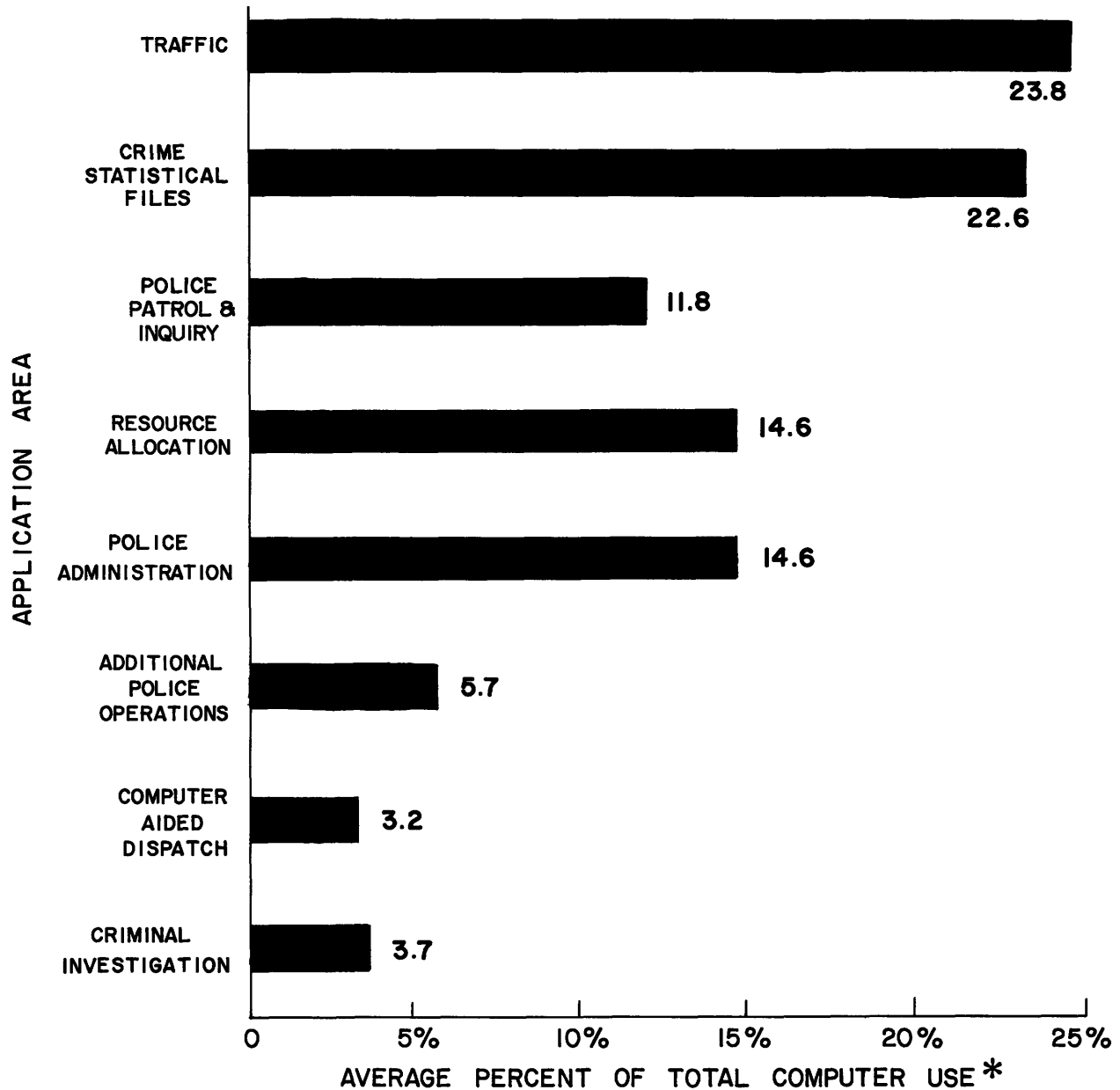


FIGURE II-1

AVERAGE PERCENT OF COMPUTER USE BY THE POLICE - 1967



* AVERAGE PERCENT OF COMPUTER USE IS OBTAINED BY DIVIDING THE TOTAL NUMBER OF APPLICATIONS REPORTED BY ALL DEPARTMENTS IN ONE OF THE EIGHT AREAS BY THE NUMBER OF APPLICATION TYPES IN THAT AREA. THESE AVERAGE NUMBERS ARE THEN TOTALED AND AN AVERAGE PERCENT OF TOTAL IS DERIVED. THIS NUMBER IS CALCULATED TO COMPENSATE FOR THE FACT THAT SEVERAL OF THE APPLICATION AREAS HAVE THREE APPLICATION TYPES, WHILE OTHERS HAVE ONLY TWO OR ONE.

FIGURE II - 2a

AVERAGE PERCENT OF COMPUTER USE BY THE POLICE - 1971

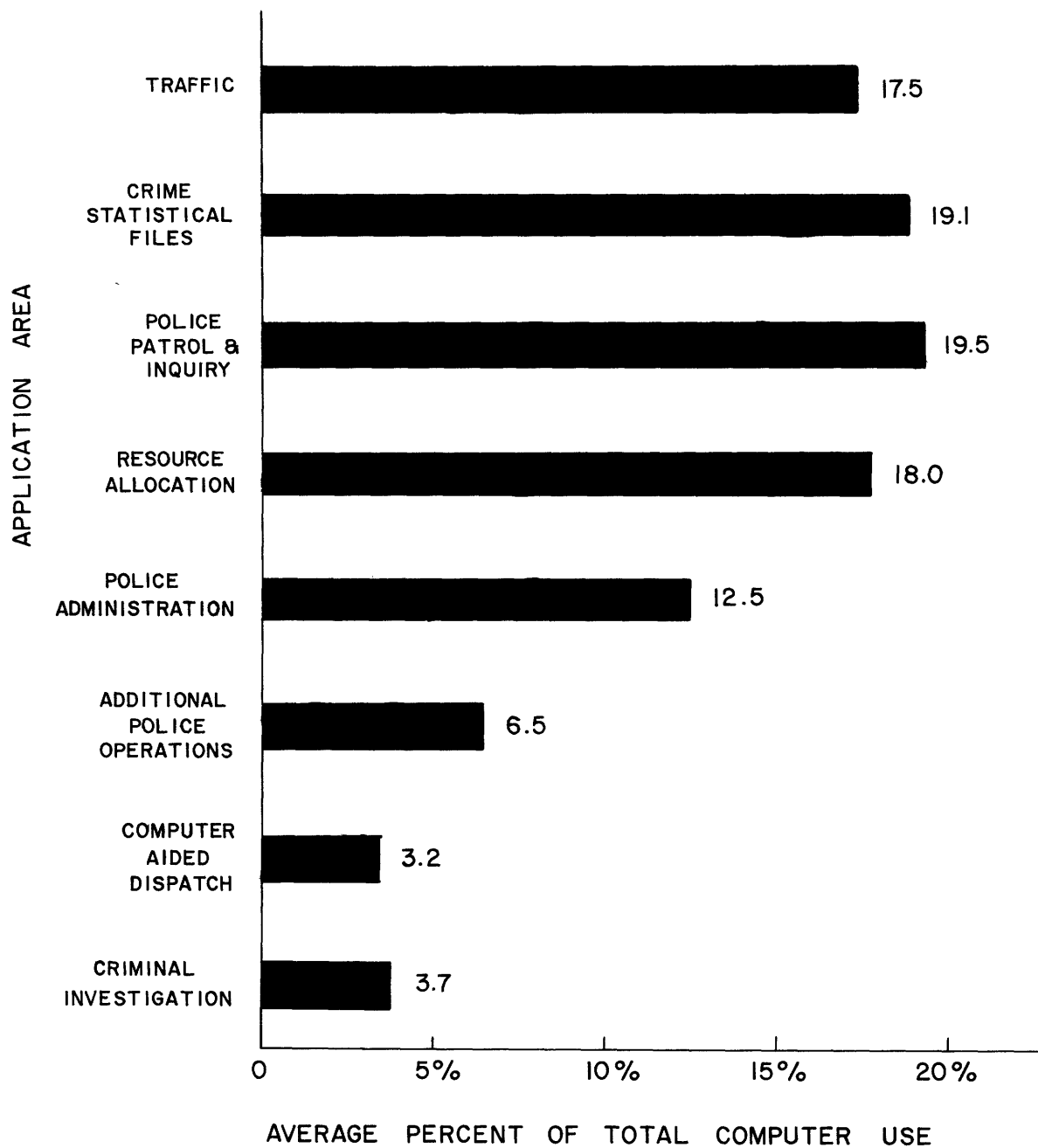


FIGURE II 2b

AVERAGE PERCENT OF COMPUTER USE BY THE POLICE - 1974

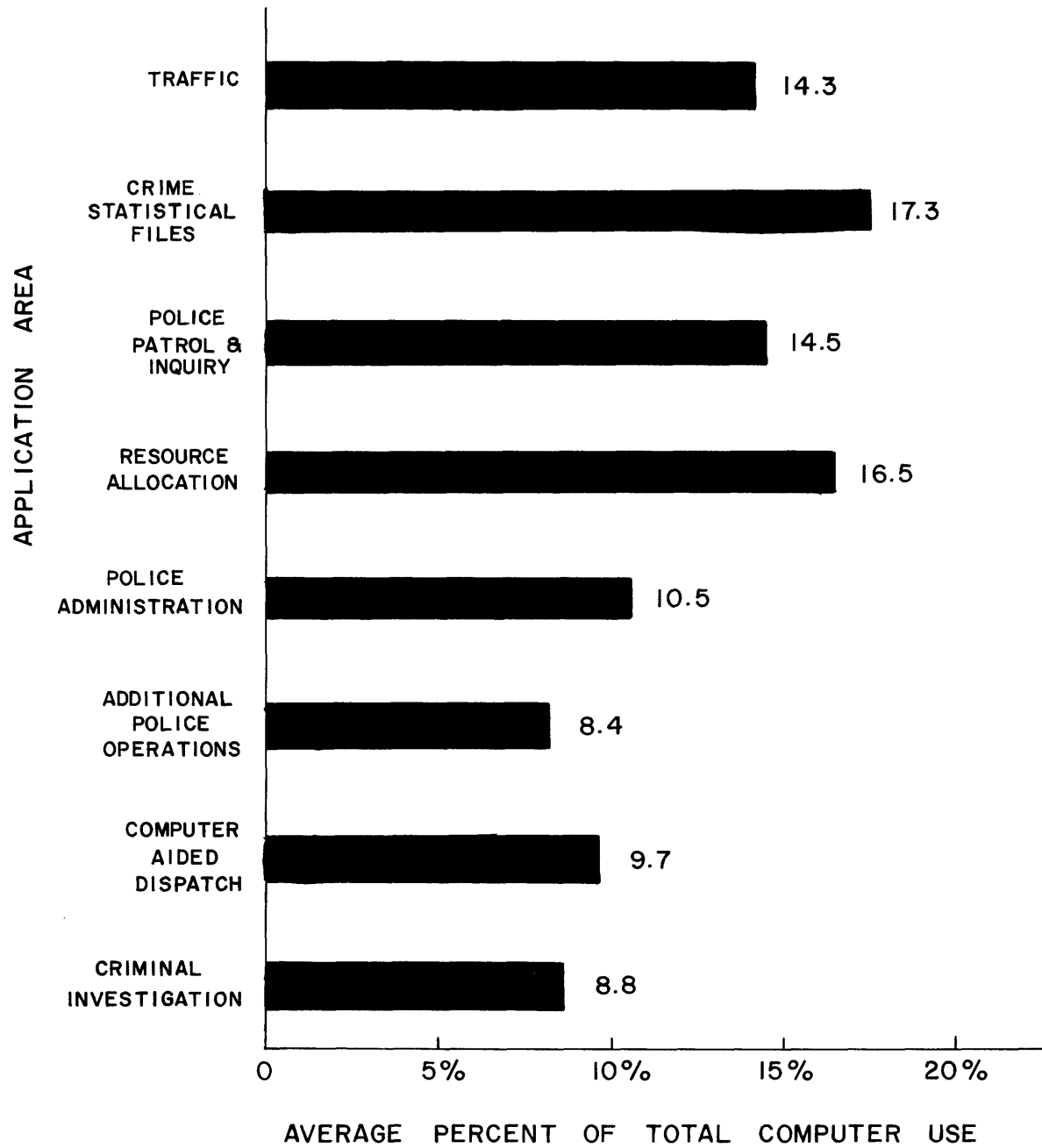


FIGURE II - 2c

CUMULATIVE NUMBER OF APPLICATIONS BY AREA FROM 1960 - 1971

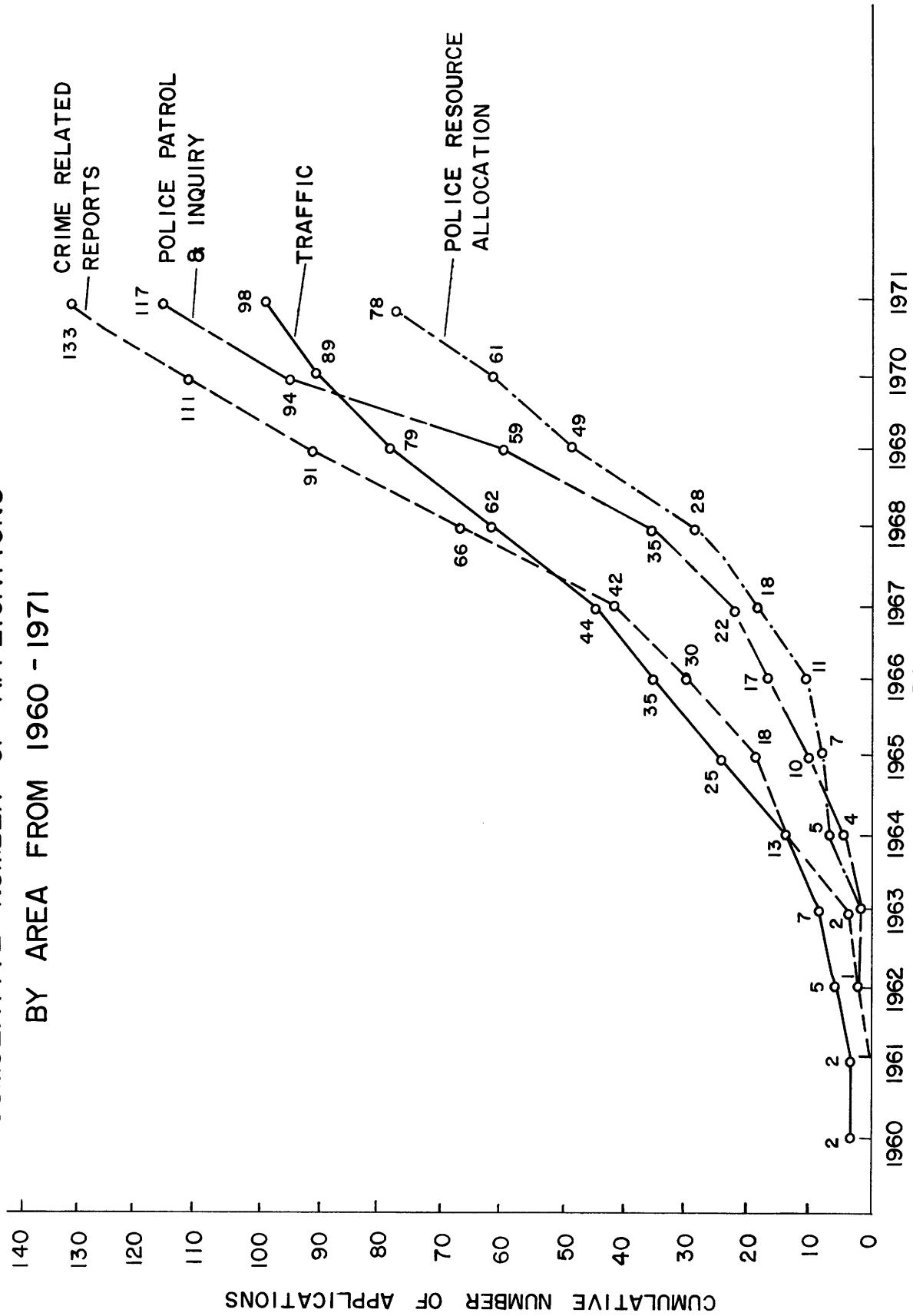


FIGURE II 3

IMPORTANCE OF COMPUTER APPLICATIONS AS RANKED BY POLICE DEPARTMENTS

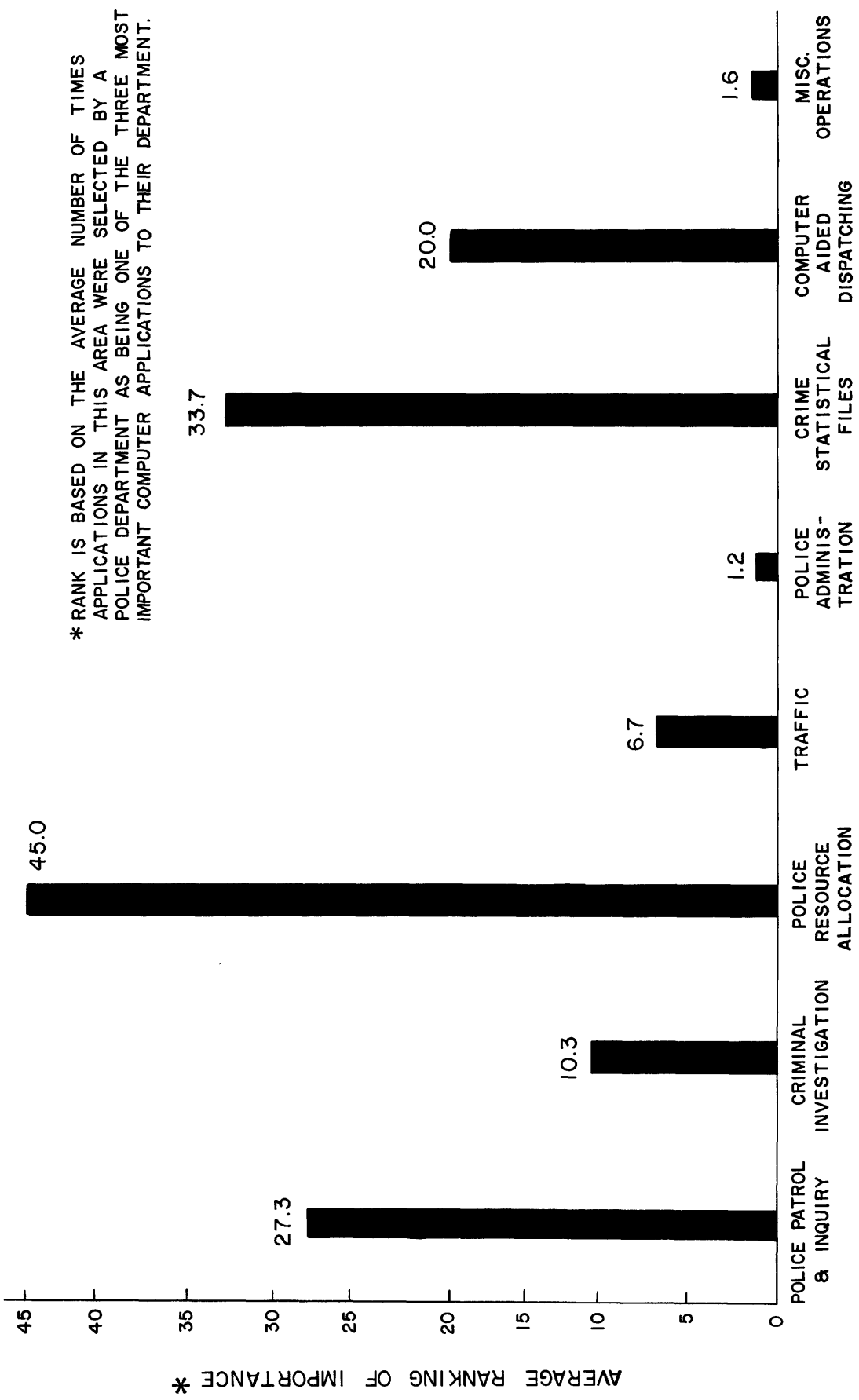


FIGURE II 4

STRUCTURED AND UNSTRUCTURED POLICE COMPUTER APPLICATIONS

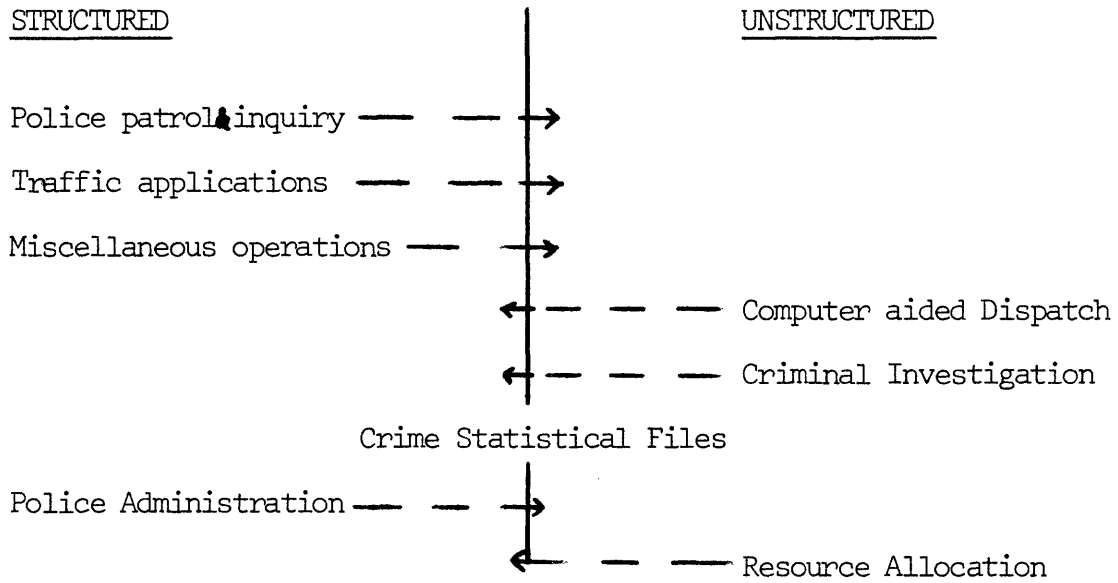


FIGURE II-5

THE INFLUENCE OF CITY SIZE ON CURRENT AND PROJECTED USE OF COMPUTERS BY POLICE DEPARTMENTS

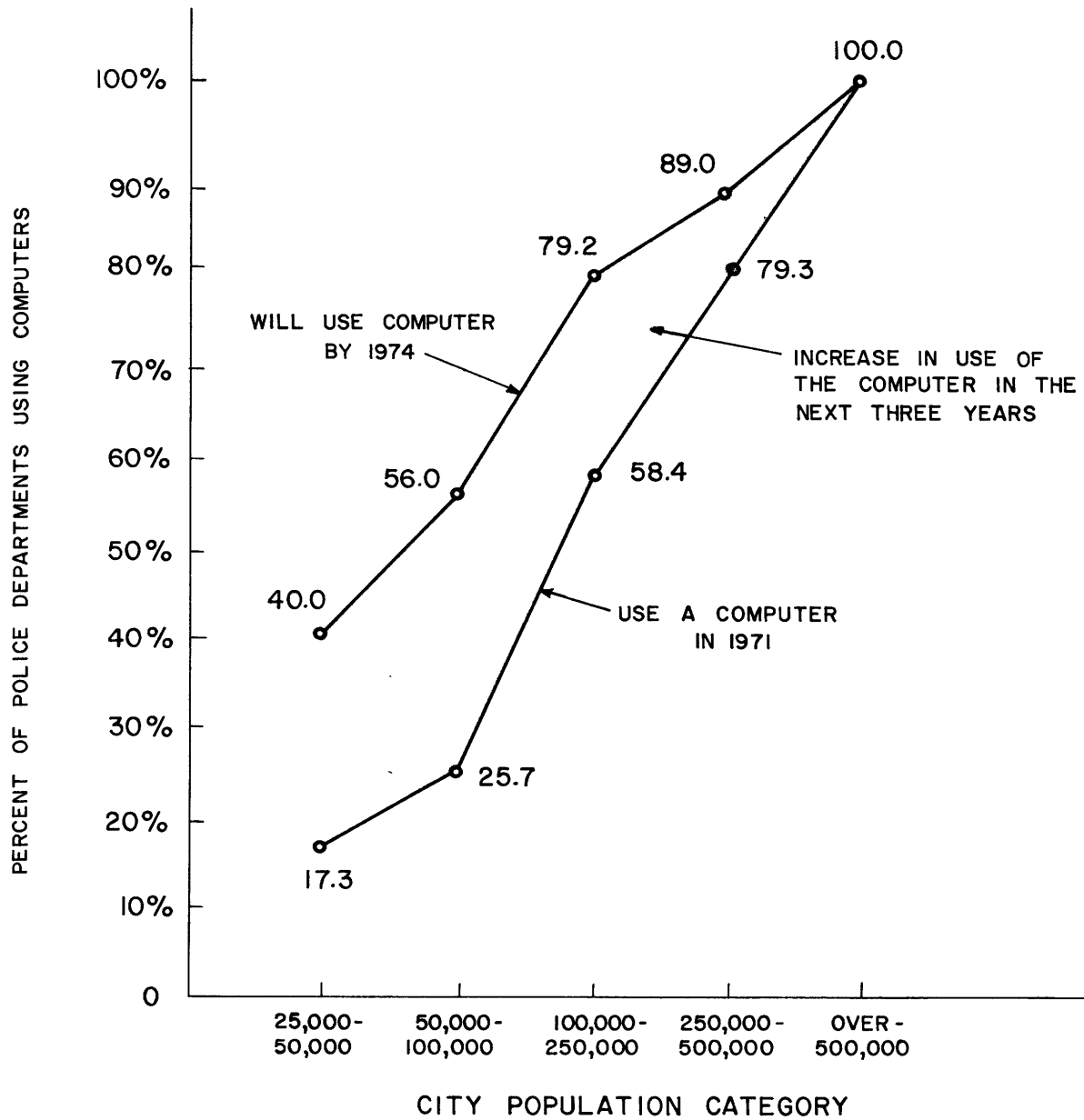
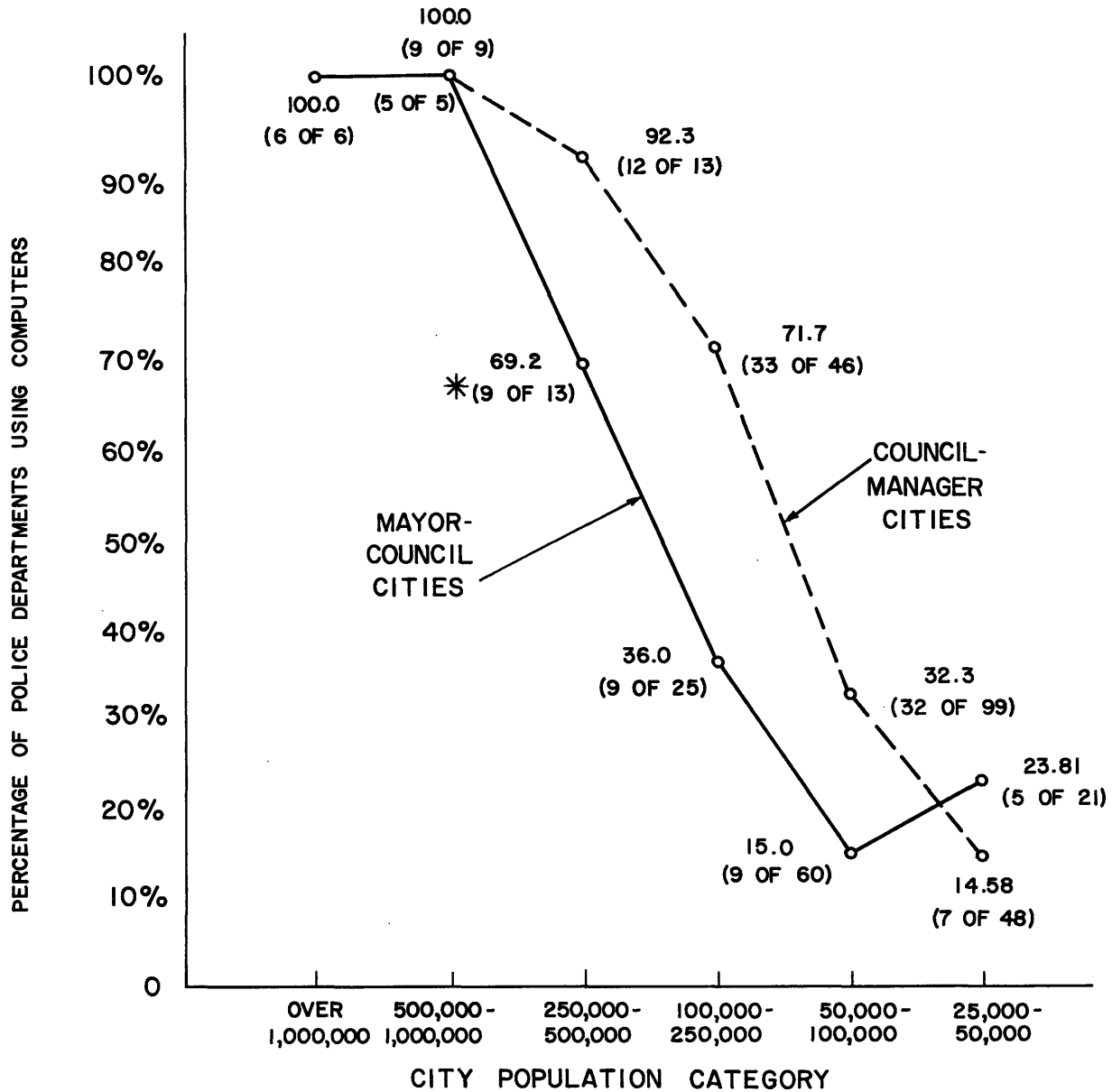


FIGURE II 6

THE PERCENTAGE OF MAYOR-COUNCIL AND COUNCIL-MANAGER CITIES USING COMPUTERS AS INFLUENCED BY CITY SIZE



* FOR EXAMPLE, THIS MEANS 9 OF 13 POLICE DEPARTMENTS WITH A MAYOR-COUNCIL FORM OF GOVERNMENT RESPONDING TO THE SURVEY WERE USING A COMPUTER.

FIGURE II 7

PROBLEMS HINDERING COMPUTER OPERATIONS

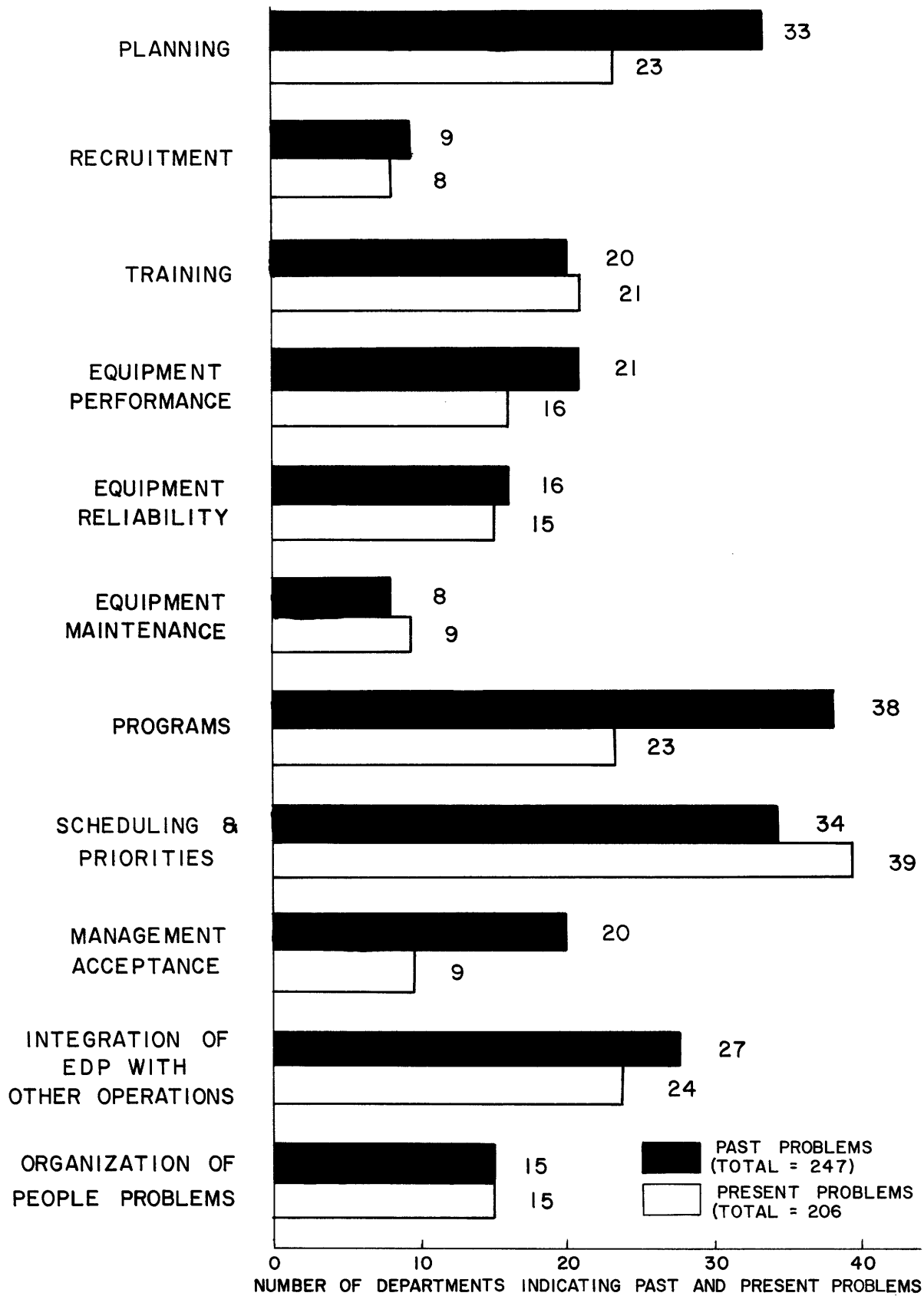


FIGURE II-8

TABLE II-1

POLICE COMPUTER USE - RESPONSE, 1971

Classification	No. of Departments Surveyed (A)	No. of Departments Responding		% of Total Responding		No. of Departments Using Computers		% of		No. Using EAM Only* (B)	% of (B)	Total No. Using EDP and EAM (B)	% of (B)
		No. (B)	% (A)	No. (B)	% (B)	No. (B)	% (B)	No. (B)	% (B)				
Total, all cities	498	376	75.5%	100.0%	146	38.8%	230	61.2%	25	6.6%	171	45.5%	
Population Group													
Over 500,000	26	20	76.9	5.3	20	100.0	0	0	0	0	20	100.0	
250,000-500,000	30	29	96.0	7.7	23	79.3	6	20.7	4	13.8	27	93.1	
100,000-250,000	98	77	78.6	20.5	45	58.4	32	41.6	6	7.8	51	66.2	
50,000-100,000	227	175	77.1	46.6	45	25.7	130	74.3	15	8.6	60	34.3	
25,000-50,000	117	75	64.1	19.9	13	17.3	62	82.7	*	*	*	*	
Geographic Region													
Northeast	-	92	-	24.5	13	14.1	79	85.9	8	8.7	21	22.8	
North Central	-	100	-	26.6	41	41.0	59	59.0	8	8.0	49	49.0	
South	-	91	-	24.2	46	50.5	45	49.5	4	4.4	50	54.9	
West	-	92	-	24.5	45	48.9	47	51.1	8	8.7	53	57.6	
City Type													
Central	-	203	-	54.0	103	50.7	100	49.3	17	8.4	120	59.1	
Suburban	-	141	-	37.5	38	27.0	103	73.0	8	5.7	46	32.6	
Independent	-	32	-	8.5	5	15.6	27	84.4	1	3.1	6	18.8	
Form of Government													
Mayor-Council	-	134	-	35.6	47	35.1	87	64.9	7	5.2	54	40.3	
Council-Manager	-	211	-	56.1	89	42.2	122	57.8	17	8.1	106	50.2	
Other	-	31	-	8.3	10	32.3	21	67.7	2	6.5	12	38.7	

*Question asked only in Part B of questionnaire which did not go to departments in cities between 25,000-50,000.

TABLE II-2

FUTURE COMPUTER USE

Classification	No. of Departments Reporting (A)	Number of Departments Using Computers		Number Planning on Future Use		No. of Computer Users by 1974 <u>No. (B+D) / % of (A)</u>	
		Yes <u>No. (B) / % of (A)</u>	No <u>No. (C) / % of (A)</u>	Yes <u>No. (D) / % of (C)</u>	No <u>No. (E) / % of (C)</u>		
Total, all cities	376	146 38.8%	230 61.2%	89 38.7%	36 15.7%	105 45.6%	235 62.5%
Population Group							
Over 500,000	20	20 100.0	0 0	-	-	-	20 100.0
250,000-500,000	29	23 79.3	6 20.7	3 50.0	0 0	3 50.0	26 89.7
100,000-250,000	77	45 58.4	32 41.6	16 50.0	2 6.3	14 43.7	61 79.2
50,000-100,000	175	45 25.7	130 74.3	53 40.8	16 12.3	61 46.9	98 56.0
25,000-50,000	77	13 17.3	62 82.7	17 27.4	18 29.0	27 43.6	30 39.0
Geographic Region							
Northeast	92	13 14.1	79 85.9	24 30.4	15 19.0	40 50.6	37 40.2
North Central	100	41 41.0	59 59.0	23 39.0	8 13.6	28 47.4	64 64.0
South	91	46 50.5	45 49.5	20 44.4	8 17.8	17 38.8	66 77.5
West	92	45 48.9	47 51.1	22 46.8	5 10.6	20 46.6	67 72.8
City Type							
Central	203	103 50.7	100 49.3	45 45.0	15 15.0	40 40.0	148 72.9
Suburban	141	38 27.0	103 73.0	33 32.0	15 14.6	55 53.4	71 50.4
Independent	32	5 15.6	27 84.4	11 40.7	6 22.2	10 37.1	16 50.0
Form of Government							
Mayor-Council	134	47 35.1	87 64.9	31 35.6	19 21.9	37 42.5	78 58.2
Council-Manager	211	89 42.2	122 57.8	49 40.2	12 9.8	61 50.0	138 65.4
Other	31	10 32.3	21 67.7	9 42.9	5 23.8	7 33.3	19 61.3

TABLE II-3A

POLICE COMPUTER APPLICATIONS

Application Area	Current Use - 1971			Future (Next Three Years)		
	No. of Depts. Reporting Computer Applications (A)	% of Total Computer Applications Reported	Average No. of Applications per Application Area (B = A/AT)	Extent of Use in Depts. Based on Departments Responding (B ÷ 122)†	No. of Depts. Reporting Future Applications by 1974 (C)	% Increase (C/A)
Police Patrol and Inquiry (AT* = 3)	180	19.9%	60	49.2%	138	76.7%
Traffic (AT* = 3)	162	17.9	54	44.3	151	93.2
Miscellaneous Operations (AT* = 2)	40	4.4	20	16.4	83	207.5
Computer Aided Dispatch (AT* = 1)	10	1.1	10	8.2	61	610.0
Criminal Investigation (AT* = 3)	34	3.8	11.3	9.3	158	464.7
Crime Statistical Files (AT* = 3)	177	19.5	59	48.4	203	114.7
Police Administration (AT* = 5)	192	21.2	38.4	31.5	191	99.5
Resource Allocation (AT* = 2)	111	12.2	55.5	45.5	131	118.0
TOTAL	906	100.0%	308.2	100.0%	1116	123.2%

*AT = Number of application types.

†Average number of applications per application area (B)/122 (the number of departments responding to this part of the questionnaire).

TABLE II-3B

POLICE COMPUTER APPLICATIONS (Total Use by 1974)

Application Area	Total Use by 1974				Extent of Expected Use in Depts. Based on Depts. Responding (E ÷ 122)
	Total Number of Departments Using Computer by 1974 (Total A+C) (D)	% of Total Applications Expected by 1974	Average Number of Applications Per Application Area (E) (E = D/AT)	% of Total Applications Expected (% of Total E)	
Police Patrol and Inquiry (AT* = 3)	318	15.7%	106	14.5%	86.9%
Traffic (AT* = 3)	313	15.5	104.3	14.3	85.5
Miscellaneous Operations (AT* = 2)	123	6.1	61.5	8.4	50.4
Computer Aided Dispatch (AT* = 1)	71	3.5	71	9.7	58.2
Criminal Investigation (AT* = 3)	192	9.5	64	8.8	52.5
Crime Statistical Files (AT* = 3)	380	18.8	126.6	17.3	100.0
Police Administration (AT* = 5)	383	18.9	76.6	10.5	62.8
Resource Allocation (AT* = 2)	<u>242</u>	<u>12.0</u>	<u>121</u>	<u>16.5</u>	99.2
TOTAL	2022	100.0%	731.0	100.0%	105.

*AT = number of application types.

TABLE II-4

REAL TIME POLICE COMPUTER APPLICATIONS

Application Area	Current Use			Future Use (Next Three Years)		
	No. of Depts. Reporting A Computer Application (A)	Number of Real Time Applications (B)	% of Real Time Applications (B/A)	No. of EDP Applications Installed (C)	No. of Real Time Applications (D)	% of Real Time Applications (D/C)
Police Patrol and Inquiry	180	150	83.3%	138	127	92.0%
Traffic	162	30	18.5	151	89	58.9
Miscellaneous Operations	40	19	47.5	83	77	92.8
Computer Aided Dispatch	10	6	60.0	61	59	96.7
Criminal Investigation	34	18	52.9	158	132	83.6
Crime Statistical Files	177	57	32.2	203	175	86.2
Police Administration	192	22	11.5	191	95	49.7
Resource Allocation	<u>111</u>	<u>19</u>	<u>17.1</u>	<u>131</u>	<u>88</u>	<u>67.2</u>
TOTAL	906	321	35.4%	1116	842	75.5%
			100.0%			100.0%

TABLE II-5

WHAT ARE THE MAJOR REASONS FOR USING A COMPUTER?

Reasons	Number of Departments Ranking as Most Important Effect <u>No. (A)</u> % of Total(A)	Number of Departments Ranking as Second Most Important Effect <u>No. (B)</u> % of Total(B)	Number of Departments Ranking as Third Most Important Effect <u>No. (C)</u> % of Total(C)	Weighted Total Ranking* <u>No. (D)</u>
Internal operations more efficient	27 23.7%	26 23.0%	16 14.3%	149
Monitor performance of precincts or units	0 0	6 5.3	11 9.8	23
Improve patrolmen's ability to identify and apprehend	35 30.7	16 14.2	10 8.9	147
Improve ability to investigate crime	7 6.1	13 11.5	11 9.8	58
Improve surveillance	0 0	1 .1	1 .1	3
Improve service to public	38 33.3	17 15.0	14 12.5	162
Get better management information	5 4.4	29 25.7	34 30.4	107
As part of "professionalization"	0 0	3 2.6	12 10.7	18
Other	<u>2</u> 1.8	<u>2</u> 1.8	<u>3</u> 2.7	13
TOTAL	114	113	112	

*Based on a composite score combining and weighting (A), (B), and (C). The total is derived as follows: 3 x (A) + 2 x (B) + 1 x (C) = Weighted Total Ranking.

TABLE II-6

INFLUENCE OF THE LEAA ON COMPUTER USERS

Received LEAA Funds	Number Indicating (A)	For Those Receiving Funds, Has the Computer Made a Difference					
		% of Total Responding	Yes, no computer without help % of	Yes, smaller without % of	Uncertain % of	No, would be the same % of	Other % of
		No. (A)	No. (A)	No. (A)	No. (A)	No. (A)	No. (A)
Yes	51	42.5%	10 19.6%	24 47.1%	6 11.8%	6 11.8%	5 9.8%
No	48	40.0	- -	- -	- -	- -	- -
No, but have or will apply	<u>21</u>	17.5	- -	- -	- -	- -	- -
TOTAL RESPONDING	120						

TABLE II-7
REASONS FOR NOT USING A COMPUTER

<u>Reasons for Not Using</u>	<u>Number Indicating (A)</u>	<u>Per cent of Total Number Responding (N=223)*</u>
Department too small	48	21.5%
Unable to afford	167	74.9
Cost outweighs the benefit	41	18.4
Present methods are satisfactory	20	9.0
Do not feel will be useful	0	0
Would have unfavorable impact	0	0
Other	<u>33</u>	<u>14.8</u>
TOTAL	309†	138.6†

*Of 230 departments not using the computer, 223 responded to this question.

†Total greater than 223 and % greater than 100% since multiple responses were allowed.

TABLE II-8

DISTRIBUTION OF POLICE DEPARTMENTS USING COMPUTERS (By City Type and City Size)

Type of City	SIZE:		500,000-		250,000-		100,000-		50,000-		25,000-		Total
	1,000,000	1,000,000	1,000,000	500,000	500,000	250,000	100,000	50,000	50,000	25,000	5,000		
Mayor-Council	6	9	9	9	9	9	9	9	9	5	5	47	
Council-Manager		5	12	33	32	7	89					89	
Commission			2	3	4	1	10					10	
Town Meeting												0	
Representative	-	-	-	-	-	-	-	-	-	-	-	0	
TOTAL	6	14	23	45	45	13	146					146	

DISTRIBUTION OF POLICE DEPARTMENTS NOT USING COMPUTERS

Mayor-Council	4	16	51	16	87
Council-Manager	1	13	67	41	122
Commission	1	3	8	4	16
Town Meeting		1			1
Representative	-	3	-	-	4
TOTAL	6	32	130	62	230

TABLE II-9

ACCESS TO NON-LOCAL COMPUTER FACILITIES

Non-Local Facility	Access Among Non-Computer Users				Access Among Computer Users				
	Number Indicating (A)	% of Total Non-Users (N=230)	Geographic Access			Total Number Indicating (B)	% of Total Non-Users (N=230)	Number Indicating (C)	% of Total Non-Users (N=230)
			North	Central	South				
		No. % of (B)	No. % of (C)	No. % of (D)	No. % of (E)		No. % of (D)	No. % of (E)	
Total Departments Responding	213*	-	69 -	55 -	43 -	46 -	-	-	
NCIC	180	78.3%	50 72.4%	52 94.5%	33 76.7%	45 97.8%	109	96	
State Police Systems	183	79.6	63 91.3	50 90.9	32 74.4	38 82.6	100	91	
Regional Police Systems	84	36.5	23 33.3	17 30.9	15 34.9	29 63.0	56	54	
Other	29	12.6	- -	- -	- -	- -	16	14	

*213 departments of 230 departments not using the computer responded to the question on access.

+Because of the way the question was phrased, it is not possible to determine the total number indicating.

TABLE II-10

OWNERSHIP OF POLICE COMPUTER SYSTEMS

Classification	Number of Departments Responding (A)	Type of Ownership													
		Service Bureau Only		Police Department Only		City Only		State Only		Joint City and Police Department		Joint Police Department and Other			
		No.	(A)	% of	No.	(A)	% of	No.	(A)	% of	No.	(A)	% of	No.	(A)
Total, all cities	124	8	6.5%	9	7.3%	76	61.3%	3	2.4%	11	8.9%	3	2.4%	14	11.3%
Population Group															
Over 500,000	19	0	0	4	21.1	7	36.8	0	0	5	26.3	1	5.3	2	10.5
250,000-500,000	23	0	0	2	8.7	15	65.2	1	4.3	1	4.3	2	8.7	2	8.7
100,000-250,000	42	2	4.8	2	4.8	29	69.0	1	2.4	3	7.1	0	0	5	11.9
50,000-100,000	40	6	15.0	1	2.5	25	62.5	1	2.5	2	5.0	0	0	5	12.5
25,000-50,000	*														
Geographic Region															
Northeast	8	1	12.5	4	50.3	3	37.5	0	0	0	0	0	0	0	0
North Central	30	1	3.3	3	10.0	17	56.7	0	0	4	13.3	1	3.3	4	13.3
South	45	1	2.2	2	4.4	33	73.4	2	4.4	3	6.7	1	2.2	3	6.7
West	40	5	12.5	0	0	23	57.5	0	0	4	10.0	1	2.5	7	17.5
City Type															
Central	95	4	4.2	9	9.5	57	60.0	3	3.2	10	10.5	3	3.2	9	9.5
Suburban	28	4	14.3	0	0	19	67.9	0	0	1	3.6	0	0	4	14.3
Independent	1	0	0	0	0	0	0	0	0	0	0	0	0	1	100.0
Form of Government															
Mayor-Council	38	2	5.3	5	13.2	20	52.6	1	2.6	5	13.2	2	5.3	3	7.9
Council-Manager	79	6	7.6	4	5.1	50	63.3	2	2.5	6	7.6	1	1.3	10	12.7
Other	7	0	0	0	0	6	85.7	0	0	0	0	0	0	1	14.3

*Question asked only in Part B of questionnaire which did not go to departments in cities between 25,000-50,000.

TABLE II-11

HAS THE COMPUTER MET EXPECTATIONS?

<u>Response</u>	<u>Number Indicating (A)</u>	<u>Per Cent of Total Responding</u>
Yes, in fact, has exceeded	15	10.4%
Yes, has met	63	43.8
No, has not met	13	9.0
No, and major changes required	8	5.6
Reactions mixed	11	7.6
Too early to tell	28	19.4
Other	<u>6</u>	4.2
TOTAL RESPONDING	144	

TABLE II-12

DO THE BENEFITS JUSTIFY THE COSTS?

<u>Response</u>	<u>Number Indicating (A)</u>	<u>Per cent of Total Responding</u>
Yes	85	59.0%
Maybe	8	5.6
Too early to tell	28	19.4
Not now, but will	17	11.8
No	3	2.1
Other	<u>3</u>	2.1
TOTAL RESPONDING	144	

TABLE II-13

IS THE INFORMATION IN THE SYSTEM ACCURATE?

<u>Response</u>	<u>Number Indicating (A)</u>	<u>Per cent of Total Responding</u>
Yes	107	76.4%
No	16	11.4
Sometimes	12	8.6
Don't Know	<u>5</u>	<u>3.6</u>
TOTAL RESPONDING	140	100.0%

TABLE II-14

DOES THE COMPUTER SYSTEM PROVIDE YOU WITH
INFORMATION YOU NEED TO MAKE DECISIONS?

<u>Response</u>	<u>Number Indicating (A)</u>	<u>Per cent of Total Responding</u>
Yes	77	55.4%
No	13	9.4
Sometimes	44	31.7
Don't Know	<u>5</u>	<u>3.5</u>
TOTAL RESPONDING	139	100.0%

TABLE II-15

IS THE RESPONSE FAST ENOUGH?

<u>Response</u>	<u>Number Indicating (A)</u>	<u>Per cent of Total Responding</u>
Yes	57	41.6%
No	39	28.5
Sometimes	37	27.0
Don't Know	<u>4</u>	<u>2.9</u>
TOTAL RESPONDING	137	100.0%

CHAPTER III

A FRAMEWORK FOR FURTHER ANALYSIS

It is possible to assess the benefits or impact of computer use at a number of levels. In an article in the Public Administration Review in 1967,¹ Anthony Downs discussed the payoffs² of urban data systems. He distinguished between two types of payoffs: technical payoffs and power payoffs. Technical payoffs were defined as benefits resulting from "technical improvements from data inputs, processing, and output." In essence they are technical improvements provided through automation which help to bring better information, for example, greater speed of processing, greater consistency

¹Anthony Downs, "A Realistic Look at the Final Payoffs From Urban Data Systems," Public Administration Review, September, 1967, pp. 204-210.

²"Payoff" is the term used by Anthony Downs to refer to the benefits or impacts of urban data systems. It is realized that in the law enforcement community "payoff" has a different connotation (as in a "payoff" provided for police corruption), and as a consequence may be a somewhat confusing word choice. However, since the question of police corruption is not dealt with at any length in this report, and since "payoff" will be used only as expressed by Downs, the term will still appear.

of outputs, and wider distribution of information.

Downs goes on to list eight potential technical benefits brought about by urban data systems:³

1. Lower operating costs of data processing.
2. Faster availability of information.
3. Wider distribution of information.
4. Generation of new information never before observed, recorded, or reported.
5. Greater consistency of reporting data.
6. Reduced distortion of data reported to top levels.
7. Eventual development of a giant data inventory. This could ultimately be used to formulate, test, and modify theories about causal relationships in the urban environment which we can now only guess at.
8. Greater freedom from routine record keeping.

Power payoffs are defined as "gains in one person's decision-making effectiveness made at the expense of another person's."⁴ They are redistributions of the benefits of decision-making. They arise because every change in organizations, techniques, or decision-making processes shifts the relative power of the individuals involved. Some people will gain and others will lose, and usually their perception of the value of the change

³Ibid., p. 205.

⁴Ibid., p. 201.

will depend on self interest. At a general level, seven potential power shifts which may result in urban decision-making as a consequence of the implementation of urban data systems are hypothesized:

1. Lower and intermediate-level officials tend to lose power to higher-level officials and politicians.
2. High-level staff officials gain power.
3. City and state legislators tend to lose power to administrations and operating officials.
4. The government bureaucracy as a whole gains power at the expense of the general electorate and non-governmental groups.
5. Well-organized and sophisticated groups of all kinds, including some government bureaus, gain power at the expense of less well organized and sophisticated groups.
6. Within city governments those who actually control automated data systems gain in power at the expense of those who do not.
7. Technically educated officials within city governments gain power at the expense of old style political advisors.

In reviewing the payoffs outlined by Downs, Myron Weiner contends that there is a third even more important level of benefit, service payoffs. He defines these benefits as the degree to which taxpayers are serviced by municipal information systems so that their quality of life can be improved.⁵ These then are improvements in the service

⁵Myron E. Weiner, Service: The Objective of Municipal Information Systems, Institute of Public Service, The University of Connecticut, 1969, p. 29.

to the public provided as a result of, or in connection with, the use of the computer.

TECHNICAL, POWER, AND SERVICE PAYOFFS AS THEY RELATE
TO POLICE COMPUTER USE

Chapter II explained how the police use of the computer has evolved over the last ten years. From initial applications in the area of traffic and crime reporting, the current focus has moved to speed for real time police systems for the rapid retrieval of information. In the future it seems that emphasis will be in such areas as automated resource allocation, computerized criminal investigation, and machine aided command and control. Using the distinction drawn in Chapter II between structured, routine applications and unstructured more "innovative" applications, the focus in the past has been on the structured; the emphasis in the future will be on the unstructured.

Regarding structured police computer applications, it is the conclusion of this study that the primary benefits to date are technical improvements. Particularly in the site visits, it was found that structured computer uses bring such technical gains as faster availability of information (e.g., response to inquiries from the man in the field in less than seven seconds), wider

distribution of data with greater consistency than ever before (e.g., better reports more widely available), and the development of data inventories providing valuable historical sources for reporting and analysis. In some cases increased revenues have even resulted as a consequence of structured police computer applications. Naturally, the actual impact of such applications has varied widely from police department to police department. On the whole, though, it can be said that such technical benefits have brought increased effectiveness to certain police operations (as long as effectiveness is somewhat narrowly defined).

The next chapter of the thesis, Chapter IV, will examine the use of the computer in structured, routine application areas. The purpose will be to further explain and define the state of the art pertaining to such uses, and more importantly, to begin to assess their benefits and effectiveness. At the outset, effectiveness will be somewhat narrowly defined to refer to increased police output or performance brought about as a result of computer applications. Since information was collected in a wide variety of police departments, each with slightly different computer uses, no single measure or standard of output will be set forth. Instead

a variety of criteria such as the following will be used:

- ... increased number of arrests, particularly arrests for outstanding warrants.
- ... increased amount of stolen property recovered, e.g., stolen automobiles.
- ... time saved (and therefore dollars saved) for both the police and citizens who have been stopped by reducing the waiting time required for record checks (response can now be almost instant as compared to ten or twenty minutes before).
- ... faster response to calls for police services.
- ... increased revenues to the city through a rise in the collection of fines due to an increase in the number of arrests on outstanding warrants (both traffic and criminal), improved billing procedures, etc.

All of these measures are indicators of the "first order" influences of computer use, but pieced together through a variety of illustrations from the various cities visited, they will begin to give some idea as to the effectiveness of police computer use, particularly pertaining to structured applications.

As to the impact of computer use regarding service impacts or payoffs--improvements in the quality of service to the public--the measures of performance referred to above will begin to give some feeling as to the benefits (and costs) of automation in providing police services. Where possible some small effort will be given

to determine the relationship between such services and the actual impact on the community (e.g., reduction in the crime rate, reduction in the number of traffic accidents, overall satisfaction of citizens with police service, etc.). However, trying to establish causal relationships between the use of the computer and, say, a reduction in the crime rate is difficult if not impossible, and will generally be considered to be beyond the scope of this study.⁶

Chapter V will be devoted to examining unstructured computer applications, non-programmed applications, where an attempt is made to begin to use the computer as an innovator and a "thinker." These include such uses as resource allocation, command and control, and computer aided criminal investigation. In general it is the conclusion of this study that such applications are still at an early stage of implementation so it is difficult to fully assess the influence which they will

⁶The crime rate is influenced by a wide variety of factors such as the composition of the population, the political climate of the nation, the environment of the geographic area under consideration, the influence of the news media, the quality of schools, etc. Since all of these variables cannot be held constant, to try to trace the influence of one factor, such as the use of a computer, is a very tedious task with data requirements beyond the scope of this thesis. Even with extensive data, though, the task still may be an impossible one.

eventually have. In many respects, only suppositions or refined hypotheses can be made. Still, it can be said that unstructured applications have generally been more difficult to implement to date than structured ones, primarily because of additional behavioral and political considerations which are involved. It also seems that unstructured applications have a greater potential for eventual power benefits or payoffs, and a greater potential for eventual impacts on police structure, task, and personnel. Chapter V, then, will review some of the primary illustrations of unstructured police computer applications to date, and will begin to examine some of the benefits, costs, and difficulties of implementation which were found.

A discussion of power payoffs for both structured and unstructured applications will be deferred to Chapter VI, where the general impact of the computer on police structure, task, and personnel will be considered.

CHAPTER IV

AN EVALUATION OF STRUCTURED APPLICATIONS: THE USE OF
THE COMPUTER AS A ROUTINE PROCESSOR OF INFORMATION

Police departments process large amounts of information. A great number of events transpire under the jurisdiction of the police, and detailed reports are prepared concerning many of them. Records are kept of the type and number of crimes committed, and reports of aggregate statistics are required at the state and national level (e.g., FBI uniform crime reports). Some of the information gathered serves a self protecting function by documenting police behavior. If a citizen calls two months after an incident has occurred and complains of police brutality, investigators must be able to go back to original records and reconstruct the occurrence. Other information is essential for investigation and prosecution. The police are only one part of the criminal justice system along with the court and correction systems. However, since it is the action of the police which usually commences the process of criminal justice, records must be initiated at that point which will be relied upon later on in the trial and correction proceedings.

Administrative and routine operations also often require a large amount of detailed data processing. Needs in this area include

such things as keeping track of paid and unpaid parking tickets, sending out warrants on traffic and parking citations, meeting payroll commitments, keeping inventories of equipment and vehicle status, and preparing and updating personnel records.

The policeman in the field also has strong information needs. Since his job requires quick judgement and decision-making, any data which will inform him or provide justification for his action can be of significant help. To know within seconds that a car is stolen, or that a person is wanted, or that an address may be dangerous, is of real benefit to the patrolman in the field.

For years police departments have been keeping records and processing information, largely without automation. Such activities will certainly continue in a department which is not using the computer, although because of the massive volume of information, large portions of the data, once recorded, will never be used again without more efficient processing techniques. As was noted in Chapter I, the computer is ideally suited for many of these processing, storage, and retrieval activities. It is able to process large amounts of routine, often detailed information rapidly, precisely, in multiple copies, and without fatigue. Many departments have taken advantage of these computer strengths and have automated these routine, structured information processing activities.

The purpose of this chapter, then, will be to evaluate the use of such structured computer applications by the police. Three parts will be included: (1) an analysis of the benefits and costs

of structured applications in general, primarily focusing on three particular illustrations in Tulsa, Oklahoma; Wichita Falls, Texas; and Denver, Colorado; (2) an evaluation of computer applications for police patrol and inquiry, the most publicized structured use; and (3) a discussion of the varying effectiveness of computer use among police departments.

STRUCTURED APPLICATIONS IN GENERAL:
AN EXAMINATION OF THREE CASES

Computers receive a wide variety of uses within police departments. Many of them are oriented to routine or structured operations. Since the introduction of computers in police departments, crime statistical files have been one of the most important, widely utilized applications. Further, a larger number of departments are using the computer to meet their reporting requirements at a state and national level. As a consequence, the information in such reports is more accurate and consistent, is available in less time, receives greater distribution, includes new information never before reported, and provides a valuable data bank to use as a resource for research and planning.

A variety of structured applications have achieved success. It is worthwhile to illustrate this fact by describing three sample cases found during the site visits throughout the country. In the description which follows, all three will be shown to be computer

uses which have demonstrated or promise to demonstrate a positive ratio of benefits to costs.

The Traffic Citation System in Tulsa, Oklahoma. In July, 1970, the Tulsa Management Planning and Systems Department of the Office of the Mayor working in connection with the Police Department and the Court Clerk for the city implemented a new automated traffic citation system. The result was a total increase in traffic income for the first year of operation of \$260,000, \$32,000 of which was from backlogged citations.

The basic purpose of the automated traffic citation system is to keep track of all parking and moving violations and to provide administrative control. The system has five basic parts:

1. All tickets for both moving and parking violations are numbered. Data regarding the nature of each citation, date, officer making citation, etc., is key punched, and overall record and data base is identified according to the use and disposition of each citation.
2. Whereas the Court Clerk's office in Tulsa used to have four men making phone calls regarding outstanding traffic tickets, the computer system has now replaced this process, and notices are automatically sent regarding traffic violations. The automated system records dates when notices are sent and identifies payments not made. After an appropriate period of time, a bench warrant is issued with the computer preparing all the paper work. Special mailings are also made every three months notifying all offenders of overdue parking ticket payments.
3. When payment is made and rung into the cash register a computer paper tape is automatically punched so that the information in the system can be updated automatically without delay and without excessive expenditure for manpower and keypunching.

4. Daily cash reports and monthly statistics are regularly tabulated by the computer and distributed to the appropriate parties. For example, the Department of Public Safety is furnished each month with a list of all moving violations paid and appropriate totals.

5. Activity reports on the work of patrolmen are printed out on a regular basis. The reports are known as "week to date activity reports" and they include information on the parking and moving traffic citations issued by each patrolman on a weekly basis.

The system provides a number of benefits. When asked what the main utility of the system was to him, the Court Clerk replied that "Administrative Control was the greatest advantage." In essence, the system keeps him informed as to what is happening. However, not only does the system inform the Court Clerk of what is happening concerning one of his primary responsibilities of overseeing the collection of revenues from citations, but it also provides information to police administrators regarding the activity of their men. This data can be a valuable aid in evaluating work and in allocating resources more efficiently. The system therefore has brought major administrative advantages. In and of themselves these would probably justify the costs of the use of the computer in this case. However, there have also been major financial returns.

Prior to the implementation of the traffic citation system in July, 1970, four men were employed to notify motorists by phone of outstanding bills for traffic citations. The monthly cost of the salaries of these four men was \$3,400 (an annual average of \$10,200 per man) and their efforts realized an average of \$5,000 collected per month. When the new system was implemented the phone calling ceased

and notices were automatically sent by machine. Three people in the Court Clerk's office were still involved in the processing of information (keypunching, recording payments, etc.), but because the nature of the task had changed, the salary requirements per month decreased from \$3,400 to \$1,400 (an annual average of \$5,700 per person). During the first month when computer notices were prepared, \$34,000 was collected (as compared to the previous average of \$5,000), and in the first six weeks of operation \$46,000 was collected. The average now is around \$31,000 collected per month. With the new system of computer notices, the back-up of outstanding, unpaid warrants was reduced from \$86,000 to \$52,000. An additional reduction is expected with a new police computer aided dispatching system which is scheduled to be implemented in the summer of 1972.¹

An increase was also seen in the dollars collected for parking tickets. Before implementation of the traffic citation system in July, 1970, the income from the first six months of operation in 1970 was \$15,000. In the next three months after the system was installed \$32,000 was collected.

It is estimated that the total overall increase in traffic income for the first year of operation of the new traffic citation system was \$260,000.² Naturally, some of this increase must be

¹Letter to author from R. C. Klewer, Management Systems Analyst, City of Tulsa, April 20, 1972.

²Ibid.

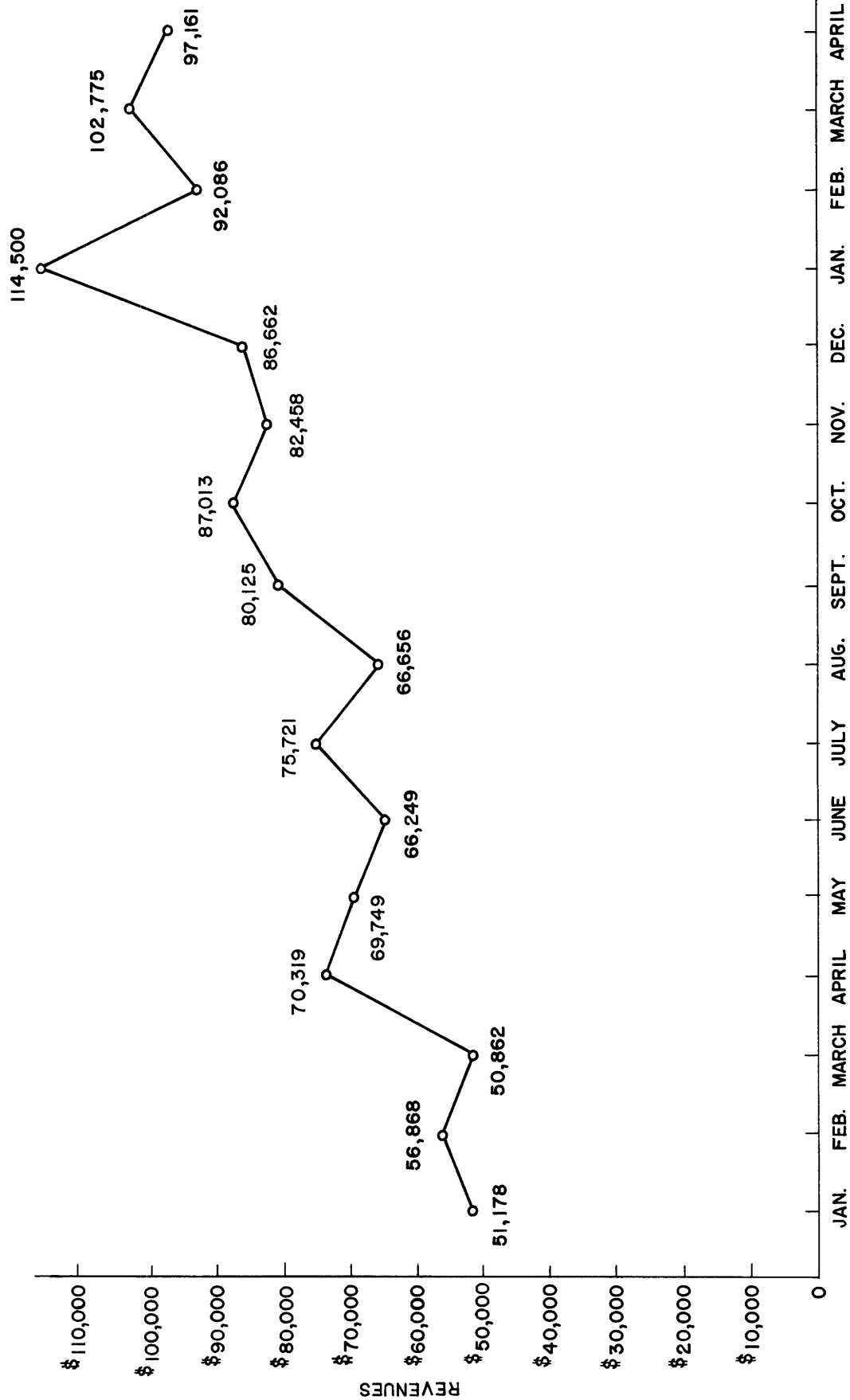
attributed to normal average rise in dollars collected. However, it is probably quite safe to equate most of the increase to the utilization of the new computerized system. Figure IV-1 plots the increase in revenues collected pertaining to traffic from January, 1970 to April, 1971. (The system was implemented during the month of July, 1970.) Note that the increase between the first four months of 1971 compared to the first four months of 1970 was by itself an increase of \$167,295.

It is now important to look at the costs incurred in order to achieve these benefits. The costs are really divided into two basic parts: costs to establish the system, and maintenance and operating costs.

The basic costs to establish the system are estimated as follows:

<u>Personnel</u>		
1 computer systems analyst for approximately one year		\$12,000
1 computer analyst/programmer for approximately 4 months \$12,000/yr.		4,000
Miscellaneous other personnel time in establishing system		4,000
<u>Computer Time</u> (approximate)		10,000
<u>Equipment</u>		12,000
(The equipment was to purchase two validating-paper tape punching machines so that payments of citations could be recorded directly onto computer paper tape. It is estimated that these machines "paid for themselves" in a year due to the reduction which they brought in key punching costs, costs of keypunch cards, etc., saved from the old system.)		
TOTAL		<u>\$42,000</u>

TRAFFIC INCOME DURING THE FIRST YEAR OF OPERATION
FOR THE TULSA TRAFFIC CITATION SYSTEM



DATE
FIGURE IV - 1

The operating costs to run the system for a year from a technical point of view are as follows:

Personnel

1/6 of a computer operator/analyst's
time of approximately \$12,000/yr \$ 2,000

Computer Time (approximate)

30 min/day x 5 days/wk x 52 wks = 130 hrs
1 hr/month x 12 months = 12 hrs
1 hr/wk x 52 wks = 52 hrs
200 hrs

Total 200 hrs x \$100/hr = 20,000

TOTAL ANNUAL COSTS \$22,000

Taking only financial benefits and costs into consideration, we see that benefits (increased revenues of \$260,000) clearly outweigh costs (\$64,000). These figures should be considered as rough estimates (for example, a detailed accounting is not included of personnel utilized in the Court Clerk's office before and after the system, although this would actually increase the benefits achieved). No effort has been made to quantify such benefits as the increase in administrative control mentioned earlier or perhaps the costs of any resistance to implementing the system. However, this simple analysis illustrates how one structured computer application benefited the traffic citation system. In addition, the beneficial ratio of the Tulsa system (\$260,000 in increased revenues vs. \$64,000 in costs, or a ratio of 4 to 1) can be expected to increase with time because the traffic citation system is only one part of the effort in Tulsa towards computer applications both in the police department and in the entire municipal

government. As other applications are implemented, they will complement the traffic citation system, and with minimal additional costs in running the traffic citation system, further increases in revenues can be expected.

Denver Parking Citation System. The computerized parking system for Denver City and County is another illustration of a successful structured computer application in the traffic area. The system differs from the Tulsa system in that it involves real time retrieval of information and is oriented solely to parking citations. (Another related system has been developed to process moving traffic violations.) The system was established to provide a more efficient and accurate means of processing an increasing volume of parking citations. Initial system design began in February 1970, and the system was implemented on April 20, 1970. According to a system overview prepared by the Denver Data Processing Division, the "system replaced a cumbersome, costly and antiquated punch card system that left much to be desired in areas of accountability and control of parking citations."³

Basically the system keeps track of citations issued and payments made. Police copies of the parking citations are delivered to the Traffic Violation Bureau daily for entry into the system by means of computer video terminals. Payments are entered

³Tom Johnson, Systems Analyst, City and County of Denver Parking Citation System, System Overview, City and County of Denver Data Processing Division, November, 1970.

by terminal on a real-time basis (that is, whenever they are received). Citations and payments are recorded and "matched" on the Parking Citation Master File. This file is read daily, and post card notices are prepared by the machine and mailed to all defendants who have not paid their parking citations within a period of 20 days after the date of issuance. Based on the data in the system, monthly reports are prepared on such terms as listings of paid citations, statistics regarding number of citations added each month, type of violation, etc.

Also, a weekly identification listing is prepared for police of all automobiles that have accumulated three or more unpaid parking tickets. This list is then used by the police to identify vehicles which fit into this category. If any are found, a "Denver Boot" is used to demobilize the vehicle until parking violations are paid. (A boot is a metal device that is attached to the wheel and axle of a vehicle for demobilization purposes.) Since such a tactic is used, it is important to update the system instantly when payment for outstanding parking tickets is received. Hence, the need for the real-time entry of information on payments. Usually before a "boot" is applied, law enforcement officers will call in to make sure that the vehicle in question is indeed still in violation of the three outstanding ticket clause.

The benefits of the system are many. First, there is the advantage of real-time updating thereby eliminating the possibility of duplicate payments and the improper demobilization of a vehicle.

As soon as payment is made, instant credit is received so that a vehicle which is no longer in violation does not get "booted." The use of the computer, though, does provide Denver with the opportunity for a very efficient parking collection system. Other benefits include the daily, weekly, and monthly reports that derived as a by-product and the overall administrative control of the parking ticket operation which the system provides.

Exact data regarding the actual benefit cost ratio of the system was not collected, but in discussions with both police and city data processing officials it was unanimously felt to be positive. According to sources in both the police department and in the data processing division in Denver, one of the primary reasons of implementing the system was to increase the parking citation revenues of the city. Again according to these sources, that objective has been fully achieved. In fact, if there is a problem as far as the police department is concerned, it is that perhaps too much priority has been placed on computer applications which will help raise revenue as opposed to those that will be of greater benefit in "fighting crime." This conflict will be discussed later on in the paper, but at this time it is sufficient to conclude that in and of itself, the parking citation system in the city and county of Denver has proved to be a beneficial one.

The Wichita Falls Complaint Processing System. A third example of a structured police computer application is the Wichita

Falls complaint processing system, a system designed to monitor and recall the various complaints and calls for service received by the police in Wichita Falls. (The design of this application is only one small part of an effort to develop an overall municipal information system in the city.)⁴ At the time of the site visit to Wichita Falls in 1971 the complaint processing system which will be described below was still in the final stages of planning and had not been implemented. An analysis as to the expected benefits and costs of the system had just been completed. A telephone conversation has indicated that some changes have occurred in the system since that time,⁵ but the type of analysis performed in evaluating the system still seems worthwhile to report.

⁴Wichita Falls is one of six cities that has been chosen to participate in a federal project on the establishment of municipal information systems. The project is known as the Integrated Municipal Information Systems (IMIS) program and it is funded by the Department of Housing and Urban Development (HUD) and several other federal agencies. The agencies form the Urban Information Systems Interagency Committee (USAC) chaired by HUD. Wichita Falls and Charlotte, North Carolina have been selected to implement complete urban information systems while the other four have been selected to implement particular subsystems of a total urban information systems program. The other four cities and the subsystems they are developing are as follows: Dayton, Ohio, public finance; Long Beach, public safety; Reading, physical and economic development; and St. Paul, human resources development.

⁵Telephone conversation between Kent W. Colton and Floyd R. Shear, Systems Analyst, Wichita Falls, Texas, April, 1972.

There were five primary objectives in designing the complaint processing system:⁶

1. To maintain a record of each complaint and to follow it through from initial call to resolution.
2. To provide a new process of record keeping tied to a microfilm system.
3. To reduce clerical time.
4. To establish an automated real-time stolen property file as one of the aspects of a complete complaint processing system.
5. To generate a variety of reports including not only the required FBI and Texas Department of Public Safety Reports, but summaries and statistical information that would be particularly useful to the department in evaluating needs and work load requirements.

The basic purpose of the system was to be able to maintain and recall all police complaints and their outcomes through the use of the computer and microfilm records. Within the computer was to be filed a real-time index to the microfilm records along with specific retrieval files on such data as stolen property, policemen assigned to various cases, etc.

Before deciding whether to implement the system or not, an analysis was done by the staff of the municipal information systems project in order to evaluate the constraints, benefits, and costs.

⁶Information describing the complaint processing system is taken primarily from the following document: draft, "System Overview Police Complaint Processing System," Municipal Information Systems Project, Wichita Falls, Texas, April 14, 1971. However, other materials obtained in the site visit to Wichita Falls have also been utilized in describing the system.

The primary constraints considered were legal, organizational, and financial, and it was found that although difficulties existed, none were so great as to "pose an appreciable problem during subsequent phases." Further, according to their documentation the benefits would justify the costs.

The primary legal constraint was that there is no specific provision in the state of Texas for the introduction of microfilm as evidence in a Court of Law. Since it was felt that such provisions would probably come in the future, an interim solution was developed. Microfilm was to be used for internal use, and all originals were to be stored for reference only when a case went to court. Upon the acceptance of microfilm by the courts, the manual file could be destroyed.

The analysis of technical constraints indicated no major difficulties, but it was found that implementation of the police complaint processing application would probably result in several organizational changes. First, the police department would no longer be the sole processor of police complaint reports since such reports would now be forwarded to data processing in order to update the file. By some this would be perceived as lessening police department control. Second, complaint processing activities would be going from a manual operation to an automated one utilizing video display terminals and microfilm. A redefinition of work tasks would therefore be required. Finally, the new system would require new forms and procedures in order to meet the more specific data format requirements of the computer and the possibility of resistance

to such changes clearly existed. However, after discussing each of these factors with police department personnel, it was determined that none would be insurmountable. In particular it was felt that police officers and the personnel of the central records section would be willing to accept the new procedures since the results would provide more accurate information in a more timely fashion. With the proper implementation and training pertaining to the new system, the negative impact of any organizational constraint could be minimized.

The analysis also found that although financial constraints might exist, the overall savings in dollars from the system exceeded the costs, at least on a daily operations basis. The current manual processing of complaints consisted of such activities as typing complaint reports, creating index cards, tallying complaint statistics, retrieving complaint information, producing required reports, and producing complaint files. The itemized clerical costs of these various activities were \$201.00 per day (see Table IV-1).

Under the proposed complaint processing system the costs each day were estimated at \$119. The proposed procedures for the automated application were expected to significantly reduce the amount of clerical time required to file and retrieve complaint processes. The processing features were scheduled to be altered somewhat drastically to include such activities as adding codes to selected data elements, typing complaint reports, microfilming complaint reports, retrieving information from computer and automated

TABLE IV-1
PRESENT DAILY COMPLAINT PROCESSING COSTS

<u>Activity</u>		<u>Cost</u>
Complaint Dispatching	24 hours x \$2.25 =	\$ 54.00
Complaint Report Typing	40 reports x 10 min. = 6.66 hr. x 2.25 =	15.00
Complaint Master Report Typing	20 reports x 10 min. = 3.33 hr. x 2.25 =	7.50
Complaint Reports Filing	40 reports x 5 min. = 3.33 hr. x 2.25 =	7.50
Index Card Filing	40 cards x 3 min. = 2 hr. x 2.25 =	4.50
Retrieval - Index Card	300 inquiries x 3 min. = 15 hr. x 2.25 =	33.75
Retrieval - Complaint Report	300 inquiries x 5 min. = 25 hr. x 2.25 =	56.25
Generation of Reports	8 hours x 2.25 =	18.00
Purging Files	2 hours x 2.25 =	<u>4.50</u>
	TOTAL DAILY COST	\$201.00

microfilm storage, etc. However, it was found that assuming the same number of new and supplemental complaint reports and using the same number of inquiries as a base, the cost of the automated system on a daily basis would be significantly less (see Table IV-2).

This increase in savings is noteworthy, but because the primary savings forecast were savings in personnel costs, it is possible that the projected savings will simply be "paper profits." In order to really save money certain people will have to be released from jobs and this usually does not happen. Instead, people are reassigned to other tasks, possibly tasks that are not being done currently. Thus, although more work may be done for the same cost, it is not likely that an actual absolute cost reduction will occur.

Besides the monetary benefits of the automated application, though, it was also found that there would be a substantial increase in benefits in terms of faster inquiry response time, more complete and detailed reports for crime analysis, etc. For example, although it was estimated that the costs of converting from a manual to an automated system would probably be between \$16,554 and \$18,220, it was also felt that by automating the stolen property file the system would be instrumental in helping to bring an increase in the recovery rate of stolen property by twenty-five per cent. If true, this would result in a savings of approximately \$50,000 annually to the citizens of Wichita Falls. This \$50,000, although

TABLE IV-2

PROJECTED DAILY PROCESSING COSTS

<u>Activity</u>		<u>Cost</u>
<u>PERSONNEL</u>		
Complaint Dispatching	24 hours x \$2.25/hour	\$ 54.00
Complaint Report Coding	40 reports x 1 min. = .67 hr. x 2.25 =	1.50
Complaint Report Typing	40 reports x 10 min. = 6.67 hr. x 2.25 =	15.00
Microfilming Complaint Reports	40 reports x 5 min. = 3.33 hr. x 2.25 =	7.50
Index Retrieval	300 inquiries x 1/2 min. = 2.50 hr. x 2.25 =	5.62
Complaint Report Retrieval	300 inquiries x 1 min. = 5 hr. x 2.25 =	11.25
Complaint Report Purge	1 hour x 2.25 =	2.25
Keypunch Reports	40 reports x 100 char. = 4,000 = 1 hr. + 1.05 hr. verification = 2.05 hr. x 2.50	<u>5.12</u>
TOTAL PERSONNEL COSTS		\$102.24
<u>PROCESSING</u>		
Complaint Inquiries	300 x 1/2 min. = 2.50 hr. = .08 hr. computer time x \$60/hr. =	\$ 5.00
Batch Processing	.05 hr. x \$60/hr.	<u>3.27</u>
TOTAL COMPUTER COSTS		\$ 8.27
<u>STORAGE</u>		
On-Line Disk Storage	2.5 million char. = 1/10 disk capacity x 600/mo. ÷ 30 days =	\$ 2.00
Microfilm Storage	Daily cost for \$25,000 investment for 10 years ÷ 3 applications	2.28
<u>TERMINAL</u>		
Rental of 2 terminals (shared between 3 applications)	2 x \$200/mo. ÷ 3 applications ÷ 30 days =	4.44
TOTAL DAILY COST		\$119.23

an indirect benefit to the police department, would more than cover the \$16,000-\$18,000 costs of starting up and converting to an automated system.

A Brief Comparison of the Case Illustrations. The three cases presented above are illustrative of structured computer applications in police departments. Their benefits are primarily technical (e.g., faster availability of information, lower operating costs of data processing, wider distribution of information, etc.), and have for the most part proven to be worth their cost of implementation.

Naturally, the actual utility of such systems varies from department to department depending upon approach, specific environment, etc., so it is difficult to reach more than very general conclusions regarding the advantages of such uses. In general, though, people seem to be happy with such structured applications. The major criticism was the one that was mentioned in Denver. There, personnel in the police department felt that such uses were nice, but since there were only limited resources regarding the implementation of computer applications, they would have preferred the priority to be placed elsewhere. To them applications which will help "fight crime" are more important than those which will increase revenue.

It also seems clear that where implemented properly such applications can increase police efficiency--for example, the

increased number of paid traffic citations in Tulsa, Oklahoma. In general the response of the public tends to be positive to such increased efficiency, but it should be remembered that some citizens will disapprove. Their feeling is that efficiency and strict enforcement are great as long as it doesn't hit "their pocketbook." It is doubted that such public sentiment will ever be so great as to preclude computer implementation, but it should be remembered that it might exist.

It is also worth noting in conclusion at this point that organizational shifts will result in police departments as a result of the implementation of such structured computer applications as discussed above (e.g., the changes anticipated in Wichita Falls), but it seems that the impact of such shifts will be small. This subject will be discussed in greater depth, though, in Chapter VI.

COMPUTER APPLICATIONS FOR POLICE PATROL AND INQUIRY

As was indicated in Chapter II, the application area which currently receives the greatest use by the police is police patrol and inquiry. This application is usually real-time, and it is established to provide the patrolman with the rapid retrieval of information important to his work. Although advanced computer technology is often utilized, the task performed is a straightforward retrieval of information and the application is therefore still considered to be a structured one.

A number of cities throughout the country have had great success in using the computer in this area. Two excellent illustrations are Kansas City, Missouri, and Los Angeles, California.

Kansas City. In Kansas City, Missouri, a city with a population of 507,000, the police department has established a regional system for real-time inquiry of information which links more than 40 law enforcement agencies. This system was established with the primary objective of aiding the patrolman. According to the Kansas City Chief, Clarence M. Kelley, "We must turn to machinery to augment the man in the field."⁷

On July 1, 1968, the telecommunications systems became operational and action was initiated to furnish information to officers in the field. Less than a year later, on May 5, 1969, the telecommunications services of the police department computer were made available to all regional area law enforcement agencies, and those civil agencies involved in the Criminal Justice process. These real-time applications of the Kansas City facility are known as the ALERT System (Automated Law Enforcement Response Team). When the system was established, the primary objective was that information requests of officers in the field receive a response within ten seconds after a question is asked.

⁷Quoted from Bill Ellingsworth, "K. C. Computer Does Its Thing," Kansas Citian, June, 1970.

An officer calls by radio to the communication center with a request for information. Each dispatcher has a video display CRT (Cathode Ray Tube) terminal in front of him. The dispatcher makes an inquiry of the system which queries not only the Kansas City computer, but the FBI's National Crime Information (NCIC) computer in Washington, D.C. A response is received, and a report is radioed back to the officer. According to the Assistant Chief, James Newman, the entire process now averages about three to four seconds. (The experiences of this author while riding patrol with the Kansas City police confirmed his estimate.) Previous to the computer it took about 35 minutes to retrieve and relay this data.

Basically there are three categories of information about which the patrolman can inquire:⁶

1. Wanted information--warrant, pickup, stolen vehicles, stolen property.
2. Criminal index, abstract, and status--current address, status, organized activists.
3. Information forewarning of probable danger from individuals (armed, dangerous, mental, suicidal, expected to resist arrest), or at a particular address (history of previous disturbances at a certain address).

The computer system now provides service to more than 40 law enforcement agencies which serve a population of 1.5 million citizens across 9,000 square miles and eight counties in Kansas and western Missouri. Over 80 local and remote data communication

⁶This categorization is found in Ellingsworth, "K.C. Computer," p. 19.

terminals are operational and linked into the automated network. During November, 1969, the police computer was interfaced directly to the FBI computer in Washington through a high speed microwave communications system.

As of April, 1971, about 13,000 inquiries and update actions were processed each day, at an average of better than one transaction every seven seconds in a 24-hour day. In 1969, the first full year of computer use, a total of 21,700 "hits" or identifications were made, the three largest categories being city traffic warrants, stolen cars, and parole violators. In 1970, 230,000 instances were recorded where quick response of a positive nature was furnished to those tied into the computer network. The police computer system in Kansas City is considered to be one of the best in the country; and so is the system in Los Angeles.

Los Angeles. In Los Angeles, the Automated Want/Warrant System (AWWS) was established through the joint efforts of the Los Angeles Police Department and the City Data Service Bureau, and has proven to be a great success. Prior to the computerized system, the Los Angeles Police Department had several thousand outstanding warrants and wanted persons entries on hand. The problem was that these warrants had to be accessed manually, and this process could take 15 minutes per warrant or even more under unusual circumstances. Although the system worked quite well

regarding the apprehension of important criminals, many minor warrants were never served, partially because police officers in the field were understandably reluctant to keep persons they stopped waiting for an extended period of time only to find that in many cases they were "clean." The result was that the files continued to grow, manual searches took longer, and officers continued to be reluctant to detain people they stopped in order to make a warrants check.⁹

In 1965 the Los Angeles Police Department initiated an in-depth study of its want/warrant files in order to remedy this situation. It soon became apparent that the ever-increasing warrant load was fast overtaxing the limits of the existing manual system. An extensive survey of both support and field personnel revealed that there were six major problem areas related to the police department's response capability pertaining to warrants:¹⁰

1. The lengthy response time necessary for a manual search tended to increase the jeopardy to a field officer unknowingly involved in a contact with a dangerous person.
2. Each inquiry required an average of 8 minutes processing, which materially reduced the officer's ability for active patrol and generated a reluctance to make want/warrant inquiries. These delays in some cases had a detrimental effect on officer/citizen relationships.

⁹"Los Angeles Police Department Automated Want/Warrant System," Datamation, June 1970, pp. 242, 243. No author listed.

¹⁰Los Angeles Regional Automated Want/Warrant System, document published by the Los Angeles Police Department, approximate date 1971, p. 4.

3. File maintenance tasks were extremely involved and cumbersome.
4. The warrant load was increasing at a rate greater than could be adequately handled manually.
5. Storage space for cross-index files and hard copy warrants was becoming critical.
6. Because of limited time, the requesting officer could make use only of Los Angeles Police Department warrants.

Further, discussion with other law enforcement agencies in Los Angeles County revealed that these problems were not unique. Numerous "wants and warrants" were not being served because each agency maintained its own file of warrants for its own jurisdiction separately, and a routine check was confined to that particular agency's file of their own warrants only. According to a Los Angeles Police Department report,¹¹ it was not unusual for a citizen to be arrested and serve a sentence and be released in one jurisdiction while law enforcement agencies in other parts of the county still had outstanding "wants or warrants" for the person.

In response to these problems the Los Angeles Regional Automated Want/Warrant System (AWWS) was developed. It became operational on September 2, 1969. The average time now for a response to the field with AWWS is eight seconds, a significant improvement from the previous time of fifteen minutes. In capsule

¹¹Ibid., p. 4.

form, the system was designed to perform the following functions:¹²

1. Allow each field and station officer to search a centralized file for all outstanding wants/warrants in the system.
2. Allow inquiry from either a visual display device (CRT) or Teletypewriter.
3. Respond to an inquiry in seven to ten seconds.
4. Allow a requestor to specify a terminal to which a printed output would be sent.
5. Allow on-line file maintenance and record update capability from any of the terminal devices.
6. Provide a built-in expansion capability to accomodate law enforcement agencies in the county.
7. Operate reliably on a 24-hour basis, 7 days a week, with minimal interruption.

In most cases these objectives have been met and even exceeded by the Automated Want/Warrant system. Working in a manner similar to Kansas City, the system can be used to check for such items as outstanding warrants (traffic and criminal), stolen cars, other stolen property, motor vehicles with excessive parking violations and wanted persons. AAWS also follows the suspect beyond arrest. When a man is booked and processed, the booking information is sent to the police departments records division. A search based on fingerprints is made, and if an arrest record is found any aliases are also checked against the AAWS files and any additional warrants are transferred to the concerned jail facility.

The AAWS is also tied to other related computer systems. They include the California Highway Patrol "AUTO STATIS" system

¹²Ibid., p. 6.

(a statewide auto theft system), the California Department of Motor Vehicles (used to check vehicle registration information, determine owners, etc.), and the FBI National Crime Information Center (NCIC).

When first begun in 1969, the system was utilized solely by the Los Angeles Police Department. However, plans were made right from the beginning to expand the utilization of the system to other law enforcement agencies in the region. This was done, with the Long Beach, California police department being the first municipal police jurisdiction to gain access to AWWs.¹³ As of April, 1971, there were 49 jurisdictions using the system (including the Los Angeles City Police Department and the Los Angeles County Sheriff's Department).

In the context of a narrow definition of success, the AWWs has been very helpful. For example, the number of arrests made on outstanding warrants in the first quarter of 1970 was over 75% more than the first quarter of last year.¹⁴ No specific financial figures were obtained to conclusively demonstrate the benefits of the parking warrant aspects of the system, but just one example helps to demonstrate the utility in such an area. In the first part of 1970 when the system was fairly new, a patrol

¹³The Los Angeles County Sheriff's Department was really the first jurisdiction besides Los Angeles itself to utilize the system.

¹⁴"Los Angeles Police Department," Datamation, p. 242.

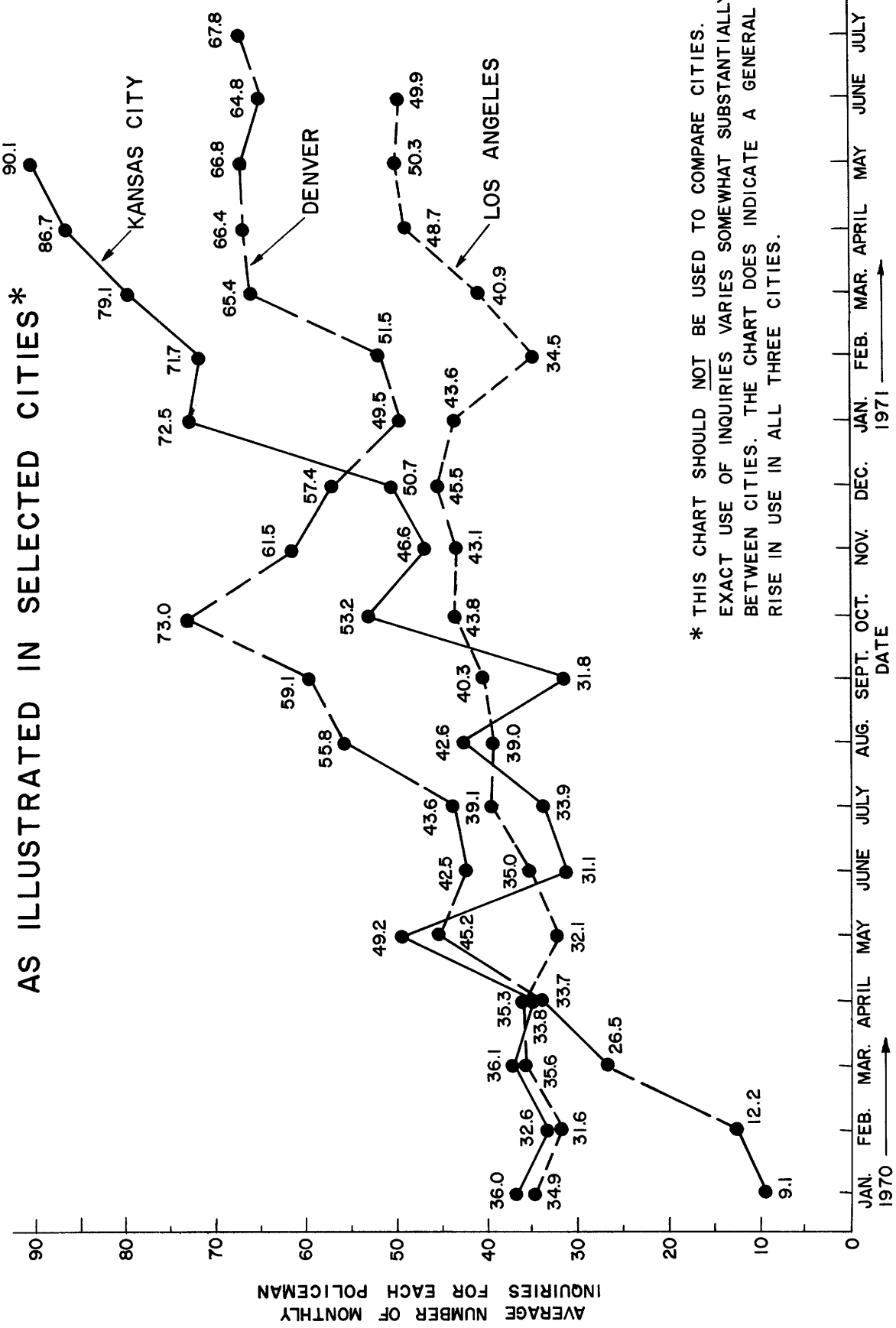
car stopped a car for a traffic violation. The arresting officer ran a routine check on the man and on his license plate number using the AWW system and in seconds was notified of a backlog of 45 outstanding parking tickets. The man was taken to the nearest station, and by the time they arrived a warrant for his arrest was waiting. This is just one illustration, but in general the Automated Want/Warrant System has been successful.

ACCEPTANCE AND BENEFITS OF POLICE PATROL AND INQUIRY COMPUTER APPLICATIONS

Computer use by the police to provide rapid response to inquiries from policemen in the field has been well received by police departments and policemen throughout the country. This is demonstrated by the fact that in every police department visited there had been a definite increase with time in the use of such systems by the men in the field. In other words, once policemen discovered that the system was available and would benefit them by providing better information in a greatly reduced amount of time, they began to use the system. The number of policemen had remained relatively constant within most cities, but within a year's time, the average number of inquiries per man doubled or even tripled in some cases.

Figure IV-2 illustrates this increase in Kansas City, Denver, and Los Angeles. Since the exact definition of "inquiries" varies somewhat substantially from police department to police

RISE IN COMPUTER INQUIRIES FROM POLICEMAN AS ILLUSTRATED IN SELECTED CITIES*



* THIS CHART SHOULD NOT BE USED TO COMPARE CITIES.
EXACT USE OF INQUIRIES VARIES SOMEWHAT SUBSTANTIALLY
BETWEEN CITIES. THE CHART DOES INDICATE A GENERAL
RISE IN USE IN ALL THREE CITIES.

FIGURE IV - 2

department, these charts should not be used to make direct comparisons among these four cities. However, they do indicate very strikingly a general phenomenon in all four: an increased use over time by policemen in the field of real-time police patrol and inquiry systems.

There are a number of both technical benefits and service benefits stemming from this type of rapid retrieval which help to stimulate further use.

Technical Benefits. Regarding technical benefits--benefits resulting from improved data inputs, outputs, and processing--three seem to be of greatest importance: (1) benefits due to better information, (2) benefits resulting from time saved, and (3) benefits providing the patrolmen with increased safety in the uncertain tasks of his work.

First, let's examine improvements in the type and availability of information. In order to make data entries into an automated system, precise forms and a series of regular procedures for data entry and verification are necessary. Hence, the quality of information improves. In Kansas City, for example, each item of information is key punched twice in order to verify input data. Such care leads to greater accuracy and consistency. Also, it is relatively easier to maintain automated computer files than manual ones, particularly for large cities. For example, it has already been indicated that one of the primary problems in

Los Angeles prior to the introduction of AWWS was that file maintenance tasks were extremely cumbersome and storage space for cross-index files and hand copy warrants was becoming critical.

Police patrol and inquiry applications lead to access to information which was never available before and to a much wider distribution of information. A number of police departments now have instant access to regional, state, and national law enforcement information where such data was only available before at the cost of hours and sometimes days. A police department with an automated system can often now have direct computer access to the files of a state department of motor vehicles in order to obtain registration information on automobiles. Before this data was only available over the phone or through the mail. With new information technology, not only is it possible to provide information to the man in the field, but terminals can be placed in a number of the administrative and investigative offices of the police department (such as the auto theft section, the records section, or the detention section), thus providing rapid inquiry capability to those sections where such information was never available, at least without the cost of time and inconvenience.

The second major benefit is that real-time computer systems for inquiry are great time savers. Not only do they save the time of police officers thereby allowing them to spend more time in preventive patrol or responding to calls, they save the time of the citizen who has been stopped. Instead of a fifteen or twenty

minute wait for a records check to be run, now, it can be done instantly and innocent people can be sent on their way. This has the potential of improving police/public relations or at least it reduces the negative potential of an innocent irate citizen being required to wait twenty minutes, thus leading to deteriorating officer/citizen relations.

Since inquiry systems save a great deal of time, the old adage "time is money," is directly applicable in trying to assess the benefits of such computer systems. An effort will not be made to place a specific dollar value on the time saved by the citizen who is stopped, although certainly some savings do exist. It is somewhat easier to place a monetary value on the policeman's time saved, so an illustrative attempt will be made.

In Kansas City it was estimated that in 1970 \$735,000 was spent to run the computer facility. This included the cost of the entire computer operation, not just the cost of the real-time inquiry portion of the system. However, the \$735,000 figure will be used as an illustrative number to represent costs in this example.

In 1970 there were a total of 1,369,270¹⁵ inquiries for information made to the computer facility in the Kansas City

¹⁵This number will be used as a basis to determine the amount of time and consequent dollars saved as a result of the inquiry aspects of the computer system. As the paper has already pointed out, the number of inquiries made of an automated system is far greater than the number made of a manual one. Therefore, it is probably slightly exaggerated to use the inquiries of the automated system as the sole basis for determining benefits since before the computer

Police Department. If it is assumed that each one of these inquiries saves the policeman eight minutes,¹⁶ then a total of 182,569 hours of police service time was saved through the use of the inquiry aspects of the police computer system.

Based on the Kansas City salary schedule for 1970, an average policeman makes approximately \$9,000 per year or about \$4.50 an hour.¹⁷ If one assumes that the 182,569 hours which were formerly potentially spent waiting for responses to inquiry are now devoted to police patrol or responding to calls, then the Kansas City community now receives approximately \$821,560 (182,569 hours x \$4.50/hour) worth of additional police services as a result of the time saved by the use of the real-time inquiry aspects of the police computer system (see Table IV-3). If such is the case, more benefits are achieved each year through the use of the inquiry aspects of the computer system (\$821,561 in police services) than the entire computer operation costs on an annual basis (\$735,000).

Naturally, this illustration is a rough one and focuses on only one very narrow criterion of performance. However, the

the number of such inquiries was far less, thus making the amount of potential time saved far less. However, the example is simply illustrative, and such assumptions as this will be made for the purpose of demonstrating a point.

¹⁶ A reasonable assumption based on response time before and after automation.

¹⁷ Kansas City, Missouri Police Department Annual Report, 1970, p. 8.

TABLE IV-3*

Annual Costs of the Kansas City Computer Operation:

\$735,000 (Estimated costs of the
computer operation for 1970)

Annual Benefits in Additional Police Services as a result of using
the real-time inquire aspects of the Computer Operation:

1,369,270 total inquiries/year

x 8 minutes estimated time
saved/inquiry

10,954,160 minutes saved

$\frac{182,569.33}{60 \times 10,954,160.00} =$

182,569 hours saved

x \$4.50/hour approximate hourly wage of
the average Kansas City
Patrolman†

\$821,561.85 Additional police services per
year as a result of time saved

*Although these numbers are actual figures, this example should be considered as only an illustrative one to demonstrate a point. Because of this, assumptions have been made, and both 1970 and 1971 numbers have been used without any effort to achieve "constant dollars."

†See Kansas City, Missouri Police Department Annual Report, 1970,
p. 8.

example is offered to demonstrate a point, and it does so rather forcefully. A great deal of police time is saved through the use of real-time inquiry systems, and this time saved represents additional police services. In turn, this additional police service represents dollars. Whether or not the actual dollar benefits of such services really equal or even exceed the costs of the computer operation as in the illustration above is not important. The point is that such benefits are significant. Alone they may not justify the use of the computer, nor should they have to. However, time saved is time applied to other law enforcement services, and it should clearly be realized that the time saved by the police because the use of the computer has increased inquiry response time and decreased waiting time does represent a major benefit.

The third area of major technical benefits resulting from computer systems for police patrol and inquiry are those which provide the policeman with greater safety in performing uncertain tasks. Police work involves a great deal of uncertainty and with uncertainty comes risk. To the extent that the use of the computer can help reduce this uncertainty, it will provide a valuable service in the performance of law enforcement work.

Computers are used to reduce uncertainty pertaining to stolen automobiles and other property, pertaining to suspicious persons, and in some cases pertaining to dangerous locations. Regarding automobiles, whenever a vehicle appears suspicious or is stopped for

a moving violation it is now possible with rapid inquiry to check that vehicle and in a matter of seconds to know if it is stolen or considered dangerous. This means that it is possible to notify a policeman whether a car has been stolen or the owner is wanted before the officer approaches the driver of a stopped car, thus letting him know what to expect. The same principle applies to dangerous persons. In some cities if a particular car is known to have been used for criminal activity it will be flagged so that if the car is stopped and a check is made, the persons within the automobile will be treated with special precaution in order to meet the potential danger. Further if persons are stopped or interviewed a name check may be made. This will accomplish several things. First, if the person is wanted an arrest can be made. Second, though, it may alert the patrolman to the fact that the man or woman should be considered dangerous and may be armed or have maniac or suicidal tendencies. Because the information is rapidly available in seconds as opposed to minutes, it means that the policeman will be informed instantly and as a consequence will have less time when he is uninformed or when the suspect can catch him off guard. This information will allow the patrolman to behave in a more appropriate manner, particularly if he has received proper training or gained effective experience in the past. Greater information in a situation like this reduces uncertainty and helps to achieve more effective performance.

Regarding address checks, some systems have now gone so far as to allow the officer or the dispatcher to check a particular location to see if any problems have occurred at that address recently, thus providing a safety warning for cars that might be dispatched. In Kansas City such an application was installed at least in partial response to a tragedy which occurred in the department. Several years ago an officer was sent to a house early in the day in response to a disturbance complaint. The situation seemed to be settled, and the officer left. Later in the day another call went out for the same location, but this time a different patrolman was assigned to respond. Not knowing that there had been any previous trouble, he approached the house with little precaution. This time, though, the persons involved had obtained a gun, and the responding officer was shot and killed. The feelings in the Kansas City Department were that if the second policeman would have known of the previous complaint he would have probably approached the situation entirely differently and his life might have been saved. Naturally, it is exceedingly difficult to place a dollar value on this type of benefit.

Service Benefits. Real-time inquiry systems not only provide technical benefits to the police, but they improve patrolman efficiency and increase apprehension ability. The precise improvement will vary sharply from police department to police department, but such a statement can be readily documented,

and several examples will be provided below.

First, with rapid inquiry systems police officers make a greater number of inquiries regarding stolen property and suspected persons. Figure IV-2 demonstrates this fact in four specific police departments. If an inquiry can be made in a few seconds, policemen are willing to make checks, whereas before with manual systems there was reluctance to inquire and then "waste time" standing around waiting for a response. Further, with regional, state, and national networks for rapid inquiry it is possible for different law enforcement jurisdictions to coordinate operations and to make arrests for each other. In order to illustrate the improved efficiency and apprehension ability which results from police patrol and inquiry systems, it is useful to look at the results of such an application in one specific police department, the department in the city of Long Beach, California.

The Long Beach Police Department became a part of the Los Angeles Regional Automated Want/Warrant System (AWWS)/, in March, 1970. That meant it could have access to all information within the system regarding wanted persons, stolen vehicles, outstanding warrants, etc., and on June 8, 1970 the department also began to enter data into AWWS regarding their own outstanding warrants. To test the changes in efficiency and apprehension ability which resulted from the use of AWWS it is useful to examine the change in the number of warrants served which resulted. This can be done

best by examining three separate tables. Table IV-4 on local warrant arrests, Table IV-5 on foreign warrant arrests, and Table IV-6 on arrests of Long Beach warrants by other agencies.¹⁸

Table IV-4 compares the number of arrests made of Long Beach warrants by members of the Long Beach Police Department prior to the system in 1969 and after the system was implemented in 1970. At first examination, the results are somewhat surprising. In most months of 1969 there were a greater number of arrests in 1969 than in 1970. Further, there was a decrease of 154 local warrants arrests for 1970 (2,484) over 1969 (2,638). Does this mean that the implementation of the AWWWS was a failure? A more detailed examination of the remaining data indicates not.

Table IV-5 compares arrests made by Long Beach Police officers in 1969 and 1970 on "foreign agency warrants" or warrants issued by other law enforcement jurisdictions. The chart illustrates a significant rise in foreign warrant arrests after the implementation of AWWWS in March, 1970. The number almost doubled from 1969 to 1970 going from 484 to 829 for an increase of 345. When this total is added to the local warrant factor previously discussed, it indicates that there was a slight increase in the

¹⁸ The data to develop these charts is taken from The Automated Want/Warrant System from Conceptualization to Implementation, Long Beach Police Department, a report prepared by Sergeant Jerry Lance, Research Department, Long Beach Police Department, March 1, 1972.

TABLE IV-4

ARRESTS ON LOCAL WARRANTS 1969 vs. 1970

Included within this report are all local warrant arrests on local warrants comparing 1969 with 1970. Following is a graphic demonstration of this listing.

<u>Month</u>	<u>1969</u>	<u>1970</u>
January	226	253
February	225	200
March	229	190
April	233	216
May	234	266
June	216	155
July	210	183
August	236	242
September	223	222
October	201	186
November	211	201
December	<u>194</u>	<u>170</u>
TOTAL	2,638	2,484

TABLE IV-5

ARRESTS ON FOREIGN WARRANTS 1969 vs. 1970

Included in this report are all local arrests on foreign warrants comparing 1969 with 1970. It should be noted that the Want/Warrant System through the computer has only been available since February 1970 for inquiry. The Long Beach warrants were not added until June 1970. Following is a graphic demonstration.

<u>Month</u>	<u>1969</u>	<u>1970</u>
January	40	39
February	39	28
March	40	63
April	57	87
May	34	71
June	42	94
July	38	82
August	33	64
September	31	41
October	35	88
November	42	91
December	<u>53</u>	<u>81</u>
TOTAL	484	829

total number of warrant arrests made by the Long Beach Police Department: 3,122 in 1969 and 3,313 in 1970. However, it is in Table IV-6 that the real success of the system is demonstrated.

Table IV-6 compares the number of warrant arrests made by other law enforcement agencies on Long Beach warrants in 1969 and in 1970. This increase can be attributed directly to the implementation of AWWs. The Long Beach Police Department began entering their outstanding warrants into AWWs June, 1970, and from that month on there has been a steady increase in the number of arrests made by other agencies of Long Beach warrants. Prior to June, 1970 no precise information was kept regarding arrests made by outside jurisdictions but the Warrant Detail Supervisor estimated that between 30-40 warrants a month were cleared by other agencies. Based on this estimate, it has been assumed that there was an average of 35 warrants per month prior to June, 1970. This means that for a six month period prior to AWWs there would have been 210 warrant arrests by outside agencies, and if calculated for an annual period, there would have been 420 such arrests each year. Now, comparing 1969 and 1970, there were 1,343 warrant arrests during the seven-month period of AWWs operation in 1970 (June - December). During that same period in 1969 there was only an estimated 245 warrant arrests. This means that there was better than a 550% increase for the first seven months period of operation compared to the previous year.

In summary, then, the use of the Los Angeles Regional

TABLE IV-6

ARRESTS ON LONG BEACH WARRANTS BY OTHER AGENCIES

This report will show the number of arrests by other agencies of Long Beach Warrants. This covers only the period of June through December as these are the only months our warrants have been in the system. Prior to this time there was no record kept of this information. However, an estimate made by the warrant detail prior to the system going into operation was approximately 30-40 bookings a month by other agencies. As will be shown by the figures, this is the area in which the increase in warrant service was most beneficial.

<u>Month</u>	<u>1970</u>	<u>1969 Estimates</u>
June	71	35
July	150	35
August	189	35
September	199	35
October	192	35
November	263	35
December	<u>279</u>	<u>35</u>
SEVEN MONTH TOTAL	1,343	245
Plus Estimated		
January	35	35
February	35	35
March	35	35
April	35	35
May	<u>35</u>	<u>35</u>
	175	175
	—	—
ESTIMATED TOTAL FOR YEAR	1,518	420

Automated Want/Warrant System by the Long Beach Police Department has proven to be highly successful from an apprehension point of view. In total, there were 3,542 warrant arrests in 1969 compared to 4,831 for 1970, an increase of 1,289 or 36.4% over 1969. When warrant arrests by Long Beach officers on foreign warrants are deducted the totals indicate 3,058 arrests on Long Beach warrants for 1969 and 4,037 for 1970, an increase of 979 or 32.0%. This rise can indeed be viewed as a substantial improvement. Finally, it is important to note again that the significant benefits of AWWS to Long Beach did not come from an increase in the number of arrests they made on their own warrants, but from the fact that with the AWWS system, officers in other jurisdictions could now identify and arrest individuals wanted in Long Beach. In fact, the Long Beach warrant squad soon discovered that instead of spending most of their time serving warrants, they were now spending the majority of their time picking up people who had been arrested in other jurisdictions due to outstanding Long Beach warrants.

Regarding the costs of utilizing the AWWS by the Long Beach Police Department, the cost-benefit ratio also appears to be favorable. Specifically, the costs of the system were estimated to be \$50,000 per annum including equipment and "service fee" paid to Los Angeles. (The costs for the first six months of use in 1969 were budgeted at \$25,192 (see Table IV-7), and the costs for 1970 were budgeted at \$50,844 (see Table IV-8). On the other hand,

TABLE IV-7

AUTOMATED WANT/WARRANT SYSTEM COST 1969-70 BUDGET

<u>EQUIPMENT</u>	<u>Monthly</u>	<u>1969-70 Yearly</u>
<u>Scantlin:</u>		
1) C.R.T. Terminals (3)	\$ 153.00	\$ 918.00
Model 830 Keyboard		
Model 836 Display Unit		
One time Installation @ <u>\$130</u> each		390.00
2) C.R.T. Controller Model 820 (1)	275.00	1,650.00
One time Installation <u>\$350</u>		350.00
3) Line Terminators Model 812 (2)	90.00	540.00
One time Installation <u>No Charge</u>		
4) Maintenance	<u>41.00</u>	<u>246.00</u>
Sub-total	559.00	4,094.00
<u>Mohawk Data Recorder:</u>		
1) Data Recorder Model 6401 (1)	161.00	966.00
Maintenance	20.00	120.00
One time Shipping cost <u>\$100</u>		<u>100.00</u>
Sub-total	181.00	1,186.00
<u>Pacific Telephone Co.</u>		
1) Data Phones at Voice Grade	202.00	1,212.00
Phone line (2)		
One time Installation <u>\$220</u>		<u>220.00</u>
Sub-total	202.00	1,432.00
<u>PERSONNEL</u>		
<u>Los Angeles</u>		
Fee to Los Angeles \$5 per police officer at 1969-70 Budget, 616 personnel	<u>3,080.00</u>	<u>18,480.00</u>
TOTAL	<u>\$4,022.00</u>	<u>\$25,192.00</u>

TABLE IV-8

AUTOMATED WANT/WARRANT SYSTEM COSTS 1970-71 BUDGET

Following is a breakdown of the Automated Want/Warrant System cost in the current (1970-71) Budget.

<u>EQUIPMENT</u>	<u>Monthly</u>	<u>Yearly</u>
<u>Scantlin</u>		
C.R.T. Terminals (3) Model 830 Keyboard Model 836 Display Unit	\$ 153.00	\$ 1,836.00
C.R.T. Model 820 Controller (1)	275.00	3,300.00
Line Terminators Model 812 (2)	90.00	1,080.00
Maintenance Cost	<u>41.00</u>	<u>492.00</u>
Sub-total	559.00	6,708.00
<u>Mohawk Data Recorder</u>		
Data Recorder Model 6401 (1)	161.00	1,932.00
Maintenance	<u>20.00</u>	<u>240.00</u>
Sub-total	181.00	2,172.00
<u>Pacific Telephone</u>		
Data Phones on Voice Grade Line (2)	202.00	2,424.00
<u>PERSONNEL</u>		
Fee to Los Angeles based on \$5 per police officer at current level of 659.	<u>3,295.00</u>	<u>39,540.00</u>
GRAND TOTAL	<u>\$4,237.00</u>	<u>\$50,844.00</u>

it was estimated that the annual revenues received from various warrants for 1971 were around \$375,000. (The actual revenue for January 1, 1971 thru June 30, 1971 was \$187,575).¹⁹ Based on an increase in Long Beach warrant arrests, of 979 or 32%, this would indicate increased benefits of somewhere around \$90,750.²⁰ The use of the Automated Want Warrant System, then, resulted in a positive benefit cost ratio of approximately 9/5, \$90,750 in benefits compared to \$50,000 in costs. Not only was the apprehension capability of the police increased, but it was done at a reasonable cost considering the benefits achieved.

THE IMPLEMENTATION OF COMPUTER USE

The introduction of a computer is the introduction of a technological change. With it comes uncertainty. Certain people in the organization will gain, others may lose. Resistance is primarily a function of whether or not people view such a change to be to their benefit. The dynamics of change are vital in understanding the impact and implementation of computers. Before

¹⁹ Memorandum dated July 18, 1971 to William J. Mooney, Long Beach Chief of Police, from Officer S.R. Eakin, AWWWS Coordinator. Subject: "Semiannual Automated Want/Warrant System Statistics."

²⁰ 979 warrants (increase from 1969 to 1970 ÷ 4,037 (total Long Beach warrant arrests in 1970) = 24.2% (% increase from 1969 to 1970 was of total 1970 warrants). Therefore, 24.2% x \$375,000 = \$90,750.

proceeding, it is important to comment briefly on the dynamics of organizational change and how they seem to relate to the implementation of computer use by the police.

A number of studies have been done to try to determine the circumstances that surround the successful implementation of change. Kenneth C. Knight has argued that the recent experience of the organization is the most important determinant of how receptive the members of that organization will be to a proposed change. If they perceive past efforts of the organization to have been successful, their willingness to change will be low. However, if they perceive that past efforts have failed, their receptivity will increase.²¹

In police departments this implies that people will be more receptive to computer use if they perceive the need to improve their basic operations. Although the principle has not been tested scientifically, interviews with police officers around the country seem to confirm it. One of the primary reasons that patrolmen or detectives stated that they felt their department should use the computer was to improve effectiveness, to move from an operation with which they were dissatisfied to one with which they were more pleased.

A study by Dalton, Barnes, and Zaleznik on the introduction of change into an organization also seems appropriate to the dynamics

²¹ Kenneth C. Knight, "A Descriptive Model of the Intra Firm Innovation Process," Journal of Business, Volume 40, No. 4, October, 1967, pp. 478-496.

of change and to the introduction of computer use among the police.²²
 It was their conclusion that two prior conditions were essential to the initiation of change.

(1) the presence of some sort of tension, (this would tie in with Knight's conclusions. Past failure would be one of the major causes of tension); and

(2) a powerful influencing agent, with ultimate power and authority drawn not only from position, but from expertise and experience, and personal characteristics and reputation (e.g., the strong influence of a powerful police chief).

In addition, they outlined four further conditions which they felt were necessary if initially implemented changes are to be maintained:

(1) movement from an external motive of change to an internalized motive (e.g., movement from the police chief's desire to set up an information system to designing a system that will provide benefits to the operating patrolman and detective as well);

(2) movement from more generalized goals and objectives to those that are more specific and concrete (e.g., movement from the objective of better information in law enforcement work to the goal of rapid retrieval of information regarding outstanding warrants);

(3) movement of those involved from a feeling of self-doubt and a lower sense of self-esteem to a heightened sense of self-esteem (e.g., the type of esteem people feel when they are given new responsibilities and participate in new decision areas); and

(4) movement from former social ties built around previous activities to new relationships which support the intended

²² Gene W. Dalton, Louis B. Barnes, Abraham Zaleznik, The Distribution of Authority in Formal Organizations, Harvard University Graduate School of Business, Boston, 1968, pp. 100 - 147. They discussed a structural change, but their basic concepts are applicable to technological change as well.

changes in behavior and attitudes. (e.g., the integration of those involved in implementing computer operations with the rest of the police department. Social ties and relationships are important to lasting change, and sometimes it takes time and effort for a civilian "computer-type" to cut into the sometimes closed social order of the police.)

Each of these conditions are important when implementing computer use in a police organization. The dynamics of change play an essential role in the application of information technology. To try to achieve successful implementation without the careful consideration of behavioral dynamics, is doomed to problems and unmet expectations. Police departments vary in their effectiveness in implementing computer applications, and some of these organizational change factors seem particularly important in understanding such differences.

In fact, it was found in the site visits to police departments that some departments are far more effective than others in implementing computer use, even in the area of police patrol and inquiry where the application is a relatively straightforward, structured one. In St. Louis, for example, a real-time computer system for police patrol and inquiry has been in operation since 1965. As of the time of the site visit in April, 1971, though, due to several complications such as having a "second generation" computer and having only a limited number of terminals available in the dispatch center (this will be discussed in more detail later in the chapter) the department had not been able to achieve the

rapid response time it desired. Instead of being ten seconds, the average time required to get information back in reply to an inquiry from a policeman in the field was as much as ten minutes.²³ As a result, slow response had lead to a certain disenchantment with the system. Only six of fourteen policemen interviewed felt that the computer had met their expectations.

In Kansas City, on the other hand, a city of similar size, the computer system was established in 1968. From the beginning, the major emphasis was placed on the "man in the field" and in achieving a rapid response to his requests for information. The objective was achieved, and now replies to inquiries are consistently returned in less than ten seconds. According to the Assistant Chief of Police the average response may be as low as three or four seconds. As a consequence, the attitude towards the computer in Kansas City is remarkably positive. Of twenty-two policemen interviewed, not a single officer felt that his expectations had not been met, and in fact, fifteen volunteered their feelings that the computer had exceeded their expectations.

The effect of the different computer inquiry response time between the two departments, though, is not only demonstrated

²³ Ten minutes was the most often quoted time of response by the patrolmen that were interviewed and was the average response time of a small sample of personal test cases while riding patrol in St. Louis.

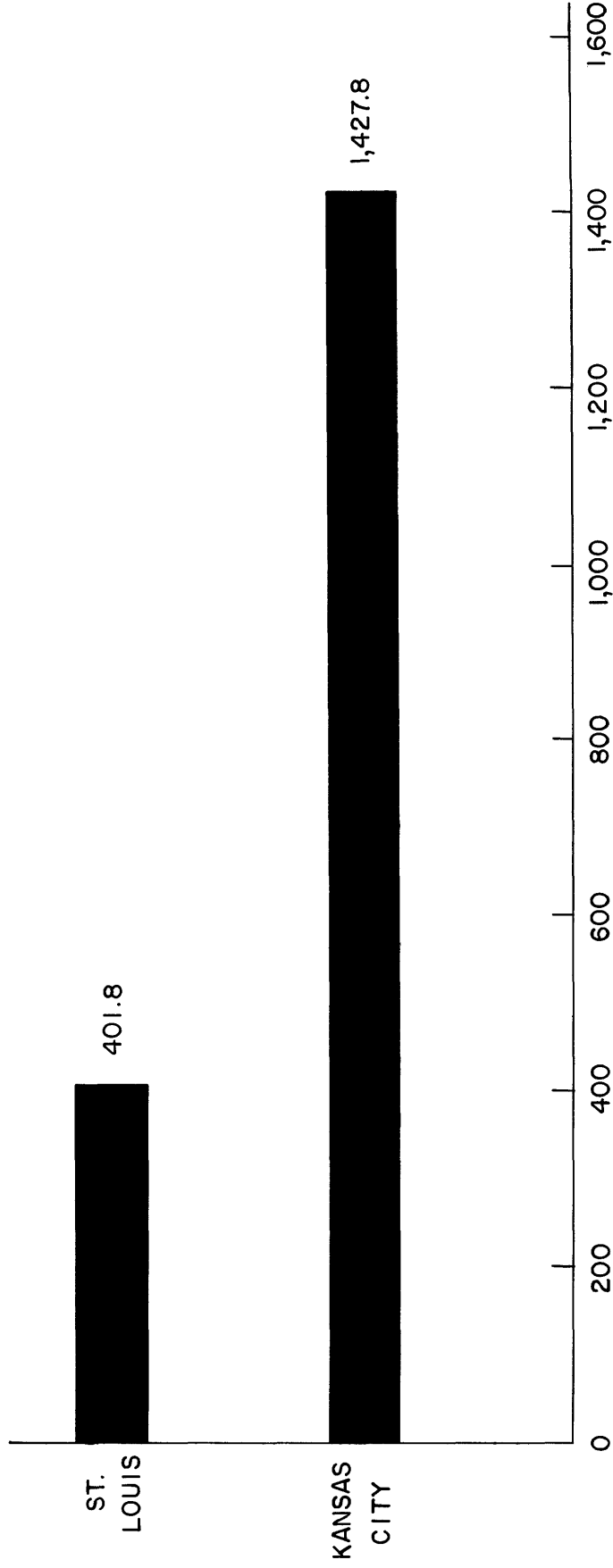
in the attitude of the policemen, but in how often they use the inquiry potential available to them. In Kansas City the average number of inquiries per patrolman on the force was more than three times as great as the number of inquiries in St. Louis (see Figure IV-3).²⁴ Because the Kansas City Police Department uses a broader definition of "inquiry" (it includes in its inquiry count some administrative and demonstration requests) the figure may be biased slightly upward. However, the difference between the two departments is still significant. Based on the data available for the first few months in 1971, the average number of total operational inquiries per month in St. Louis per policeman was 33.2. In Kansas City the average number of "operational inquiries" (in other words not counting any administrative or demonstration inquiries) per patrolman per month was 76.2, more than twice as many.

It is useful to examine the factors which seem to be most important in accounting for such disparities among departments. In understanding such variations the organizational change factors discussed above will be particularly relevant.

First, it seems that there is no "school solution" to successful computer implementation. Each city and police department

²⁴ In 1970, Kansas City had only 959 sworn police officers while St. Louis had 2,037. However, the policemen in Kansas City made 1,369,270 real-time inquiries while the policemen in St. Louis made more than a third less, 818,398. When a determination is made as to the average number of inquiries per sworn policeman, the difference is even more striking: 1,427.8 inquiries per policeman in

COMPUTER USE IN ST. LOUIS AND KANSAS CITY IN 1970



179.

FIGURE IV - 3

must adopt and modify to fit their particular situation and need. Similarities do exist, however.

Among the nine police departments visited actually using the computer extensively or having plans to do so in the immediate future, an evaluation was made of the overall acceptance of computer implementation, the attitude and understanding of the police towards computer use, and the problems encountered both past and present. The purpose was not to evaluate the overall success of computer use, but simply to identify those departments which seemed to be particularly effective in implementing the computer and in achieving the acceptance and use of technology by their men. The evaluation suggests that the departments can be classified into three basic groups: two that were unmistakably effective in terms of acceptance and use as rated by policemen in the department; four that were performing adequately but for which it was still too early to determine the ultimate outcome; and three that were definitely having difficulties by their own admission of one sort or another.

Based on an analysis of the ICMA survey and interviews and information from the site visits, six variables seemed particularly

St. Louis compared to 401.8 inquiries per officer in Kansas City.

important in determining effective computer use:

- (1) The involvement and quality of leadership at the top;
- (2) The involvement of other police personnel (and the ability to bridge the gap between EDP and police);
- (3) The emphasis placed on human-computer interaction.
- (4) The basic approach and establishment of priorities;
- (5) The caliber of computer systems and technical staff; and
- (6) The technology available.

A closer examination will indicate that many of them relate directly to the factors outlined earlier by Dalton, et. al., and Knight.

The Involvement and Quality of Leadership at the Top. Police departments tend to be fairly rigid organizations with well-established and precise chains of command. Thus, understanding, support, and involvement of leadership are essential if computers are to be used to their full potential. When asked in the ICMA survey who had made the initial proposal to use the computer, more than half indicated it had been the chief, and seven out of ten said either the chief or the assistant chief (Table IV-9). However, it is not sufficient just for the chief to make the initial proposal or to be in favor of computer use. Dalton's research indicated that a powerful influencing agent was essential in achieving organizational change. Visits to computer users confirm this conclusion. The chief (or, at minimum, a very capable top assistant) must fully

TABLE IV-9

WHO MADE THE INITIAL PROPOSAL FOR COMPUTER USE?

<u>Response</u>	<u>Number Indicating (A)</u>	<u>Per cent of Total Number Responding (N=118)*</u>
Chief of Police	60	50.8%
Asst. Chief or Chief's Direct Staff	23	19.5
Data Processing Manager	11	9.3
Planning, Research Director	15	12.7
Other Administrative Officer	12	10.2
Office of Mayor or City Manager	24	20.3
Outside Consultant	9	7.6
Other	<u>9</u>	<u>7.6</u>
TOTAL RESPONDING	163†	138.0†

WHAT STIMULATED THEIR INTEREST?

		<u>(N=111)Δ</u>
Professional Meetings	42	37.8%
Journals or Written Reports	29	26.1
Activity in other Cities, States	72	64.9
Computer Salesman	8	7.2
Outside Consultants	14	12.6
FBI Crime Reporting	19	17.1
IACP Department Surveys	17	15.3
Federal Assistance	16	14.4
Other	<u>15</u>	<u>13.5</u>
TOTAL RESPONDING	232†	208.8†

*Of 146 departments using computers, 118 responded to this question.

†Multiple responses possible.

ΔOf 146 departments using computers, 111 responded to this question

understand and be involved in the operation and implications of computer applications. In the most effective police departments this understanding and involvement was obvious.

For example, in Kansas City, two thirds of the patrolmen interviewed (sixteen out of twenty-four) felt that the involvement of their chief and assistant chief had been so crucial that they volunteered their opinion on this subject without direct questioning. The civilian manager of the department's computer system strongly believes that if the computer system is judged a success, all credit must go to the two top administrators of the department. His words are "never in my twenty-five years of experience in data processing have I had such strong support. The department's computer program could not have been successful in the face of many tribulations, without their backing."²⁵

The Involvement of Other Police Personnel. Involvement of the chief is a necessary condition for success, but it is not sufficient. Police at the operating level must also be involved in the design and development of computer systems. As Dalton maintained there must be movement from an external motive of change to an internalized motive, and new social ties and relationships must be established. In Dayton, Ohio, the data processing manager,

²⁵

"The Kansas City Missouri Police Department", an unpublished statement by Alan Westin, Columbia University, on the Kansas City Police Department Computer System, 1971. Westin's statement was given to the author by Mr. Mel Bockelman, Manager, Kansas City Police Department computer facilities.

who was also a policeman, put it this way: "You can train a policeman to be a programmer, but you can't train a programmer to be a policeman." Police officers can be suspicious of outsiders and change, so methods must be devised to bridge the gap between EDP and police and to effectively merge the data processing operation with the rest of the department . When the computer operation was instituted in Kansas City, eight policemen were selected through a series of special tests to become programmers and systems experts. In order to cultivate and maintain their interest, a special technical pay scale was introduced. Throughout the department, sworn personnel would refer to the involvement of these eight policemen as one of the keys to success.

In St. Louis, the situation was somewhat different. Efforts had been made to try to involve policemen in the computer operation but in general they had not met with success. Some of the "systems staff" within the department felt that one of the reasons they had not succeeded was because the St. Louis department had not authorized a special technical pay scale for police data processors as they had done in Kansas City. As a result, they found that once policemen were trained in data processing, they would realize that their earning potential was somewhat higher and would begin to think about looking elsewhere for work. For example, one of the patrolmen who worked in data processing eventually gave up his commission as a policeman in order to earn a higher salary. He

design by the police and programming by civilian personnel, has proven to be a very viable one.

The Emphasis Placed on Human-Computer Interaction. Sometimes people will think of the computer as a replacement for man. This is both unrealistic and inefficient. One of the most critical variables for the efficient and effective operation of any computer system is the development of a proper balance in the interaction between man and machine.

For example, in St. Louis the real-time system was established to provide rapid response to the man in the field. However, the method established for retrieving information from the computer was inefficient. The patrolman would call in to the dispatcher and make a request for information, say, on whether a car was stolen. The dispatcher would write this down and hand it to a terminal operator who would query the computer. The time taken for the operator to get a reply from the computer was seldom more than thirty seconds, and often faster. However, the terminal operator was servicing several dispatchers, so a line or queue would often form and a delay would result. Once the terminal operator received a response he would write it down and hand it back to the dispatcher, who in turn would contact the patrolman. The result- -a ten minute wait and sometimes more for the patrolman in the street. To him the system was not much better than the

still remained on working in the data processing section of the St. Louis police department, but as a civilian employee earning a higher salary than he had been earning as a commissioned police officer. This switch was looked on with disfavor in the eyes of many policemen, and actually probably added to the gap in the relations between EDP personnel and the police.

This is not to say that the only way to succeed is for policemen to become programmers. Clearly the actual technical task of programming can be performed by a civilian or someone who is unfamiliar with police work. However, the full potential of the computer in police operations may not be realized until sworn personnel are intimately involved in the design and development of computer application (and as Dalton said, there is a movement of those involved from a feeling of self doubt and lower sense of self-esteem to a heightened sense of self-esteem).

In Los Angeles the Police Department has evolved a very successful working relationship with the City Data Service Bureau. The city owns the computer, but a number of police officers work in what is called the Advanced Systems Development Section of the Police Department where the major systems analysis and design of computer applications is carried out. In turn, the Data Service Bureau appoints a "task force" of technical people who work with the Advanced Systems Section and are responsible for the programming and technical aspects of each application. This combination of

manual operation the department had before.

In direct contrast to this are the systems in both Kansas City and Los Angeles where the dispatcher has a video terminal directly in front of him. While a request is being made he is entering the information into the computer. Response is almost instantaneous, and the dispatcher relays it immediately to the officer in the field. The result- -a five to ten second response and an extremely satisfied policeman (to say nothing of the citizen who only has to wait for ten seconds instead of ten minutes).

The machine will not replace the human element in police operations, and just because something can be automated it is not a clear sign that it should be. If we are to utilize the computer fully as an aid in law enforcement work, more time must be spent on working out the best relationship between man and technology to obtain the optimum performance from both.

The Basic Approach and Establishment of Priorities. The basic approach to computer applications and the process of determining priorities plays an important role in achieving success. The most effective formula for those who want to implement a computer is to start with a specific definable product which has not been oversold, do a good job, and from that point add from one item of success to another. As Dalton explained, there is a need to move from general goals to those that are more specific

or concrete. For example, once beginning computer use, Kansas City and Los Angeles both set out early to move from general computer goals of efficiency and effectiveness to the more specific task of helping the "man in the street" by providing almost instant response to inquiries on wanted cars, property, persons, dangerous suspects, etc. Because this first step was accomplished so well, the atmosphere in both departments is now conducive to major technical innovations in administration and management; and numerous other applications are under way.

In St. Louis, on the other hand, one of the initial efforts of the computer operation was to establish a real-time capability. However, due to the various complications discussed earlier, retrieval time remained in minutes rather than seconds, and the expectations of the patrolmen were not met. The priority was placed, but the objective was never quite accomplished.

Other departments have put their initial focus more on housekeeping details (e.g., payroll, personnel) or on areas that have less direct positive utility for the patrolman in the field (e.g., resource, and patrol allocation). As a result, the enthusiasm about the computer in these departments has seemed to be far lower than in Kansas City and Los Angeles. For example, in Denver there was initially a great enthusiasm for the computer among the police department. However, according to many of the policemen interviewed, the city seemed to emphasize use of the computer for administrative and housekeeping applications,

particularly those that would increase the city's revenue. This city/police department relationship was a disappointment to the police, and for some of them had resulted in a major dampening of their original enthusiasm.

The Caliber of Computer Systems and Technical Staff. A good data processing man makes an important difference, whether the computer is controlled by the police department or by the city. He must be an individual with technical skills and a perspective broad enough to allow him to communicate with the police department and to envision the uses and impacts of various applications. In order to obtain such individuals, a city or police department must be willing to pay competitive wages.

As in most of the other factors, though, this condition for success seems to be a necessary, but not sufficient one. In most of the cities visited the data processing people were qualified and hard-working. Some were more effective or farther along than others, though, primarily because of the circumstances surrounding the other five factors currently under consideration in this portion of the report.

The Technology Available. It was found that the technology utilized affected performance, although this may seem like a statement of the obvious. It makes sense that a third generation computer with integrated circuits would perform with better speed

and precision than a transistorized second generation machine with a tendency to break down often because of age. Beyond that, though, it can also be demonstrated that better technology can lead to increased use. This does not mean that expensive hardware is always best in every situation, or that it will pay to purchase more machinery. What it does mean, though, is that only a careful benefit/cost analysis can suggest the appropriate level of technology for a given department.

St. Louis is a striking example of the change which can occur through the use of new technology. When the site visit was made there the police department was using a second generation computer (an IBM 7040). However, they were in the process of shifting to a third generation machine (IBM 360/50) and to switching from using "teletype" and "typewriter" terminals to video display CRT terminals which are faster, easier, and more "fun" to use, and naturally more expensive. Conversion turned out to be more difficult than expected, but by the fall of 1971, the system was operational. In a six week period after the system was first operational (from October 6, 1971 to November 17, 1971) there was a remarkable rise in the number of inquiries made of the St. Louis real-time computer system. Figure IV-4 plots this climb from 6,008 inquiries in the week of October 6, 1971 to 18,744 inquiries in the week of November 17, 1971, a three hundred percent increase in a matter of six weeks. After that time the number of inquiries

INQUIRIES IN ST. LOUIS DURING A SIX WEEK PERIOD

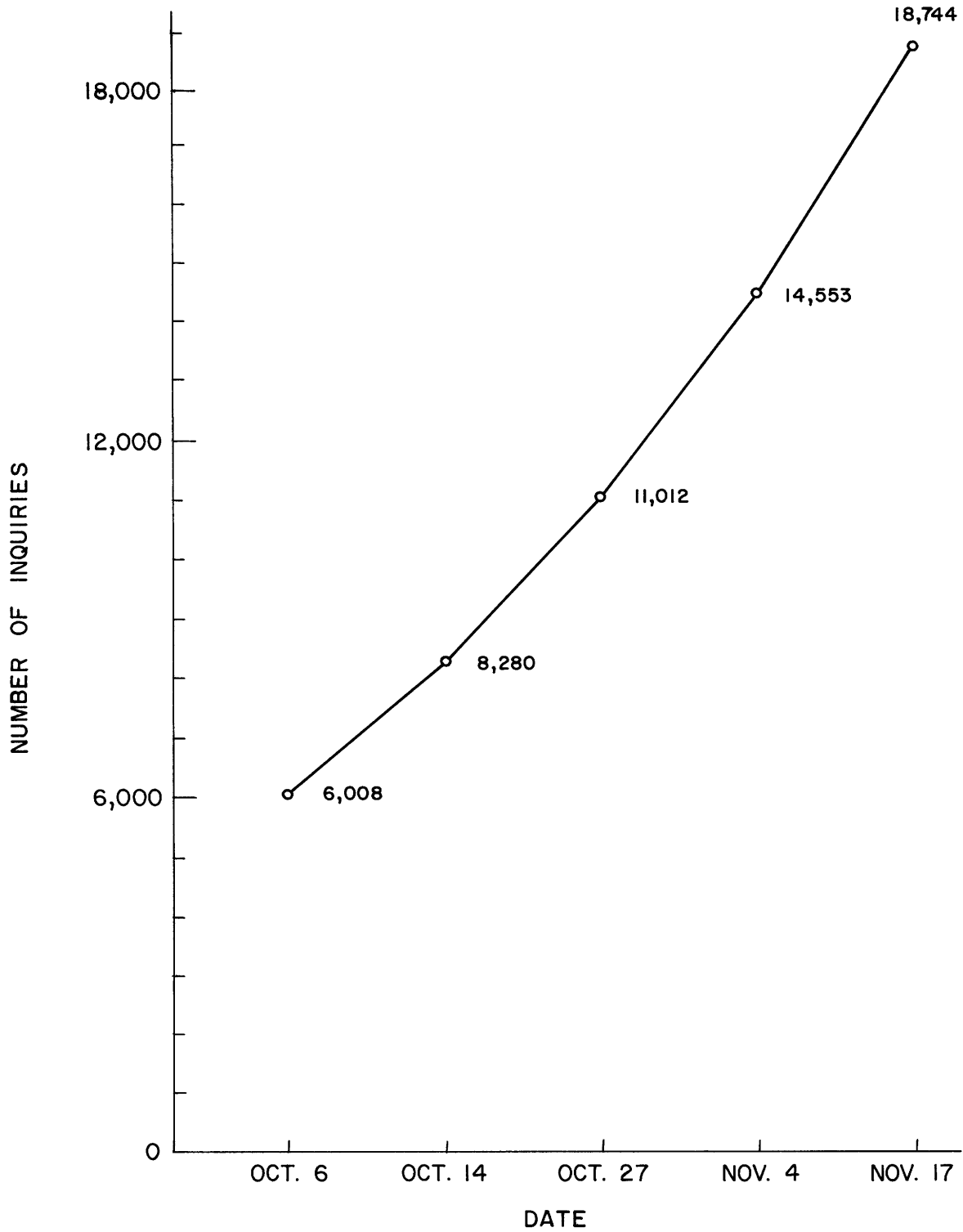


FIGURE IV - 4

made of the system each week has seemed to level off, increasing slightly from 18,000, but at a much slower rate.

One point of clarification should be made regarding these numbers, though. In the first part of 1971 the average number of inquiries made of the system was 33.2 per man per month. During the process of converting from the second generation to the third generation computer system, this average rate must have slipped. During the week of October 6, 1971 there were only 6,008 inquiries as mentioned earlier. If this rate of inquiry would have continued for an entire month there would only have been 12.5 inquiries per policeman per month, well below the average in the first part of 1971. By the week of November 18, 1971 the number of inquiries had climbed to 18,744 or calculated on a monthly average basis 38.9 inquiries per patrolman per month. Therefore, in order to really determine the rise achieved through the introduction of more advanced technology, the average inquiry rate as of November 11th, 38.9, should be compared not only with the average as of October 6th, 12.5, but with the average during the first part of 1971, 33.2. In that case, the rise from 33.2 inquiries/man/month to 38.9 inquiries/man/month, or a rise of 17.2%, is not nearly so dramatic. Still a 17.2% increase is significant, and it does demonstrate that benefits can be achieved through the use of improved technology.

SOME CONCLUDING THOUGHTS ON STRUCTURED COMPUTER APPLICATIONS

As we have seen, the primary benefits from structured police computer applications are technical ones as defined by Anthony Downs--technical improvements from better data inputs, processing, and outputs which bring such advantages as improved information, greater speed of processing, greater consistency of output, and wider distribution of data. From a benefit cost perspective, specific illustrations have been shown where these technical improvements have resulted in monetary returns which exceeded their costs, although the utility of such applications varies from police department to police department, and a number of organizational behavioral and technical factors influence the successful implementation of automation. It has even been shown that some structured applications--particularly applications for police patrol and inquiry--can improve the law enforcement capability of the police. If one is willing to measure improvements in police service to the public in terms of number of arrests, number of apprehensions, number of record checks, number of traffic tickets issued, etc., then we may say at this point that computer use can improve police service.

However, as discussed in Chapter I, there is still a great deal of question regarding what the task of the police should be. In the eyes of many, the emphasis should be on the enforcement of the law, and to them the indicators listed above are appropriate

measures of police activity. For others, though, the task of the police should be redirected from law enforcement to order maintenance and to carrying out such soft activities as improving relations with the community and serving as a social agent. To them the use of the indicators above fall short of being appropriate. To the extent that the use of the computer reinforces those indicators, then such technology may also have a similar biasing influence on the police. True, if the computer saves the policeman time in carrying out law enforcement activities, it is possible that he then will be able to spend the hours that have been freed working in non law enforcement functions. However, the fear is that additional time will not be used in this manner, but will simply serve to reinforce a direction which has already been overemphasized.

In other words, then, it is appropriate to say that the use of the computer in structured applications such as police patrol and inquiry improve police service as long as one believes that the service which the police are presently performing is the appropriate one. Computer applications may improve such services, but they do not change the basic assumptions upon which police departments operate. Whether or not they should and what their impact may ultimately be will be one of the subjects of Chapter VI.

CHAPTER V

AN EVALUATION OF UNSTRUCTURED APPLICATIONS:
THE USE OF THE COMPUTER AS A "THINKER"

Chapter IV has been devoted to a discussion and evaluation of computer use by the police in application areas which tend to be of a routine or structured nature. There is another group of computer applications, though, where use tends to be more complex. In this "unstructured" area attempts are made to use the machine as a tool for decision-making, strategic planning and for man-machine interaction. Examples of this type of application are computer resource allocation, criminal investigation, and police dispatch.

In the unstructured realm it is far more complex to program a response that will be appropriate to changing life situations. Each situation is slightly different and needs vary. The decision as to which police car to dispatch varies depending on type of crime, the location of available cars, and the street patterns between the incident and the car to be assigned. Programming a computer to recognize criminal patterns is a complex process requiring large amounts of background information. The allocation of police resources must be based on some formulation of criteria, but the appropriate criteria varies depending upon the aspects of the police

task chosen to be emphasized.

In order to computerize an unstructured problem, determining factors and alternatives must be made explicit and some value must be placed on each. An attempt must be made to so well define and simplify an unstructured situation so that it can be treated as a structured one. However, it must always be remembered that the situation still remains unstructured. In order to program the machine assumptions must be made, and naturally these assumptions will bias results. Further in unstructured areas such as allocating police resources, investigating crime and in dispatching patrolmen, there are a number of behavioral and organizational factors that must be considered. These factors will complicate the process of "structuring the unstructured", and in some cases it must be realized that every decision cannot be programmed, at least in the short run.

As this chapter will show, the use of the computer in such unstructured areas has sometimes fallen short of expectations. One of the reasons for this is "oversell". The state of the art as portrayed in the literature or in written reports is often more sophisticated than it is in real life. In other cases (and this really applies to practically all unstructured applications) experimentation is still underway, and it is still simply too early to tell what the actual benefits or ultimate potential might be.

Unstructured applications differ from more routine or

structured uses in the type of benefits they may have. Recalling from Chapter III, Anthony Downs distinguished between two types of payoffs, technical and power. Technical benefits were defined as improvements in the processing of data inputs and outputs, thus resulting in greater speed precision, consistency, wider distribution of information, etc. Power benefits refer to a redistribution of the advantages of decision-making, a shift in one person's decision-making effectiveness made at the expense of another's. With this in mind, the benefits of routine uses are primarily technical. Unstructured uses also provide technical payoffs- -for example, better information for investigating crime, distributing policemen, etc. However, there is a greater potential for unstructured applications to result in power payoffs than structured ones. Real-time systems result in rapid response and are widely accepted in police departments, but they do not alter the basic operations and decision processes of police organizations. On the other hand, new methods of allocating resources may have a much more significant impact by bringing greater control to the top levels of police organization. In fact, automated allocation tied to some advanced forms of computer aided dispatch which have been proposed could conceivably have a strong influence in altering the entire process of delivering police services if they ever come about. Such influences will not be felt immediately, but the potential is there.

One of the primary topics of Chapter VI will be to discuss the potential of these power payoffs. The remainder of this chapter

will be devoted to describing some of the unstructured computer applications underway in various police departments around the country and in making an initial evaluation. In particular, the chapter will deal with whether or not such applications really work, discuss how well they are accepted, explain some of the major problems and conflicts of their implementation, and evaluate the possibility of improved police efficiency (narrowly defined).

Applications to be examined will include criminal investigation, computer aided command and control, and police resource allocation.

THE COMPUTER AND CRIMINAL INVESTIGATION

The use of the computer for criminal investigation is a relatively new application. To date there has been little use in this area, but according to the ICMA survey this will change dramatically in the future. Only 3.8% of all computer applications reported in response to the ICMA questionnaire were in the area of criminal investigation. In fact, departments were given the opportunity to indicate if they had installed applications in any of three possible investigative areas--automated field interrogation reports, modus operandi files, or fingerprint files. Only 13.9% of the police departments reporting computer use indicated they had automated field interview reports, only 9% that they had any sort of modus operandi system, and only 4.9% that they had any

computerized fingerprint search capability.

However, according to estimates by these same departments as to applications that will be installed in the next three years, there will be a remarkable switch in the situation by 1974. 47.5% of the police departments surveyed predicted they will have automated field interview reports, 51.6% will have modus operandi capability, and 30.3% will have some type of fingerprint search system. (See Table V-1.) The overall increase in applications is particularly dramatic, a rise of 464.7%. The percentage of all computer applications being in the criminal investigation area will climb from 3.8% to 14.2%.

In the visits to police departments three general application areas related to investigation seemed to be most significant: field interview reports, modus operandi files, and applications to directly aid the process of detective work and the management of investigation. Each will be covered in turn.

AUTOMATED FIELD INTERVIEW REPORTS

Police use field interview reports (FIR's) as a means of collecting information on people or groups of people who are stopped and "interviewed" by policemen in the field. The idea is that this information may someday be helpful in locating a wanted subject by having access in the field interview report file to such information as his address, where he is employed, his habits and

TABLE V-1A
POLICE COMPUTER APPLICATIONS

Note: This table is identical with II-3A

Current Use - 1971		Future (Next Three Years)					
Application Area	No. of Depts. Reporting Computer Applications (A)	% of Total Computer Applications Reported	Average No. of Applications per Application Area (B = A/AT)	% of Total Applications Responding (B ÷ 122)†	Extent of Use in Depts. Based on Departments Responding	Future Reporting Applications by 1974 (C)	% Increase (C/A)
Police Patrol and Inquiry (AT* = 3)	180	19.9%	60	19.5%	49.2%	138	76.7%
Traffic (AT* = 3)	162	17.9%	54	17.5%	44.3%	151	93.2%
Miscellaneous Operations (AT* = 2)	40	4.4%	20	6.5%	16.4%	83	207.5%
Computer Aided Dispatch (AT* = 1)	10	1.1%	10	3.2%	8.2%	61	610.0%
Criminal Investigation (AT* = 3)	34	3.8%	11.3	3.7%	9.3%	158	464.7%
Crime Statistical Files (AT* = 3)	177	19.5%	59	19.1%	48.4%	203	114.7%
Police Administration (AT* = 5)	192	21.2%	38.4	12.5%	31.5%	191	99.5%
Resource Allocation (AT* = 2)	111	12.2%	55.5	18.0%	45.5%	131	118.0%
TOTAL	906	100.0%	308.2	100.0%		1116	123.2%

*AT = Number of application types.

†Average number of applications per application area (B)/122 (the number of departments responding to this part of the questionnaire).

TABLE V-1B

Note: This table is identical
with II-3B

POLICE COMPUTER APPLICATIONS (Total Use by 1974)

Application Area	Total Use by 1974				Extent of Expected Use in Depts. Based on Depts. Responding (E ÷ 122)
	Total Number of Departments Using Computer by 1974 (D) (Total A+C)	% of Total Applications Expected by 1974	Average Number of Applications Per Application Area (E) (E = D/AT)	% of Total Average Number of Applications Expected (% of Total E)	
Police Patrol and Inquiry (AT* = 3)	318	15.7%	106	14.5%	86.9%
Traffic (AT* = 3)	313	15.5	104.3	14.3	85.5
Miscellaneous Operations (AT* = 2)	123	6.1	61.5	8.4	50.4
Computer Aided Dispatch (AT* = 1)	71	3.5	71	9.7	58.2
Criminal Investigation (AT* = 3)	192	9.5	64	8.8	52.5
Crime Statistical Files (AT* = 3)	380	18.8	126.6	17.3	100.0
Police Administration (AT* = 5)	383	18.9	76.6	10.5	62.8
Resource Allocation (AT* = 2)	<u>242</u>	<u>12.0</u>	<u>121</u>	<u>16.5</u>	99.2
TOTAL	2022	100.0%	731.0	100.0%	

201.

*AT = number of application types.

his associates.

When a policeman is on patrol, he may stop a person or a group of people behaving suspiciously or suspected of committing a crime. After talking to them the officer may decide not to make an arrest. Nevertheless, he will fill out a field interview report with as much information as possible to indicate that a particular person was in the area, what he was doing, etc. This report is often on a card with multiple parts. Under a manual system one copy is usually filed at the local police station and other copies are sent to the central headquarters. If it is later learned that a crime was committed in that same area at around the same time, this person or group of persons will become possible suspects, particularly if a description matches or if they have a previous record indicating a tendency towards the type of crime committed. Such field interview report files have been automated in order to provide far more rapid retrieval and for inquiry based on a wide variety of variables.

In the site visits it was found that both St. Louis and Los Angeles have automated field interview report (FIR) systems, and both departments seemed to be well satisfied. For example, St. Louis's system became operational March 4, 1968. Prior to the use of automated file the department had utilized a 5 x 8 three-part form prepared by the officer in the field. One copy was filed in the local section and the other two were taken to the central office where one was filed according to the location where the

interview was held and the other alphabetically. In essence there were only two ways to access the file, by name and by location. With the automated system forms are filled out in the field and then sent to the Department Data Processing Division to be checked for completeness, coded, keypunched, and entered into the automated file. Whereas there were only two ways to access the FIR file under the manual system, name and location, now there are many. For example, such items as name, geographic area by either block or larger region, age, height, physical description, striking features, clothing attire, etc., can all be used as indicators to query the file. A disk file is used to keep the most current three months of information for immediate access, and after three months, field interview reports are removed from the disk file and placed on magnetic tape. Access to the disk file is on a real-time basis with terminals in each of the precinct police stations to use for inquiry. If an officer wishes to query the older FIR's on magnetic tape, he may initiate a background check.

Initial success seems to be an important factor in helping to stimulate widespread use of the FIR file. In St. Louis, the Homicide Division of the police department highly praised the computer on the grounds that it had helped tremendously in performing their investigative work, particularly through the use of the FIR file. The lieutenant in charge of the Homicide Division reported that prior to their first success, they were really

uninterested in the computer. However, soon after the FIR file was automated an elderly lady was murdered during the evening. As the criminal was leaving the premises, her son came into the house and caught a glimpse of a man with an army jacket slipping away. After several weeks of investigation, every clue seemed to disappear. Finally, they decided to check the FIR file, with the only indicator for inquiry being the description of a man in an army jacket. As luck would have it, a field interview report had been taken from a man in an army jacket in the same area several nights before. With nothing else to go on, they decided to check it out, and gradually things began to fall into place. Eventually, after several months of investigation, the man who had been in the area admitted to the crime. To the detectives in the Homicide Division this was a real indication that the FIR file could help them in their work. Naturally, every case did not work so smoothly, but the automated file had provided them with a place to go to look for clues when all else had failed.

A somewhat similar situation was found to be the case in Los Angeles. An interview with one of the detectives responsible for establishing the department's on-line AFI file (Automated Field Interview file) indicated that the initial proposal to establish the system was not approved immediately by the administration in the department. Only after several attempts was the system finally approved. Further, once the system was established, better than ninety days passed without any positive results.

People began to wonder whether it would work or not. Finally, the automated field interview file was instrumental in providing the lead in solving a "bank job". From then on, the use and credibility of the system increased. In his estimation and in the estimation of several Los Angeles police officers, the AFI had exceeded their initial hopes and expectations. Once a reservoir of information was established, regular "hits" became the rule rather than the exception.

MODUS OPERANDI FILES

Modus operandi files are related to field interview reports, but they are far more intricate and complex. The basic idea is that when people perform crimes time and again they will often follow the same pattern of behavior. They will break in a window the same way, will steal only certain items, etc. If the characteristics of various crimes committed can be recorded in an automated file, it may be possible to ask the computer to search for common patterns. If such patterns are discovered, crimes may be linked to the same person or the same group of persons, and additional clues may be gathered. If a certain pattern of crimes begins to occur, that pattern may be traced to see if it had appeared before. If so, the same person may be responsible for the current outbreak who was arrested a few years earlier for a similar set of offenses. Further, if a person admits to one

crime, a modus operandi file may be utilized to see if there were any similar crimes committed earlier in different locations. When presented with the appropriate dates and places, the suspect may admit to additional infractions, thus providing the means for clearing unsolved cases.

In the law enforcement community there is some disagreement over the potential of such automated modus operandi systems. A number of people are skeptical, at least at the present time. For example, one official of the Law Enforcement Assistance Administration who was interviewed after spending several months traveling to various state and local police departments to examine computer systems, was generally pessimistic regarding such computer use. Based on his experiences, the efforts which had been attempted so far had been underway for several years, but very few results had been achieved. Naturally, it takes several years to build up a necessary backlog of information, but even then, the subtleties and intricacies are so great that to go beyond the obvious is difficult. Certain kinds of crimes seem to attract similar behavior, for example, sex offenders. However, the recognition of these patterns is usually fairly simple, certainly not requiring a computer.

The only police department visited that had modus operandi files in operation was Los Angeles. The Los Angeles Police Department (LAPD) have been working on their PATRIC System (Pattern Recognition and Information Correlation) for a number of years,

but real testing and experimentation just began in 1971. Working with a consultant, they had just started to test the system on an experimental basis at the time of the site visit for this paper. The basic purpose of the system is to provide tactical information derived from crime and crime-related reports for use by the investigative and patrol personnel of the department.

"The basic information within PATRIC will include: the suspects and their trademarks; the premises attached; weapons used; the date, time, and day of week; and the suspect's physical description; personal oddities; and any vehicle descriptions. PATRIC will correlate these crime-event components to isolate crimes which seem to be committed by one person, then list potential suspects. Planned comparisons of the description of stolen property records with pawn shop records will also bolster the Department's capability to recover and return stolen property."¹

Most people within the Los Angeles police department were enthusiastic towards the PATRIC system. In fact, the civilian director of the Los Angeles Data Service Bureau, perhaps one of the best municipal computer operations in the country, felt that the PATRIC system in the long run had a greater potential for impact on the way police operations are performed than any of the other computer operations which were currently being installed. Since the evidence is still not in, only time will show whether or not his feelings are valid.

¹ LAPD and Computers, publication produced by the Los Angeles Police Department, Advanced Systems Development Section, Advanced Planning Division, 1970-71, p. 31.

COMPUTER USE FOR DETECTIVE WORK AND THE MANAGEMENT OF CRIMINAL INVESTIGATION

As indicated earlier, greater emphasis will be placed on the use of the computer for criminal investigation over the next few years. However, Tulsa, Oklahoma is an illustration of a police department that is already putting primary stress on criminal investigation computer applications. In an interview with the police lieutenant responsible for data processing in the department, he made it clear that one of the department's main focuses was to develop a real-time, on-line system to aid police investigators so that the detective could sit down at a video terminal and have rapid inquiry and access to past arrest records, field interviews, current records of stolen property, crime patterns, etc. In keeping with this emphasis, when the Captain of the Detective Division was asked what he felt the greatest impact of the computer would be, he replied without hesitation, "as an investigative aid."

Many of the applications in Tulsa are still being designed and/or implemented, so it is too early to determine what the outcome of their focus will be. Still, it is interesting to briefly describe some of their proposed applications. First, they have already transferred to a complete microfilm system for keeping their basic arrest records. Hard copies of reports are maintained for some time before being destroyed, but primarily for court and short term transitional purposes. If a detective is interested

in examining an arrest record in the future, he will utilize a microfilm machine with search capability operated from various remote locations. Records from within the microfilm system will be displayed on video terminals, and if hard copies are desired, they can be made. The eventual idea will be to use these microfilm records along with the computer in order to provide a very valuable technological aid to the investigative function. At the time of the site visit, arrest records dating back to 1913 were being coded and keypunched in order to be placed in the computer file, so that the investigator would have rapid access to their contents based on a number of different retrieval parameters. Perhaps going back to 1913 is too much due to excessive time and dollars expended, but the basic idea is to provide a valuable data base of information which can be made available for rapid inquiry and search. With this system implemented, search will not only be along narrow lines as to whether a particular car has been stolen or if a particular person has an outstanding warrant. Instead, this would provide for a search of an investigative nature and would include such inquiry as to whether a person was accompanied by associates when arrested, whether those associates had a previous criminal record, and whether a male with dark hair and a scar above his left eye had been arrested in the south part of town within the last six months, etc. Just as the computer now has been designed in a number of cities to provide rapid inquiry to aid the man in the street, efforts are being made in Tulsa to design the

system so it will have a main benefit for police investigation.

Long Beach, California is another city where thought is being given to use of the computer for police investigation. There it is envisioned that automation may eventually change the whole way cases for investigation are assigned and followed up on. Both the lieutenant in charge of the detective division and a sergeant in the research and planning department who was very heavily involved in the computer operations in the department referred to the fact that it was their eventual goal for cases to be assigned to investigators through the use of the computer. The idea was that all available information regarding the case would be placed into the machine. Then based on the nature of the crime, the probability of solution, and the current workload within the department, priorities would be assigned, and specific cases would be allocated to each detective. Also, it might be possible to have a tentative number of hours assigned for a preliminary investigation. If nothing was turned up within that time, then active pursuit would be dropped. To some this may sound a bit extreme, but to the head of the detective division it provided hope that someday the means would be available for "assigning cases on a truly professional basis". Currently, detectives have to decide themselves which cases will receive priority. A number are followed upon primarily for political reasons. Use of the computer would provide a management tool for criminal investigation that would "allow us to tell others just exactly what

we were doing and why". In a paper prepared by Sergeant J. E. Lance and C. N. Lloyd, "Proposed Investigative Information System"² a flow chart comparison is made between the existing investigative process and the one which they propose using a computerized information system. The differences are shown between Figures V-1 and V-2.

Although the Long Beach Police Department had no actual plans to automate the process of allocating criminal investigation cases, efforts were underway to provide an effective automated field interview system which would tie into former arrest records and to provide rapid inquiry access to information in traffic citation files as a means of investigative support. (In other words, if the location of a man by the name of John P. Jones was desired, past traffic citations would be searched to see if a John P. Jones had ever received such a ticket, and if so what type of a car had he been driving and what was his address at the time.) Such improvements should be fully implemented within the next few years, and then perhaps more dramatic innovations will be made.

In conclusion, then, a number of ideas have been proposed and are being developed to use the computer as a tool for criminal investigation in the future. However, any sort of an evaluation of the efforts so far is almost impossible since most of them are still in conceptualization or experimental stages. Field interview

²Paper prepared by C. N. Lloyd and J. E. Lance for a university course which they had taken.

EXISTING INVESTIGATIVE PROCESS

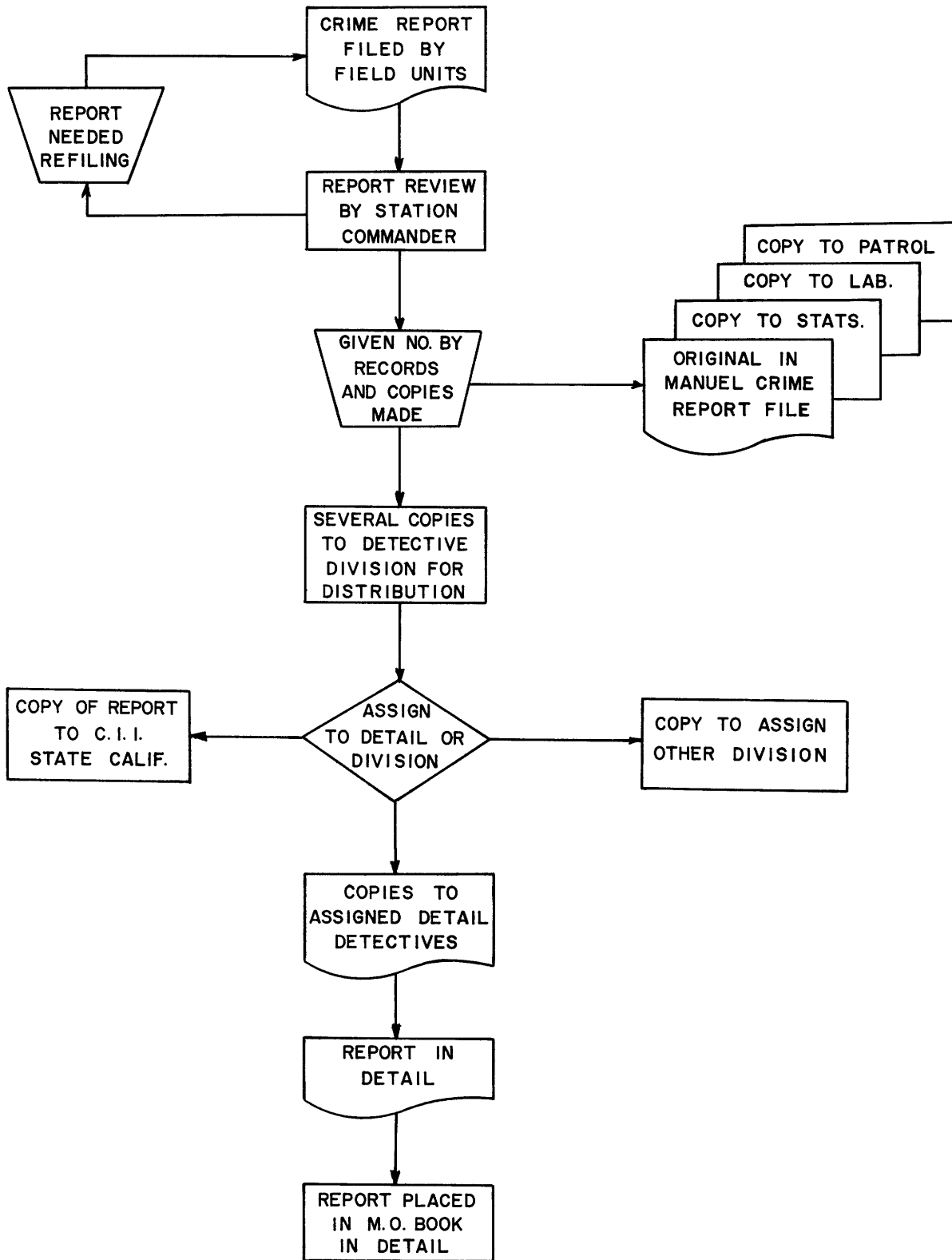


FIGURE V - 1

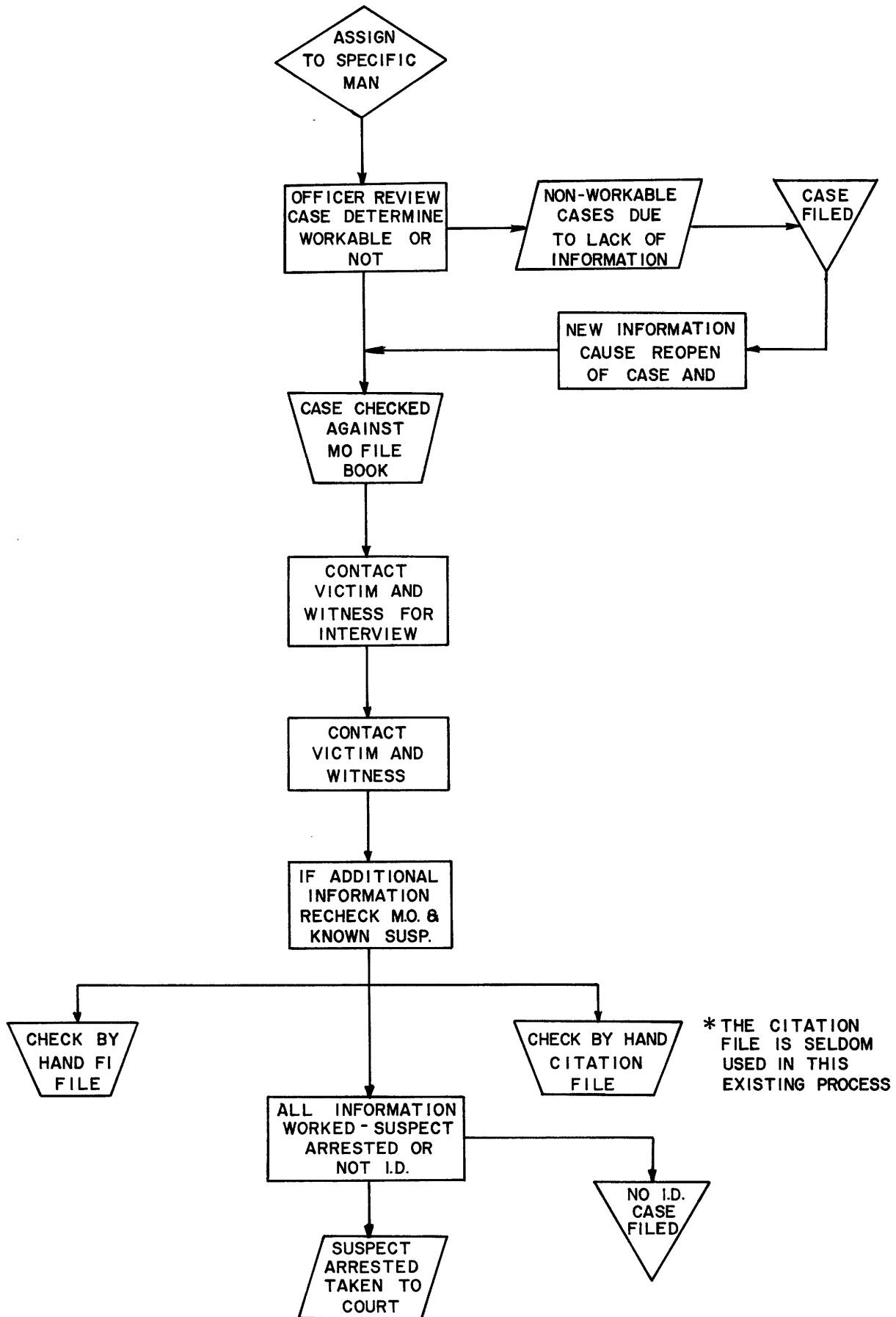


FIGURE V-1 (con't.)

PROPOSED INVESTIGATIVE INFORMATION SYSTEM

PART I

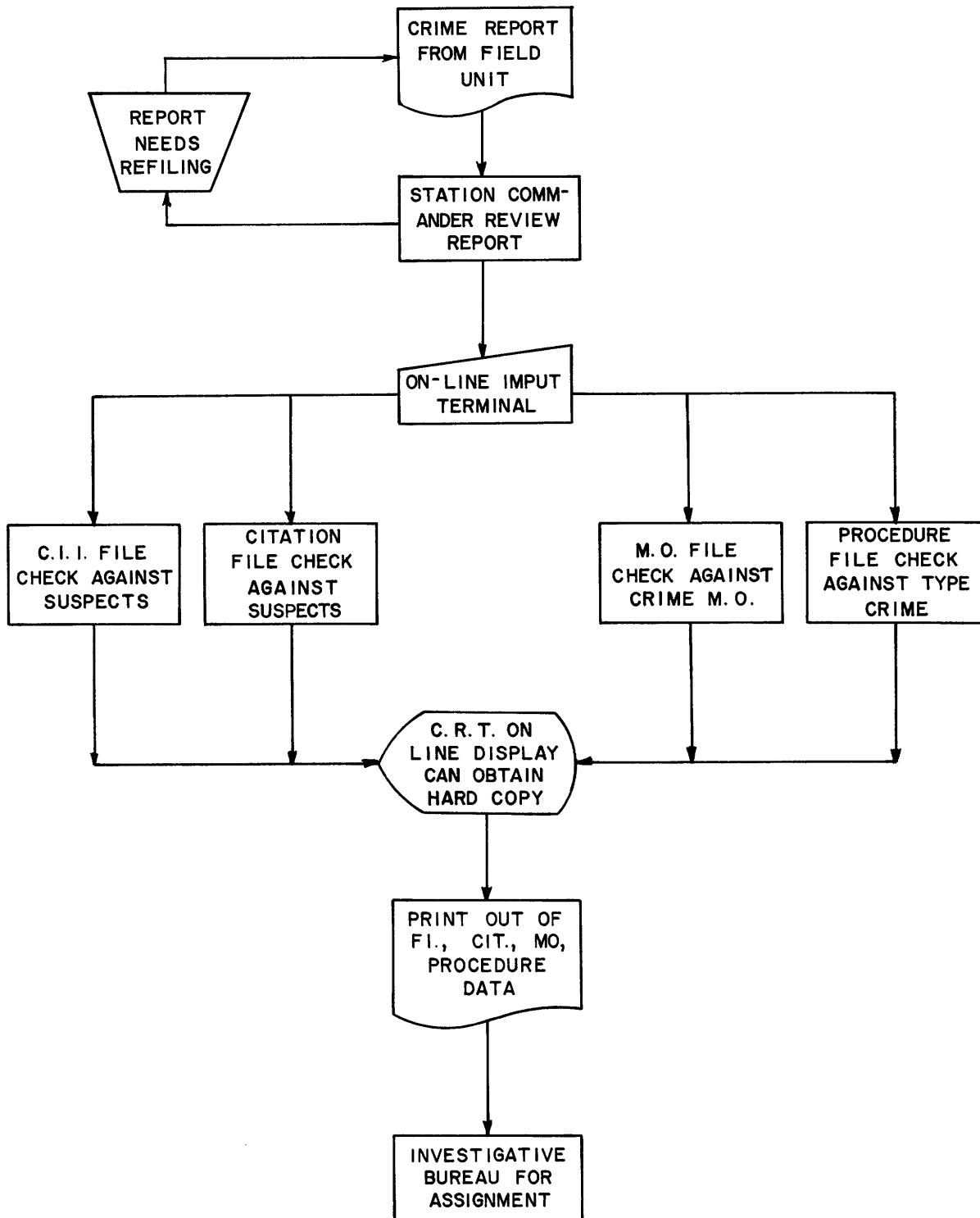


FIGURE V - 2

PART II

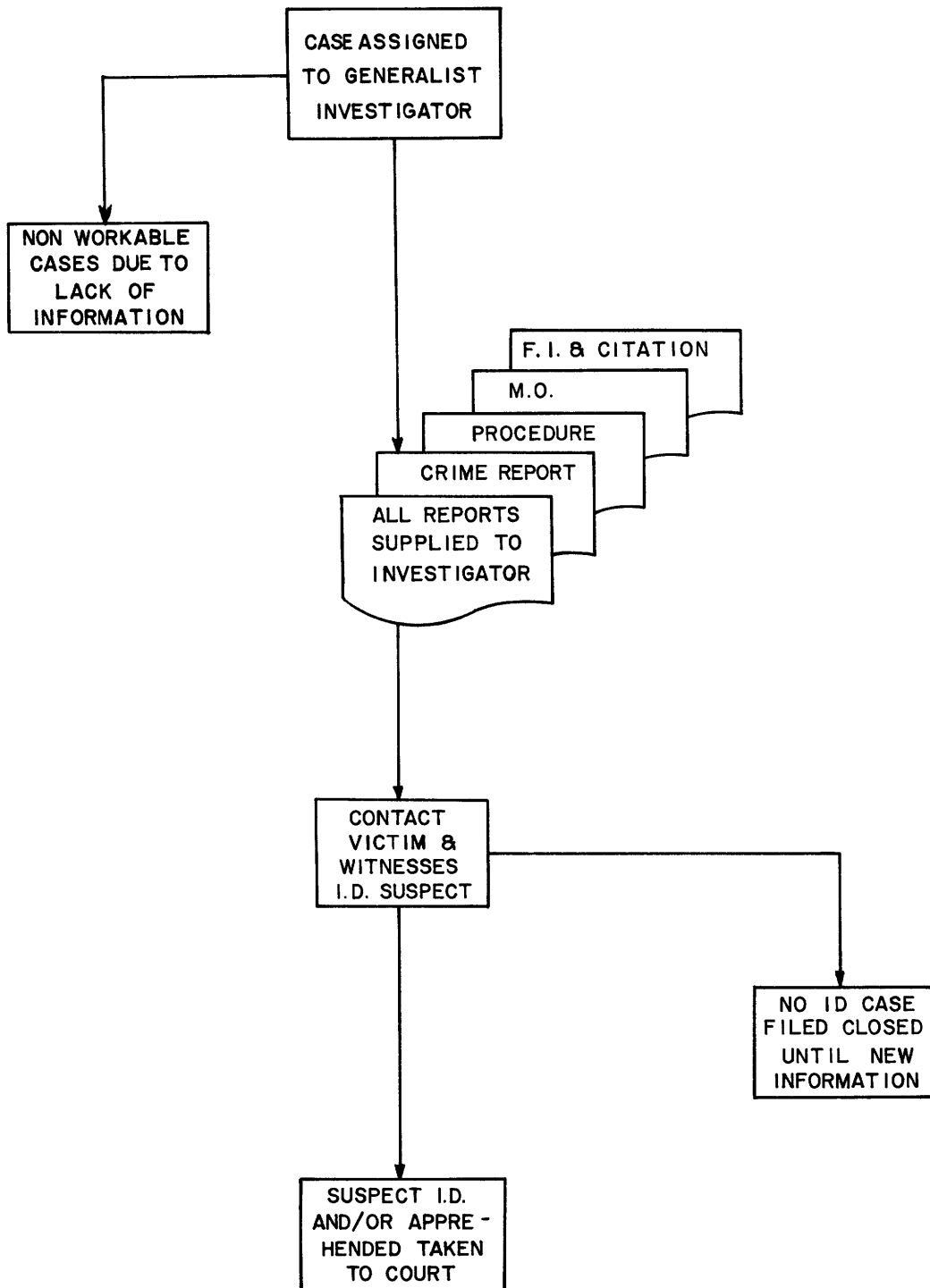


FIGURE V - 2 (cont.)

reports have received fairly wide use and in general are reported to be quite effective. Still, their application is really fairly routine, particularly compared to some of the more "innovative" ideas which are proposed. In general, this author is skeptical about the use of the computer for modus operandi activities, at least in the near future. However, other investigative uses such as applications for more widespread investigative search (as in Tulsa), and uses for administration and control seem well on their way, and it seems that the potential exists for the computer to have a fairly major impact in the area of criminal investigation, although it is still five or ten years in the future.

COMPUTER AIDED DISPATCH FOR COMMAND AND CONTROL

The term command and control stems from military terminology and stands for the planning, direction and control of operations. In the context of police work, the term applies to the process of identifying required service (either through citizen calls or through detection by a policeman) and in allocating and dispatching patrol officers to respond. In the broad sense, the term applies not only to controlling and directing current operations, but to planning for future operational needs as well. The computer has been identified as a possible tool to aid in the command and control process and in dispatching policemen to respond to calls for service. This section of the paper will

introduce some of the applications which have been started in this area and will discuss some of the primary considerations which such computer uses raise. However, it first seems appropriate to briefly elaborate on the present command and control operation of the police and how this relates to the basic process of apprehending suspects.

The apprehension process can be viewed as a sequence of actions which are taken in response to the supposed commission of a crime:³

- (1) The crime is detected either by a policeman, a patrol, an alarm device, and/or a victim or another citizen.
- (2) Information about the crime is communicated to the police, usually by telephone, or if the crime is spotted by a policeman the information is transmitted via radio to central communications center.
- (3) An appropriate police response (e.g., choosing a patrol car to send to the scene, or sending additional cars) is selected.
- (4) The assignment or "dispatch order" is communicated to the patrol force, usually by voice radio.
- (5) The appropriate patrol cars travel to the scene.
- (6) A search is conducted for the perpetrator of the crime (either a "hot" search at the crime scene, a "warm" search in the general vicinity of the crime, or a "cold" investigative search by officers or plainclothes investigators).

³ For a similar listing of the steps involved in the apprehension process, see Task Force Report: The Police, The President's Commission on Law Enforcement and Administration of Justice, U.S. Government Printing Office, Washington, D.C., 1967, p. 58. The listing in this paper does not follow the one in the task force report exactly, but it is similar.

- (7) Throughout the search, suspects appear and have to be checked out.
- (8) If the search is successful, the criminal is captured and evidence to support a charge is assembled.

This sequential process is depicted graphically in Figure V-3.

The current police command and control operations relate closely to this apprehension process. In most police departments, the focal point is a central communications center. Here citizen calls are received usually by a complaint clerk who answers phone calls in the order which they come in. If the clerk decides that a car should be dispatched, he writes the information down on a complaint card (often an IBM card designed to be keypunched later for data processing purposes), and sends it on to the dispatcher. Some method usually exists to indicate real emergency cases, and often the dispatcher is advised directly by switching him into the telephone conversation (although this happens only on rare occasions). The dispatcher then determines which car to assign, dealing first with those cases where some indication of high priority has been placed on the dispatch card. In making such an assignment the dispatcher must determine the precise location of the call, the status of patrol cars in the vicinity, and the actual location of these cars (under current technology the dispatcher knows the beat to which a car is assigned- -generally a radius of 1 to 4 miles- -but he does not know where within the assigned beat the car is located or if the car is actually even within that beat at that moment). Since the dispatcher doesn't know the

THE APPREHENSION PROCESS

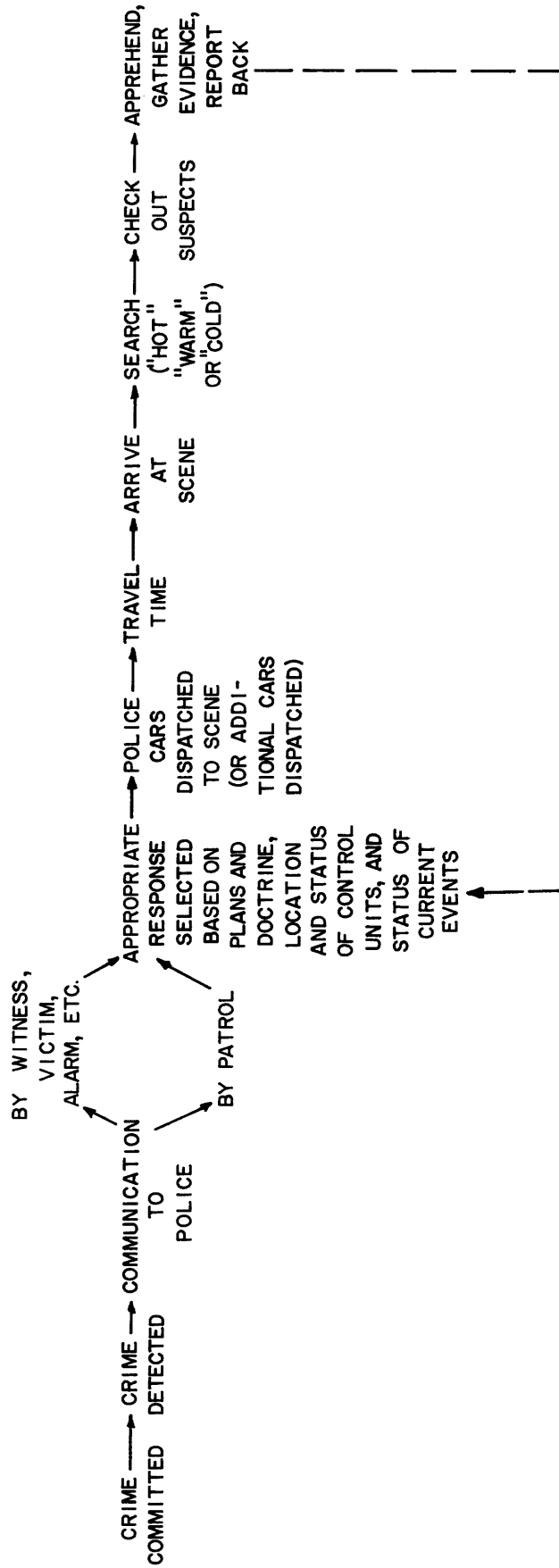


FIGURE V - 3

precise location of each car, in an emergency situation, the call may be broadcast to all units so that all those within a suitable distance will go to the announced call, thus providing a method of bringing the closest car to the call as quickly as possible. However, the result is often to also divert additional cars unnecessarily. Once the dispatch order is acknowledged by a car in the field, the dispatcher will time-stamp the card and update the status board, often by simply placing the dispatch card in the appropriate slot in the "active call tray".

Realizing that a number of variations exist in each department to the operations of the communications center described above, it is still clear that a number of problems exist in current police command and control operations:

- A great deal of information flows through the information center, but it is difficult to rapidly retrieve this information when it is needed.
- The location (and sometimes status) of cars is only crudely identified.
- It takes time to process a call through the communications center; the delay caused can be significant. (For example, the President's Commission on Law Enforcement and Administration of Justice studied the response time to calls for service in the city of Los Angeles. It was found that it took 1.5 minutes for a priority call and 5.9 minutes for a nonpriority call to be processed through the communications center. It was further found that patrol cars take an average of 3.8 and 6.8 minutes to reach the scene of priority and nonpriority calls, respectively. Thus, the communication center accounts for 28.3% to 46.7% of the time involved between when the police receive a call and and actual response arrives at the scene.)⁴

⁴Task Force Report: Science and Technology, The President's

- Radio spectrum congestion problems exist in most large cities.

- Great variability of command and control is found between police departments, no guidelines for improvement exist, and little or no research to obtain such guidelines to design and operate a communications center seems to be underway.

As a result of these problems suggestions for computer applications to help provide aid in this command and control process of assigning and dispatching cars have been favorably received by many people in the law enforcement community. Based on a preliminary examination, the President's Commission on Law Enforcement and Administration of Justice recommended that "an experimental program to develop a computer-assisted command-and-control system should be established with Federal support."⁵

The commission also reported on a preliminary survey of over 4,700 calls for service in Los Angeles. In that study it was found that of 1,905 crimes examined 482 (25% resulted in arrests or other clearances with 50% of the 482 actually involving arrests. More than half of these arrests were made within eight hours of the crime, and almost two-thirds within the first week. Further, if an arrest was not made at the scene of the crime, it was found that identification of the suspect at the scene was almost essential to making an arrest. "Of the 482 cleared cases

Commission on Law Enforcement and Administration of Justice, U.S. Government Printing Office, Washington, D.C., 1967, p. 22.

⁵Task Force Report: The Police, Op.Cit., p. 28.

63 percent involved 'named suspects'. In the 1,556 cases without named suspects, only 181 (or 12 percent) were solved later by arrest."⁶ The Commission concluded that although additional studies were needed to establish the relationship between response time and apprehension rate, the data from the survey seemed to indicate that response time was an important factor in apprehension. Thus, the use of the computer to help speed this response time was recommended.⁷

Answers by police departments to the questionnaire sent out by the ICMA indicate that a significant increase in such computer application will occur in the next three years. In 1971, 10 of 122 police departments or 8.2% indicated that they had some form of computer aided dispatch. According to police department estimates, by 1974 this number will rise to 61, an increase of 610%. Although it is difficult to interpret this

⁶ Task Force Report: The Police, Op. Cit., p. 58.

⁷ See also, Task Force Report: Science and Technology, Op. cit., p. 93. After comparing data relating overall response time in minutes to percent of arrests, the report made the following statement of conclusion: "while this evidence does not imply that faster response time will result in more arrests, (only a controlled experiment designed specifically to test this hypothesis would be conclusive proof) it does appear to support the view and tends to reinforce our intuition about rapid response time being significant in police effectiveness. The results of this analysis seem to imply that both communication center delay and field response delay should be minimized."

prediction exactly since no precise definition was given in the survey of "computer aided dispatch", it does clearly indicate that the use of the computer in the command and control operations of the police is on the rise.

However, just because police departments indicate a growing use of computer aided command and control, it does mean that the potential and impact of such applications is all positive. First, response time is the sum of the times for all of the factors in the apprehension process illustrated in Figure V-3. Although the data obtained by the President's Commission indicated that processing time in the communications center accounted for 28.3% to 46.7% of the time involved once a call was received by the police, it must be remembered that time is also involved in detecting a crime and reporting it to the police. This means that dispatch time is only one part of overall response time. To automate this dispatch process will result in a number of both monetary and behavioral costs. Whether the benefits really justify this cost still remains to be seen, particularly until the relationship between response time and apprehension rate is more fully established. Further, automated dispatching does not automatically result in more rapid response time. In fact, in at least one city, Tulsa, just the opposite is predicted (see the discussion which follows). Finally, before an ultimate conclusion can be reached regarding the actual utility of computerized command and control, a number of technical and behavioral issues

must be resolved. Sometimes there is a tendency to introduce technology just because the mechanical capability to do so seems to exist. In the view of this author, this temptation should be resisted, particularly when it comes to accepting computer aided dispatching as being an a priori good.

SOME ILLUSTRATIONS OF COMPUTER AIDED COMMAND AND CONTROL

Based on both the site visits and the literature, there seems to be a wide spectrum in the actual applications and proposals which exist for various computer aided command and control systems. The range varies from systems which simply keep track of and provide rapid recall for various decisions which are still made by a human dispatcher, to systems designed to mechanically track the location of each patrol vehicle and to entirely automate the dispatch operation. Examples will be drawn from the site visits of proposals at various points along the spectrum. It should be made clear at the outset, though, that although a quick review of the literature might at first glance indicate that progress was farther along, practically all such applications in the United States are still in the conceptual, experimental, or developmental stages.

The "Conservative" End of the Spectrum. Perhaps the best illustration from the site visits at the more conservative end of the spectrum (as opposed to the fully automated, "space age"

end), is the system which is currently being established in the Tulsa police department. The system is known as TULCAD (Tulsa Computer Assisted Dispatching). Its objective is "to improve the effectiveness of law enforcement by providing a centralized and integrated information center for the deployment and control of police manpower and vehicles."⁸

The system will operate in the following manner. A call for service will be received and if a response seems warranted, it will be passed on to the dispatcher. The dispatcher in turn will have a computer video terminal in front of him. He will type in the complaint address on the terminal and will enter this and other necessary data into the computer. Based on a geocoding system or "map in the mind of the computer", the computer will look up the location of the complaint and will determine which patrol car beat is the closest. It will then indicate the prime unit to be assigned to respond to the call, and the four best alternative possibilities. The system does not have a mechanical car locator; therefore, the computer will simply choose the prime candidate for dispatch by looking for the car from the closest beat where a car is available. The four best alternatives will be determined in a similar manner. The dispatcher will then assign a car, either following the "recommendation" of the computer or making a selection of his own. Once the car

⁸ TULCAD System Design, prepared by the Police Department and the Management Planning and Systems Division of the city of Tulsa, March 24, 1971, p. 1.

has been dispatched, he will type the number of the unit assigned to the complaint on the terminal, thus putting that vehicle in an unavailable status. At the same time the computer will automatically assign a complaint number, a number that will remain with the case permanently. When the call has been completed, the dispatcher will make a status change on the vehicle. Naturally, if at any time the dispatcher desires to retrieve any information regarding the status of a particular car, the length of time a car has been on call, the type of complaint, etc., such a request can be made with immediate response.

The system also has several interesting safety features for the patrolman in the field. For example, if a patrolman sees a crime and gets out of his car in pursuit, the dispatcher can "key" a "26" on the terminal which will start an automatic timer in the computer. If the patrolman is too long, a message will come back on the video display reminding the dispatcher to check on the officer, and if necessary, to assign another vehicle to survey the situation.

The TULCAD system will provide great benefits to the police department and its men in the form of extensive information for analysis, reporting, investigation, etc. Further, the entry of data by the dispatcher will serve as the initial point of data entry into the police department's automated record files. In other words, dispatch cards will no longer need to be key-punched.

However, it is interesting to note that the department has also discovered that on the average it will probably take slightly longer to dispatch a car using the new automated system than it does utilizing their current manual system because of the time required to input all the pertinent data before a response can be obtained. Tremendous gains will be made in terms of new information available, safety, convenience, etc., but compromises must also be accepted, particularly when considering that the primary reason which is usually cited for computer aided dispatch is to speed the process of dispatching patrol cars to a given call.

It also should be remembered that in implementing applications such as this, a great deal of time and work is involved, and efforts often lag far behind initial hopes and expectations. For example, the Boston Police Department was one of the first police departments in the nation to point to the need of some type of automated command and control system. In 1968 a document was published by the Boston Police Department and the Office of Law Enforcement Assistance in the Department of Justice reporting on the first phase of a longer-run "analysis and action" program on the information needs of the department.⁹ Among other things the report mentions that some system is required to handle complaints and to aid in the dispatch process. The report goes

⁹ The publication was entitled "Reports, Records and Communications in the Boston Police Department; A System Improvement Study", and it reported on the initial phase of the study which was funded in 1965 and was completed in 1967.

on to recommend some type of command and control system. "It is now technically feasible to make a command and control system for police field operations which will: allow the dispatcher to see at a glance the status of car operations in any District; allow District supervisory personnel to know what its cars are doing; provide data on daily operations in a machine-useable form for the preparation of daily operational statistics; provide the basis for a District control log to be prepared at Headquarters for transmission to the Districts; and provide the machine-useable data base for a name and location index."¹⁰

Interestingly enough, this very report was mentioned as one of the initial stimulants to the Tulsa Police Department in getting them started with some sort of command and control system. The efforts in Boston were also referred to by police personnel during the site visit to the Denver Police Department.

However, even though work in Boston to establish the command and control system began shortly thereafter and has been underway for more than three years, the system still seems to be some distance away from becoming operational. When site visits were being conducted in the spring of 1971, a prototype of the

¹⁰ "Reports, Records and Communications in the Boston Police Department: A System Improvement Study", by the Boston Police Department, assisted by Arthur D. Little, Incorporated, LEAA Project Report, Office of Law Enforcement Assistance, U.S. Department of Justice, Washington, D.C., May, 1968, p. 17.

system was to be up and running at any moment. By January 1972, the prototype was working, but the system itself was not operational and would not be for about another year according to police department estimates. With the delays that have occurred in the past, though, even the estimate to be operational within the year may still be an optimistic one.

This is not to belittle the work that has been done by the Boston Police Department. (Severe contractual difficulties have particularly hampered progress in this instance.) It is simply to point out that such computer efforts take time, problems inevitably occur, and efforts often lag far behind initial time estimates and expectations. The reasons are usually a combination of technical, behavioral and institutional factors, and they are particularly prevalent in the establishment of unstructured applications such as in the area of command and control. Not only do systems have to be designed to react with speed and precision without technical flaw, but police personnel both in the communications center and in the field must be satisfied and successfully retrained in order to avoid obstructive resistance. All this takes time, and naturally in some departments, the process and resistance is more difficult than in others.

The Middle Range of the Command and Control Spectrum. Efforts which are underway in two police departments will serve to illustrate the middle range of the command and control spectrum: (1) planning

and development efforts which are underway in the Oakland, California Police Department and (2) a system which is in operation in Dorchester, England. (There are undoubtedly other illustrations, and perhaps some which are better than these, but unfortunately, the author is not aware of them.)

The basic purpose of the system in Oakland is to provide the means whereby a police unit can be directed to a desired location as quickly as possible when a call for service has been received. In the view of the Oakland Police Department, the speed with which a unit will arrive at the scene depends upon its location relative to the location of the call. The travel time will be a function, at least in part, of the distance between the car and the place of the call. Therefore, they have devised a system to aid them in keeping track of the more precise location of their patrol vehicles. Then, when a car has to be dispatched, instead of trying to assign the car patrolling in the closest beat (a method which pinpoints the location of an available car in Oakland only to within a one to five mile traveling distance of any point within the beat), they will have each car more accurately located and will assign the closest one.

The system is known as LOCATE (Location of Oakland Cars via Telecommunications), and it is based on a map-like car locator device known as digimap. Digimap is a vehicle location sensor with a pressure-sensitive map of portions of the city of Oakland. A digimap corresponding to the area in which that vehicle usually

patrols is placed in each car. As a policeman travels around within his beat, he presses that portion of the map where he is located, thus indicating to the central communications center where he is at at any point in time. Typically the location of a vehicle can be determined within 500 feet if the area covered by the map in the vehicle is less than or equal to 5 square miles (2.0 miles by 2.5 miles). Maps in downtown areas may be larger scale (covering, for example, 1 mile by 1.25 miles) to gain greater detail; whereas maps in more rural areas may be on a smaller scale (covering, for example, 4 miles by 5 miles) where high resolution is not required and normal patrol beats are larger.

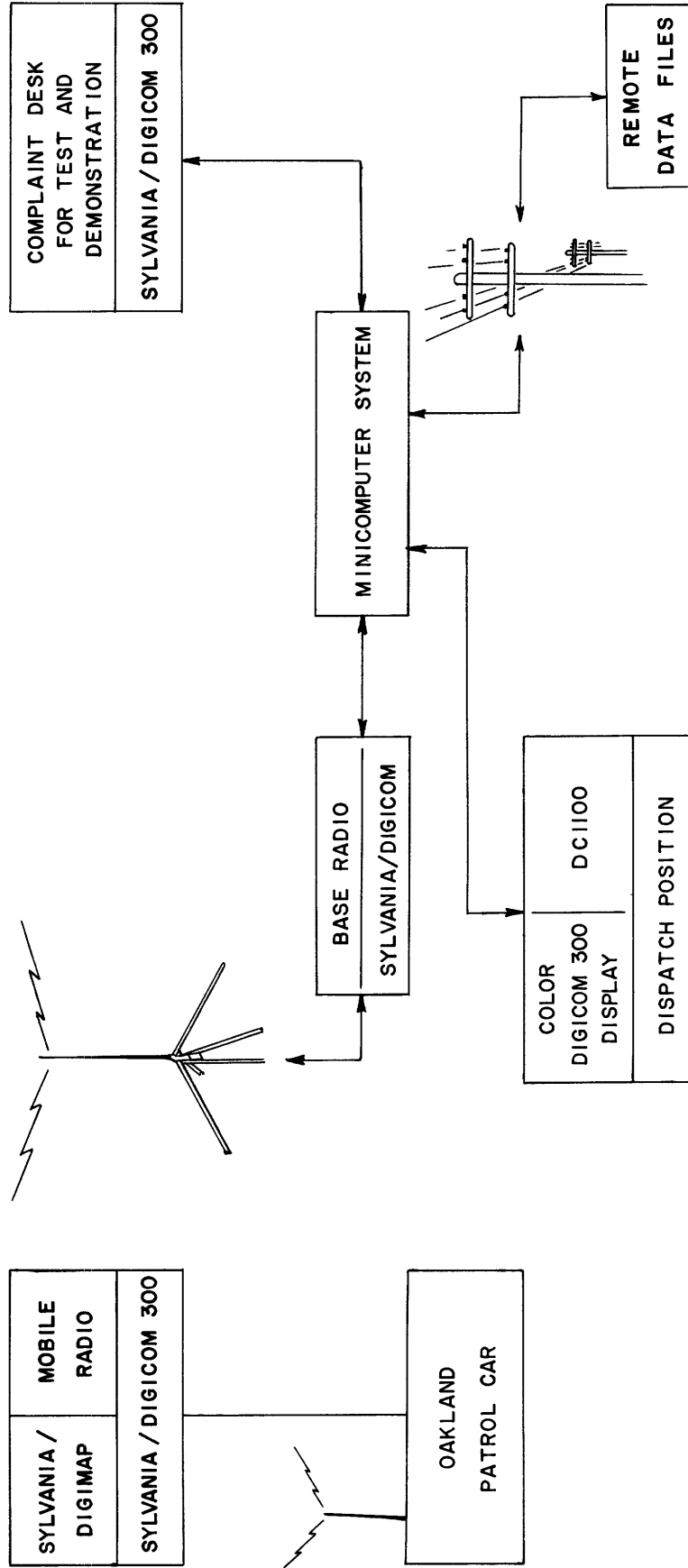
With the location of each car displayed on video terminals in central headquarters, it is hoped that a better determination can be made as to which car is the closest to a call location so that the most appropriate vehicles can be dispatched to the scene. Figure V-4 pictorially demonstrates the conceptual operations of the LOCATE system.¹¹

More complex technical sensing devices requiring no manual effort on the part of the policeman have been proposed to keep continuous track of location in other police departments.¹²

¹¹The figure is taken directly from Proposal for Oakland City Police Department LOCATE System, prepared by GTE Sylvania Incorporated, Electronic Systems Group Western Division, March 15, 1971, p. 2-2. This manual also provides a more detailed explanation of the LOCATE System.

¹²For a discussion of these alternative locator devices see

CONCEPTUAL OPERATION OF LOCATE SYSTEM*



* FOUND IN "PROPOSAL FOR OAKLAND CITY POLICE DEPARTMENT LOCATE SYSTEMS", PREPARED BY GTE SYLVANIA INCORPORATED ELECTRONIC SYSTEMS GROUP/WESTERN DIVISION, MARCH 15, 1971, P. 2-2.

FIGURE IV - 4

However, the objective in Oakland as expressed by police department personnel was to provide a relatively inexpensive way to begin to assess the whole command and control concept. As a consequence, the use of DIGIMAP was designed as a one year experiment to be operational in September, 1971. The idea is that the system would work in the field for 6 to 8 months and then an evaluation would be performed. The evaluation proposed was to look at such items as before and after response time, response time between parts of the city with DIGIMAP and those without, before and after apprehension rates, data on reductions or increases in radio air time, etc. The results of the study should be helpful in assessing car locator and computer aided command and control systems.

One of the obvious disadvantages of the system in Oakland is that officers must manually update their location regularly by continually pressing the map as they patrol around. Therefore, the potential is there that they may simply forget--intentionally or unintentionally. According to the Oakland Police Captain responsible for the effort, there are a lot of ways to "jog" the memory of the patrolman in the field. First, units can be asked to report their location either on a mass (all cars report) or individual basis. Second, they can keep track of how often a car

Task Force Report: Science and Technology, Op.cit., chapter 3, particularly pp. 25-25, and Appendix E. For example, such a device is proposed for use in the suggested Los Angeles command and control system which will be discussed later in the chapter.

reports a change in location, and if it doesn't seem often enough, they can follow-up with an inquiry and discipline if necessary. Certainly it will be possible for a car to sit stationary while taking a "refreshment break" and simply to simulate movement by pressing the digimap. Whether or not policemen will be honest with this system remains to be seen. Once again the Oakland Captain was optimistic. He felt that most people in the department were enthusiastic about the system. Although "goldbricking" or "sandbagging" might be a problem in some departments (he mentioned, for example, in the east), he really didn't think it would be in Oakland. According to him, a "guy doesn't have time to hide, and there really isn't anyplace good to go."

Oakland has a reputation as a "professional" police department (see Chapter I) throughout the country, and perhaps what the Captain says is true. However, it is the sense of this author that the same enthusiasm would not be found in departments throughout the country. If a system of car locators and automated dispatch was ever really installed, it would mean the ability of those at the top to more closely monitor the behavior of those below. "Big brother" would truly be watching, and some policemen can be expected to respond negatively. For example, in Boston a system was implemented several years ago with the idea of providing for the greater safety of the patrolman in the field. "Triggering devices" were put in each vehicle so that if the patrolman was not in his car and central headquarters needed to

get in touch with him or if the policeman had been gone responding to a call for what appeared to be a dangerous amount of time and central communications wanted to check to see if everything was all right, then the siren in the car could be activated so that the patrolman would know to call in immediately. These devices were not well received by the Boston policemen. Within a relatively short period of time all of them were "broken" by going over rough roads or railroad tracks or other "unfortunate" accidents. Since the devices seemed to be so susceptible to accidental damage, the experiment was halted.¹³ If more technically advanced car locator devices were installed in cities such as Boston, it is also possible that they would have a high probability of "accidental" damage. When it comes to the installation of unstructured computer applications, behavioral responses must receive careful consideration.

A system somewhat similar to the one proposed in Oakland has already been in operation in Dorchester, England since October, 1970. Utilizing coded tone generators, each patrol crew can send an 8-digit coded message giving their call sign, duty and location by pressing six buttons on the central panel. This data, in turn, appears on the console manned by the dispatcher in the control room and is then transferred to an electronic map on the control

¹³Steve Waldron, Arthur D. Little, Interview, May 19, 1971.

room wall where car locations are indicated by lights.

It is estimated that the use of coded tone generators will reduce routine duty and location transmission "air" time by 89 percent. The most important aspect of the system, though, "is that the notification received from units as to their location and status provides a continuous picture for operational command and control purposes. The fact that the moving picture of police work throughout each day is captured for subsequent analysis is an automated byproduct."¹⁴

It is difficult to evaluate the Dorchester system based on the sparse material available. It is worth pointing out primarily because it points to the use of computers by the police on not just a national but an international scale. The concluding paragraph by Assistant Chief Constable Green stresses this fact.

The concept upon which the system is built is one which aims at complete flexibility and the use of manpower to optimum effect by assigning and deploying police units in relation to activity or potential activity. The system is a practical example of how these objectives may be achieved and is perhaps an indication of the direction in which policing throughout the world is moving.¹⁵

The Fully Automated, Space Age End of the Spectrum. Perhaps the most technologically advanced and the most expensive command

¹⁴ H. Green, Assistant Chief Constable, Dorset and Bournemouth Constabulary, Dorchester, England, "A Police Command and Control System," FBI Law Enforcement Bulletin, May, 1971, p. 29.

¹⁵ H. Green, Op. cit., p. 30.

and control system which was proposed in any of the cities visited, was that of the Los Angeles Police Department.

On May 12, 1971, Mayor Yorty held a press conference to propose the implementation of a unique, computerized Emergency Communications System for the Police and Fire Departments to provide citizens with faster and more efficient service and protection. The system (if implemented) will take at least four years to install and will cost \$55 million, \$41 million of which Los Angeles is requesting to be subsidized by a federal grant from the Law Enforcement Assistance Administration. According to Mayor Yorty, the Emergency Command Control Communications System (ECCCS), "will be the first of its kind in the nation."¹⁶

The system has two primary objectives: first, to provide for a more rapid, reliable response to emergency calls for police and fire; and second, to reduce the heavy workload on overcrowded radio communications channels, by replacing voice communication where possible with digital messages.

The proposed Emergency Communications System includes five basic elements:

- 1) A Centralized Dispatch Center- -the center will process all requests for services from citizens, officers, and

¹⁶ Mayor Sam Yorty, Mayor of Los Angeles, Press Conference Statement, May 12, 1971.

other agencies. It will utilize digital communications and automate the functions of dispatching, car location, status keeping, and map representations on video display cathode ray tubes (CRT's). Complaint Board Operators will enter the location and other basic information on complaints using the CRT terminals. In turn the computer will have the capability to automatically determine proper jurisdiction, select the closest available field unit(s), and digitally transmit the dispatch order, all supposedly within four seconds. Sector coordinators and Watch Commanders will be provided with CRT terminals to monitor the dispatch operation and to accept and respond to radio requests from field units. By the use of digital communications only five additional radio frequencies will be required over the next ten years instead of the twenty new frequencies that would be required if the current manual operation were to be continued.

2) Automated Division Headquarters- -A remote CRT display will be located in each geographical division headquarters. This will automatically display field activity and assignment of division forces. A printer will also be used to automatically print out reports that would have otherwise been prepared manually, thus allowing field units to spend time carrying out other activities.

3) Field Units- -Police vehicles will be equipped with

two-way voice and digital radio data links. This will enable officers to obtain information directly from federal, state and local computer memory banks utilizing a digital message entry device and a teleprinter for transmitting and receiving. A car locator system will automatically report on the status of each field unit. The officer will also be provided with an emergency switch to signal when emergency help is required.

4) Emergency Command Center- -This center is located next to the dispatch center and will be activated in the event of a major unusual occurrence.

5) Mobile Command Center- -This center will utilize from one to three van type vehicles, which can be moved rapidly to any location in the city to facilitate on-the-scene control of any unusual occurrence.

If ECCCS is ever implemented, it will be the most elaborate of the police command and control systems which are currently being proposed. The question is whether or not the benefits will justify the costs. The police department, of course, says yes. They feel that the operation of the new system, when compared with the costs of expanding the present manual communications program to meet expected needs, will save the city of Los Angeles \$33 million over a ten-year period. Further, it is their estimate that the savings will be much greater after the initial ten-year period. It is estimated that the new system will cost about

\$5 million per year to operate while an expanded manual communications system would cost \$12 million per year - a savings of \$7 million annually.

SOME CONCLUDING THOUGHTS ON COMMAND AND CONTROL

It seems inevitable that there will be an increased use of automation in the area of computer aided dispatch and police command and control systems in the future. Even if the 610% increase which was predicted by police departments in their response to the ICMA survey is somewhat high, it clearly indicates a trend towards increased use as time goes on. At this point, though, it is difficult to evaluate what the actual impact of more extensive computer use in this area will be since most of the efforts are still at such a preliminary stage. (When the site visits were made, none of the police departments contacted had computer aided dispatch systems which were operational, even on an experimental basis, although Oakland was scheduled to begin their experiment in September, 1971.)

Certainly there are benefits to be gained. The potential for faster response, greater administrative control, additional time saved, and improved officer safety all are real advantages from such applications. Even the monetary costs do not appear unreasonable. In the report of the President's Crime Commission in 1967, Raymond Knickel estimates that the cost of a car locator system at that time would range between \$500 - \$1,000 per car for

initial purchase plus what would be a somewhat lower annual cost for operations and maintenance.¹⁷ Considering that a two-man patrol car costs in the range of \$100,000 - \$200,000 per year to man and operate on a 24-hour-a-day basis, this seems to be a relatively small cost in an undercapitalized area such as law enforcement if the benefits discussed above can really be achieved.

On the other hand, implementation of command and control systems will not come without problems and costs. With something this new and untested the possibility of overselling the product is very real. Further, it is often difficult to accurately estimate anticipated expenses. For example, the monetary savings discussed in connection with the proposed Los Angeles "ECCCS" system sound impressive; however, it must be realized that at this stage they are only "paper profits". Such projections are often based on desired reductions in personnel which never seem to come about (partially because a whole new set of personnel are required to support an automated system) and estimations of technical costs which are too low (sometimes priced that way so that hardware and software vendors can make their proposed product look good). Before a decision is made that a computer assisted command and control system will a priori have positive

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Raymond Knickel, "Electronics Equipment Associated with the Police Car", Task Force Report Science and Technology, Op. cit., Appendix E.

effects, a thorough evaluation needs to be made in each police department where such an application of modern technology has been proposed.

Further, such an evaluation must consider more than just monetary benefits and costs, but behavioral factors must be examined. Command and control systems will probably result in greater control on the part of administrative officers, but the psychological impact of constantly monitoring the patrolman in the field is still unknown. Arguments can be made that such computer applications will improve the safety of police officers by virtue of the fact that the command and control center will always know where they are at and what they are doing. It is not clear, though, that individual policemen will perceive the situation in the same positive light (e.g., the sabotaged siren system in Boston).

With all of these factors still remaining to be evaluated, it seems that the way to proceed is with experimentation in selected cities, and thus the effort in Oakland should be carefully observed. Also, we are still far from being ready to totally disregard the human element of dispatching and control. In fact, it is the observation of this author that, at least in the short run, the most critical question in command and control will be obtaining the proper interaction between the human and automatic elements. The human brain is still a far greater "computer" than any mechanical or electronic device we have yet been able to produce. As an alternative to complete automation, perhaps more

consideration should be given to allowing a blend of responsibilities between man and the computer, with each carrying out those activities at which they are most skilled.

RESOURCE ALLOCATION

The use of the computer for resource allocation is an application of automation to aid in the decision making process, an application in which the machine interacts with man through the use of analysis to influence policy. In many ways it is similar to the application of the computer to aid the police dispatching and the overall command and control process. The basic premise of both computer aided resource allocation and command and control is to most effectively allocate and control police forces. Resource allocation tries to do this by providing for an initial allocation of police resources which best matches the potential need. Computer aided dispatch attempts to improve the efficiency achieved by these allocated forces by sending the closest available unit to respond to a call, thus increasing the effectiveness of the responding unit, the effectiveness of the cars which are farther away and therefore are not called, and the overall efficiency of the responding police force.

As earlier portions of the paper have already pointed out, utilization of the computer for resource allocation is more than just having the machine duplicate a manual process which is

already being performed. The application is a far more innovative one. Successful implementation must make careful consideration of behavioral and organizational factors as well as technical ones.

As Chapter II pointed out, the use of the computer for resource allocation has been growing rapidly over the last few years, and this growth is expected to continue. In fact, according to responses to the I.C.M.A. survey, resource allocation will become the dominant computer application in the years to come. Almost half (45.5%) of the police departments that are using computers say they already have some sort of application related to resource allocation and manpower deployment. By 1974, though, the percentage is predicted to skyrocket dramatically. Of the 122 police departments that indicated in the survey that they were using a computer, 121 of 122 responded that they plan to be using the computer for patrol allocation and distribution and police service analysis within the next three years. Experience with visits to police departments seems to indicate that future expectations are usually overly optimistic regarding the date that implementation actually occurs. However, even allowing for some exaggeration, the trend of future use for resource allocation is both clear and striking. This trend is more fully reinforced by the fact that police departments also feel that resource allocation is the most important police computer use. In the I.C.M.A. survey departments were not only asked not only what

applications they had or planned to have within the next three years, but also to indicate the three applications which they felt were most important or would be most important in their department. The applications related to resource allocation- -patrol allocation and distribution, and police service analysis- -received the highest number of positive rankings (see Figure V-5). Not only will applications for resource allocation be found in practically every department which is using a computer by 1974 if the predictions in the survey prove to be true, but uses of the computer in this area are and will continue to be felt to be of greatest importance.

Still, the results of the use of the computer to date in the area of resource allocation have been mixed. Of the fourteen police departments visited in this study, most had some program underway or in the experimental or planning stages in which the computer was to be used as a tool in police deployment. However, only four were really very far along, St. Louis, Los Angeles, Dayton, and Kansas City. Even in those departments, it was still unclear what the ultimate influence would be. In several cases, use has fallen short of initial expectations. In part, this has been the result of the interaction of behavioral influences. Before going on to examine some of these efforts, though, it is important to understand what is meant by resource allocation.

The demand for police services varies according to the time of the year, the day of the week, the time of day, the

IMPORTANCE OF COMPUTER APPLICATIONS AS RANKED BY POLICE DEPARTMENTS

RANK IS BASED ON THE AVERAGE NUMBER OF TIMES APPLICATIONS IN THIS AREA WERE SELECTED BY A POLICE DEPARTMENT AS BEING ONE OF THE THREE MOST IMPORTANT COMPUTER APPLICATIONS TO THEIR DEPARTMENT.

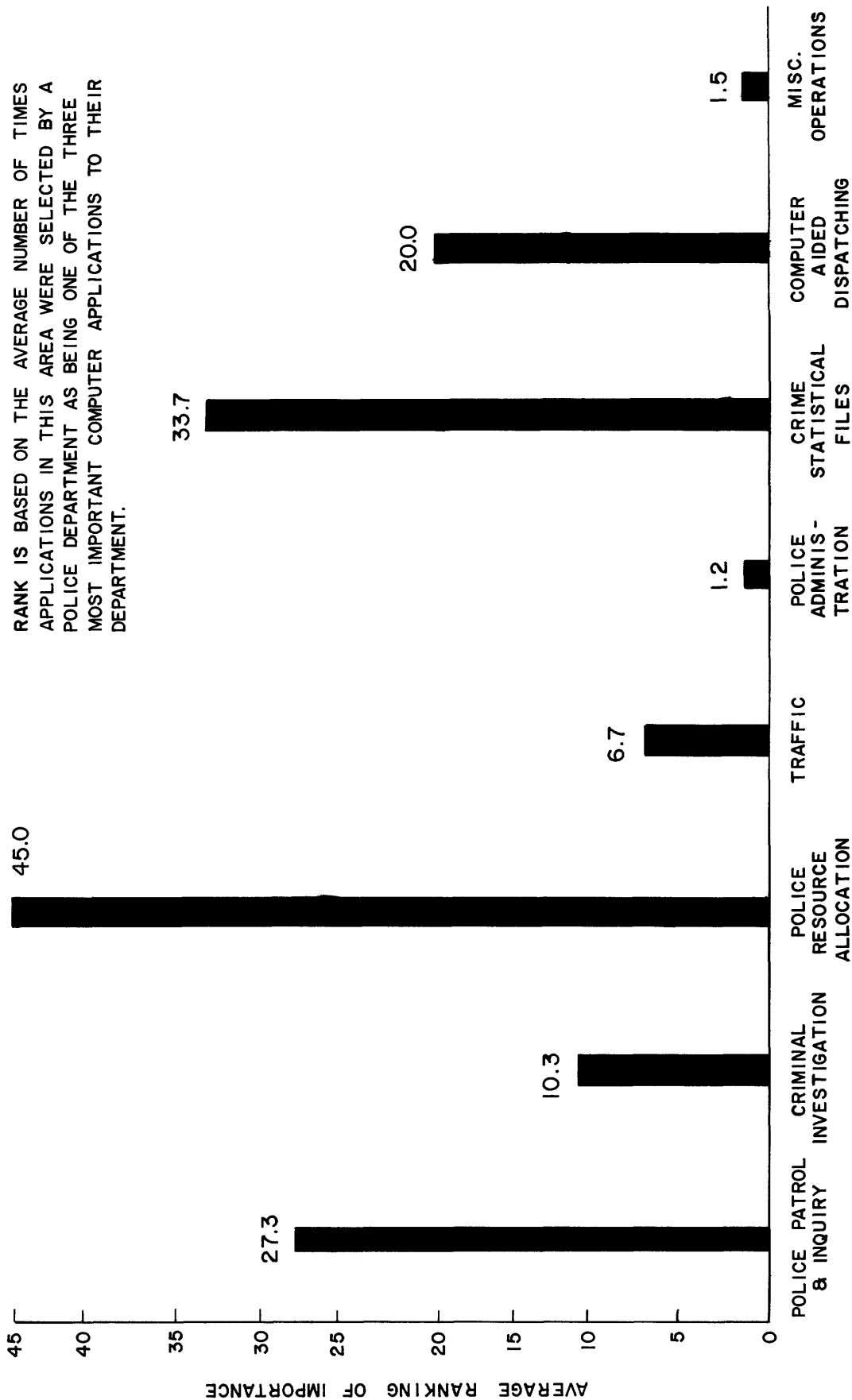


FIGURE V - 5

geographic area, the socio-economic conditions of the community, etc. The basic concept in programs for police deployment is to utilize the computer and various forms of analysis to allocate limited law enforcement resources more effectively so that the police can meet these varying demands rather than constantly assigning the same number of people to a set beat 24 hours a day, 365 days a year. The procedure for achieving this varies from department to department. This paper will discuss several of the procedures for allocating resources found in the police departments included in the site visits as well as several additional methods discussed in the literature.

HAZARD FORMULAS

One of the most widely used formulas for allocating police resources is the "Hazard Formula or Plan." These procedures were first introduced into police work in the 1930's by O. W. Wilson.¹⁸ They provided a major breakthrough by giving police administrators a systematic methodology for distributing forces whereas before their introduction, commanders' discretion had been the primary factor in determining the deployment of police units.

Where used today, this procedure identifies a series of factors which are felt to be significant in determining the demand for police patrol services. Significant factors may include the number of crimes against person, total of all crimes, calls-for-service, population, area, juvenile delinquency, accidents and

aided cases, school crossings, and licensed premises. Each one of these factors is weighed according to its perceived importance, and totals are calculated in order to arrive at a single "hazard number" for a particular area. This number is supposed to represent the "hazard" in a geographic district. The total number of men will then be distributed to each geographic district based on the "hazard number" for that district.

There are several problems inherent in the hazard formula method. First, the determining factors for allocation are input measures as opposed to output measures or indicators of police performance. The factors may be indicators of need, but they say nothing about how good or how effective allocative forces have been, and do not attempt to distribute forces in order to increase effectiveness. In keeping with this problem, hazard formulas distribute a total police force, but they say nothing about what the size of a police force should be in order to meet a certain service level of performance. Second, hazard formulas reflect conditions of the past rather than predicting future conditions and allocating forces based on predicted needs. Third, the system of simply adding the weighted importance of a number of factors means that the interaction between each of them is largely forgotten as is the significance of any one factor as a

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O. W. Wilson, Distribution of the Patrol Force, Publication 74, Public Administration Service, Chicago, Illinois, 1941. Also discussed in O. W. Wilson, Police Administration 2nd edition, New York, McGraw-Hill Book Company, 1963.

primary determinant of need.¹⁹

As mentioned above, the use of hazard formulas is widespread, and a number of police departments have devised variations of the basic procedures (notably New York City²⁰ and Phoenix, Arizona²¹). Some provide innovative alternatives, but no system of allocation has proven perfect.

THE SYSTEM IN DAYTON, OHIO

In Dayton, Ohio, a system has been developed whereby the police workload, represented by the total number of crimes, arrests,

¹⁹ For a critique of Hazard Formulas, see Jan M. Chaiken and Richard C. Larson, Methods for Allocating Urban Emergency Units, The New York City Rand Institute, R-680-HUD/NSF, May, 1971, pp. 13-16.

²⁰ Joel Edelman, Case Report: Police Resource Allocation Methodology, unpublished case study on efforts of the Rand Institute to devise police allocation methodology for the New York City Police Department.

²¹ James S. Kakalik and Sorrel Wildhorn, Aids to Decision Making in Police Patrol: A Summary of Findings, a report prepared by RAND, Santa Monica, California for the Department of Housing and Urban Development, R-593-HUD?RC (Abridged), February, 1971, p. 7.

and dispatches, is predicted on the basis of past experience for various times of the year. These figures are then used by the computer to build patrol beats with equal workload distributions. The algorithm utilized is a simple one. An effort is made to construct each beat in such a way so that it will have the same workload as every other beat. The objective is to achieve such a distribution so that the workload of a given beat is no more than 4% above or below the average.

The method avoids one of the basic problems of hazard formulas in that distributions are made based on predictions of the future instead of simply using past data. However, a number of problems still remain. First, the significant factors used to determine beat distribution are still measures of input instead of output or performance. No attempt is made to determine whether the selected beat distribution improves police service. Further, only three factors (and often just one: number of dispatches) are used to determine workload. Little analysis has been conducted to see if these are the most significant in determining demand for law enforcement resources. And finally, because of the large numbers of interbeat dispatches, it is difficult to determine workloads according to separate beats.²²

Nonetheless, the system has been a helpful one. Whereas

²² See, for example, Chaiken and Larson, Op. cit., p. 32.

in 1965 Dayton had three generally equal patrol shifts, one of which rotated every week, now the computer is used to determine equitable beats, and a permanent shift system has been established to get more policemen in the field at those times of the day and year which are shown to be most critical. The computer, then, in this situation is used primarily as a means of processing large amounts of information. Relatively little quantitative analysis is involved.

Perhaps the greatest achievement of the resource allocation part of the computer system in Dayton, though, is the fact that it has been well received in the police department. From a mathematical point of view it is relatively simple; but the fact of the matter is, it's used. Prior to the site visit a new beat distribution had just been prepared utilizing the computerized procedure. The old beat patterns had followed a natural boundary, a river flowing through the city, and the result had been to overload one district as opposed to the others. With the new system "equal" districts and beats had been developed in terms of workload, and the new patterns of distribution were being implemented. The use of the computer has been relatively low key, and the primary work in designing and programming the system has been by police personnel without extensive technical backgrounds. Still the impact has been felt, and with time the influence of the computer operation in resource allocation will

increase. In fact, it was the prediction of the police lieutenant who was in charge of the data processing operation that the time would eventually come when specific patrol beats would be discontinued and replaced by a more "fluid" or moving patrol force. Instead of reporting to patrol a particular beat each evening, an officer would be assigned to patrol or answer calls in a different area each night, the determination of the appropriate area being made through the analysis of available information utilizing quantitative analysis and computer technology. Naturally there are pros and cons to such a scenario, and they will be discussed later on in the chapter. The point here is that the use of the computer for a rather simple system of resource allocation had been effective enough in Dayton that the police personnel were optimistic regarding the possibilities for the future.

RESOURCE ALLOCATION IN ST. LOUIS

According to some sources, St. Louis has one of the most advanced operational methods of patrol force deployment currently in use. A study by the RAND Corporation on aids to decisionmaking in police patrol in six police departments around the country stated that "the most advanced operational method of patrol force deployment currently in use has been developed and applied in St. Louis."²³ In a recent book, Richard Larson concurs with

²³ Kakalik and Wildhorn, Op. cit., p. 7.

these sentiments. In a discussion on various approaches and benefits in utilizing quantitative aids in police decisionmaking Larson indicates that "perhaps the best example of a successful implementation is found in the St. Louis Police Department."²⁴ After spending almost a week in a site visit at the St. Louis Police department examining information and conducting a wide range of interviews, though, it was apparent that the results of the St. Louis effort are still mixed. Although benefits have been achieved in some areas, some of the initial expectations have not been met, particularly from a behavioral point of view.

The St. Louis police department began its initial experimentation with resource allocation in 1966. One of the basic aspects of the system was to experiment with concepts of split patrol by distinguishing between two aspects of the police patrol function: 1) Calls for service, or responding to calls or complaints from the public, and 2) Preventive patrol, or all patrol activities directed at the prevention of crime or apprehension of criminals. The demand for police services, measured by the expected number of criminal incidents, was then predicted by area and time of year, week, and day. Information was also gathered on the distribution of time required to dispatch patrol cars to service these criminal incidents. Then, based on relatively simple mathematical

²⁴ Richard C. Larson, Urban Police Patrol Analysis, M.I.T. Press, Cambridge, Massachusetts, 1972.

techniques using queueing theory, an estimate was made of the number of patrol cars needed in a given area or beat so that a certain percentage of the predicated calls for police services could be met without any dispatching delay. In other words, the program could show the number of men that would be required if the department desired to respond to 85 percent of the calls without delay, 90 percent, etc. Men were then assigned to the two different patrol functions, calls-for-service and preventive patrol. Enough men were assigned to each beat to respond to calls-for-services so that 85 percent of the predicted incoming calls could be met without delay. The remainder of the patrol force was assigned to preventive patrol.

Besides designating the allocation of specific beats, information useful to police administrators was also provided as part of the resource allocation system in St. Louis. For example, a series of computer maps utilizing computer graphics were prepared periodically indicating the number of calls for services, crimes reported of various types, arrests made, etc. These maps provided useful visual information for police commanders in making final determinations in designing patrol beats and in determining alternative law enforcement strategies.

Also, a number of additional ideas began to evolve and be tested. At the first stages of experimentation in one of the police districts, it was decided to use two-man cars where possible (two men riding in a single patrol car to provide greater

safety) in preventive patrol and in cars assigned to respond to calls for service. However, midway through the experiment the desirability of using both one- and two-man cars became apparent--one man cars to be used for responding to calls for service of a relatively minor nature which required the services of only one police officer, and two-man cars to be held in reserve for more serious types of offenses.²⁵ As a result of this experience, both one- and two-man cars were provided for operations when it was decided to expand experimental use of resource allocation concepts from one to four districts.

The idea developed into what was referred to as the stacking of patrol calls. The basis of the idea was to make an increased effort to more carefully screen calls requesting service as they came into the police department. Those that were felt to be of a low enough priority (and not to be of a dangerous nature) could not only be assigned to one-man cars, but could be "stacked" or delayed. In other words, one or two cars in a district could be assigned to answer low priority calls, and if one of them was not immediately available, response could simply wait or be "stacked" up until such time as a car was available. Eventually the idea was expanded further to include the development and implementation of

²⁵ Allocation of Patrol Manpower Resources in the St. Louis Police Department, Volume I, a report on the resource allocation experiment conducted under the Office of Law Enforcement, Grant Number 39, p. 75.

a full-scale complaint evaluation program whereby police officers screened calls in an effort to first reduce the fraction of calls requiring dispatch, and second, of those calls actually requiring dispatch, to increase the percentage that could be stacked.

Perhaps the greatest conceptual criticism of the St. Louis effort is that it utilizes only one criterion in determining the number of cars assigned to a beat to respond to calls for services, the fraction or percent of calls that cannot be answered without delay. Related to this, "requirements for preventive patrol are not explicitly considered when assigning cars and the question of the relative value of a car on response and on preventive assignments is not addressed."²⁶ However, the accuracy of the system in predicting workload has proved very successful. For example, a detailed comparison was made between the predicted and actual number of calls in the Ninth St. Louis Police District for the police rotation period from March 6, 1967 to March 26, 1967. It was found that the variation in the predicted number of calls for service accounted for about 90% of the variations in the actual observed values, a very strong correlation between predicted and actual.²⁷

²⁶ Kakalik and Wildhorn, Op. cit., p. 8.

²⁷ For more detailed information and specific figures demonstrating the prediction accuracy of the system, see Allocation of Patrol Manpower Resources in the St. Louis Police Department, Volume II, Op. cit., pp. 28-33.

Based on the work and procedures in St. Louis, IBM Corporation has put together a computer program package known as LEMRAS (Law Enforcement Manpower Resource Allocation System) which is currently being leased to several police departments around the country. The police departments in Los Angeles and Kansas City were utilizing the LEMRAS system, and some comments on the impact and success of their operation will be made later.

ADDITIONAL RESOURCE ALLOCATION EXPERIMENTATION

Additional experimentation is also underway to implement several recently developed techniques. Richard C. Larson has devised an allocation procedure and simulation model which is designed to address the basic questions of police deployment.²⁸ The algorithm requires police administrators to specify a number of policy objectives for each command area or beat. These are stated in terms of constraints. For instance, average travel time for urgent calls should not exceed four minutes. Other objectives can involve preventive patrol, administrative considerations, or any other factors deemed important. As a consequence, some of the objections of the St. Louis and LEMRAS systems that they do not consider enough factors have been overcome. The procedure determines the minimum number of units required for each

²⁸ Richard C. Larson, Urban Police Patrol Analysis, Op. cit.

beat so that all objectives are fulfilled. If the total number of units to be allocated is insufficient to satisfy objectives, then the method computes the deficiency and requires a more modest set of objectives. If there are additional units to allocate beyond those needed solely to satisfy constraints, they are deployed using a mathematical optimization technique known as "dynamic programming" in order to fulfill some city-wide objectives (for instance, minimization of average overall waiting time for dispatch). This method has been applied to the New York City Police Department and played a role in the efforts of the Mayor and Police Commissioner to obtain a fourth platoon which now operates from 6 p.m. to 2 a.m.²⁹ The model is also being implemented in Boston and several other U.S. and Canadian police departments.

AN EVALUATION OF RESOURCE ALLOCATION

It is difficult to evaluate fully the success of many of the resource allocation efforts. A number of variables are involved, both technical and behavioral, and in many cases it is still premature to predict what the eventual impact and utility will be. Critics are skeptical, but most departments still seem enthusiastic.

²⁹ The New York City RAND Institute, First Annual Report, October, 1970, p. 26.

In analyzing the use and implementation of computer applications a number of questions must be answered: Does it work? Is it accepted and used by the men and women in the police department? Has it accomplished the objectives originally specified? Has it improved police efficiency and effectiveness (as narrowly defined in Chapter III)? And, if simplifying assumptions are required are the correct ones chosen? Is the application a good simulation of reality? These questions, though, seem to sort out into two basic dimensions: (1) Those which have to do with achieving success in implementation (does it work, acceptance, use, etc.); and (2) those which have to do with the quality and value of the computer application itself (improving police service, effective simulation of reality, etc.). In achieving success in implementation the factors outlined as related to Dalton and Knight at the end of Chapter IV are particularly important--involvement of quality leadership at the top, involvement of other police personnel, human-computer interaction, proper priorities established, caliber of technical staff and technology available. In achieving success in the second area, the quality of the application itself, a different set of variables are most significant--proper qualifying assumptions, worthwhile application, effectiveness in simulating reality, technically valid, etc. Both areas of success or effectiveness are important and are often intertwined. In many cases, "success"

in one without "success" in the other will doom the computer application to failure, or at least obscurity. If the application is relatively straightforward it may be easier to implement,³⁰ but the final outcome may not be any better than the manual operation which preceded it. If the application is more complex, the benefits achieved may be greater, but if there are difficulties in implementing the project and it never really becomes operational then the potential advantages will be lost. In evaluating police computer applications, then, both dimensions influencing effectiveness must be examined. As we begin to evaluate several of the police resource allocation applications around the country, the idea will be to take both into consideration.

First, it seems that in a general sense it is easier to allocate resources to effectively respond to demands in the area of traffic control than it is related to crime. This paper will look briefly at one illustration of this where the computer

³⁰ This is not stated as an axiomatic principle or hypothesis, and in fact, the opposite is often the case. In Joel Edelman, Op. cit., Edelman reports on an attempt by the RAND Institute in New York City to work with the New York Police Department in trying to allocate 3,000 new uniform patrolmen to the most appropriate districts. A real-time modification of the hazard formula approach was selected. Technically, the computer application was very straightforward. However, the final result was that their suggested innovation was rejected in favor of using the results of the existing allocation method. According to Edelman the primary reasons included tradition, too little time available to convince officials of its usefulness, and the fact that the allocations arising from application of their formula often did not meet police officials' "intuitive standards" of usefulness.

has been used to aid in the allocation of a department's traffic patrol. The focus will then shift to an evaluation of resource allocation related to the law enforcement function of the police, taking particular look at the efforts in St. Louis and Los Angeles.

Resource Allocation for Traffic Patrol. At the time of the site visits, Kansas City had been working for over a year on a program of computer aided deployment related to traffic enforcement. Before the institution of the system "wheel officers", officers on motorcycles attached to the traffic patrol, would be assigned to general work areas but the areas which were large and overlapping. Further, officers roamed through the areas in a random fashion. Now, each officer is assigned to a particular beat, and each beat is determined through quantitative analysis and the use of the computer. Various reports are also produced indicating the level of enforcement (number of tickets) in each beat, the work performed by each officer, the number of accidents per beat, etc. Between 1969 and 1970 with this new program in action the city experienced a 5 percent reduction in traffic accidents even though there was a smaller number of men on traffic patrol during that same period. The department did not claim there was a direct correlation between selective enforcement and reduced accidents because of the difficulty of isolating causal relationships in such a case, but there were "strong

suspicions" that a correlation existed.

However, resource allocation in traffic control is probably easier than the allocation of manpower in the prevention and response to crime. First, the nature of the task is more clearly defined. As one traffic patrolman working in Syracuse, New York told an interviewer:

"I was on patrol for nine years, and as far as I'm concerned you can have it. You've got all those messy details; you're called in on cheatings and stabbings, family fights and quarrels; you're chasing kids. You never know what's going to happen next, and not all of it is very pleasant. When you get in a traffic enforcement unit you know exactly what's expected of you and what you have to do; then you can do your work and that's it."

Second, since the task is clearly defined, measures of output can be more clearly specified and sought after. If police administrators want to measure success or evaluate individual performance, they will have something to start with. Third, traffic problems seem more responsive to controls and programs to modify their nature. It is often possible to isolate troublesome roads and corners and to saturate those areas at critical times. In Kansas City, as discussed above, this led to a reduction in traffic accidents. In an area such as traffic which is comparatively responsive to such treatment the police department is more likely

³¹ Quoted in James Q. Wilson, Varieties of Police Behavior, Op. cit., p. 53.

to be able to determine and maintain an overall approach to traffic control than it is in most other areas of law enforcement work such as criminal apprehension or investigation. As a consequence, the use of computer analysis seems easier to implement when related to the allocation of resources for traffic enforcement.

Resource Allocation for Criminal Apprehension and Patrol.

On the other hand, allocation of resources for criminal apprehension and patrol is more difficult. Even in cases where efforts have been underway for some time it is often hard to understand the relationship between resources used and the effect which they have. Because so many factors seem to influence the crime rate, it is very difficult to predict what influence an increase or decrease in the number of policemen in the field will have on crime prevention. For example, the average number of police officers for every thousand citizens in cities throughout the country varies widely. In 1970 a survey by the Kansas City Police Department of thirty-seven police departments in cities of 300,000 to 1,000,000 population indicated a range of a low of 1.17 police officer per thousand in San Antonio, Texas to a high of 5.92 in Washington, D.C.³² Other cities of interest included Atlanta, Georgia at 1.56/thousand, Baltimore, Maryland at 3.83, Boston at

³² "1970 Survey of Municipal Police Departments", Kansas City, Missouri Police Department, Clarence M. Kelley, Chief of Police, November 1, 1970.

4.48, Denver at 2.22, Kansas City, Missouri at 1.71, Long Beach at 1.79, Newark, New Jersey at 3.70, St. Louis at 3.67, and San Francisco at 2.59. The crime rate in Washington, D.C. should not be expected to be half what it is in San Francisco just because the number of policemen per thousand in Washington is more than twice as high. Nor, if the number of policemen per thousand were doubled in San Francisco, should the crime rate be expected to be cut in half. As stated earlier, crime in our society is a complex function of a number of variables. This means, then, that the evaluation of any law enforcement program will be difficult because of this complexity. Such is certainly the case with trying to assess the impact of computer aided resource allocation efforts. As a consequence, to try to look only at the impact of such efforts as a means of reducing crime would certainly be a mistake. The basic purposes of these concepts, the allocation of manpower resources effectively according to police or societal needs by time and space, should not be lost in wishful thinking that the more effective utilization of resources will automatically result in a lower incidence of crime.

In St. Louis resource allocation efforts began around 1966, and in 1970 the city began using this deployment program city wide. In the evaluation of the program prepared for the federal government, the conclusion was that "the resource allocation model proved successful. That is, the System showed itself capable

of generating output which could be used for effective allocation of manpower resources within the test district in relation to need, both by time and place. This, of course, was of chief importance and represented the fulfillment of one of the prime goals of the grant."³³ Still, in the site visit to St. Louis by this author, it seemed that the reactions within the department and the actual impact on the department have been a mix of both positive and negative aspects.

Quantitative analysis of a variety of project indicators was the first place where both positive and negative aspects of evaluation begin to emerge. According to the St. Louis final report, index crimes and Part I crimes "increased rather steadily during the life of the experiment and were, for the most part, substantially higher during each month of the test period than for the same month a year earlier."³⁴ The increase in the crime rate does not necessarily imply failure of the resource allocation system. It is possible that without the resource allocation system a greater increase in crime would have been experience in the test district without the new techniques. Naturally, there is no way to really know.

As shown earlier, though, the resource allocation system

³³ Allocation of Patrol Manpower Resources in the St. Louis Police Department, Volume I, Op. cit., p. 75.

³⁴ Ibid, p. 76.

did prove to be a good predictor of workload and calls for services. Further, the allocation method proved to be successful in influencing the number of calls that could be responded to by the police department without delay, one of the primary purposes of the model. For example, during the testing stages of the system, the beats for the first rotation period were designed so that the calls-for-service units would handle virtually all calls without delay. Over the next successive rotation periods the workload by beat was gradually increased. As this was done, the percent of events which call-for-service units could handle without delay declined correspondingly, as was desired. Over the first six rotation periods the percent of events handled by the call-for-service units was 98, 95, 93, 90 and 92, respectively (with the remaining calls being assigned to preventive patrol units). Essentially, these response levels were the ones desired and predicted with the corresponding workload, thus indicating the effectiveness of the system in this respect of relating the number of officers assigned to a beat and the corresponding ability to respond to calls-for-service without delay.³⁵

In other areas, the success of the allocation system also seemed mixed. In general, the officers in the St. Louis Police Department felt that the resource allocation system had not met

³⁵ Ibid, p. 80.

their expectations (eight out of fourteen indicated this). A mild negative response such as this, though, should not be alarming. In fact, perhaps it should be expected. As discussed in Chapter IV the implementation of innovation almost always brings some resistance and problems.

In the course of the experiment, though, a number of things have been learned. For example, after the project had been underway for awhile the precise distinction between cars for preventive patrol and cars responding to calls for service began to come into question. According to one source in the department it was discovered that policemen who were assigned to cars answering calls for service felt they should do only that, while those assigned to preventive patrol felt that their activities should be limited to patrol. When the workload demanded that preventive patrol cars should respond to calls, or vice versa, the men were somewhat dissatisfied. In keeping with this idea, the final report on the project cautioned against an over-specialization in split patrol functions. It states that in St. Louis there was some tendency in this direction by police officers assigned to call-for-service units. "They would receive and complete an assignment and then wait for the next one without performing in the interim such routine police work as enforcing moving traffic violations, or stopping pedestrian and occupants of motor vehicles for legitimate questioning. They justified this on the grounds that, since they were liable to receive another

call for service at any time, they could not tie themselves up on duties which would prevent them from handling their normal assignments."³⁶ Another source outside of the department indicated that almost the opposite effect had resulted for police officers assigned to preventive patrol.³⁷ According to him, their main problem was that they simply got bored in constantly just driving around on preventive patrol. No direct mention of this was made to the author while in St. Louis on the site visits, but it certainly seems plausible.

As a result primarily of such behavioral factors, the precise distinction between preventive and call-for-service patrols was dropped and a compromise method has developed. Now a determination is made of the number of cars needed in a district to respond to calls. This number is allocated, and where possible extra cars are provided which can be used as the District Commander desires (e.g., for preventive patrol). However, a precise distinction is no longer made between cars for patrol and cars for calls for service. In fact, the workload is often such that in the busier districts at least, all cars have to be utilized to respond to calls, patrolling on the side where possible. The concept of using single man cars to respond to "stacked calls" of lower priority is still in use, as is the complaint evaluation

³⁶ Ibid, p. 78.

³⁷ Interview with Steve Waldron, Arthur D. Little, Corporation, May 19, 1971.

program.

Other reactions by the patrolmen in St. Louis have also demonstrated the importance of behavioral influences on police computer use. One of the basic ideas of more effective resource allocation is to provide for more police manpower during the times when the need is greatest. However, when changes were proposed in the hours and rotation schedules of police officers in order to meet this objective, resistance was encountered. It was recommended that the rotation of police shifts be moved back one hour so that watches would change at 8:00 a.m., 4:00 p.m., and 12:00 p.m. rather than at 7:00 a.m., 3:00 p.m., and 11:00 p.m. in order to achieve more efficient use of manpower. In fact, an attempt was made to implement this recommendation. It was discovered that the resistance of the police officers represented through their patrolman's association was so great, though, that the change had to be discontinued. One of the greatest complaints was that the 8:00 a.m. to 4:00 p.m. shift put the patrolman coming and returning to work during rush hour traffic, and they didn't like it. The basic fact was that the policemen were used to their time schedules, and they just didn't want to change. Once again, such resistance is not alarming. In fact, in many cases it can and should be expected. However, it does demonstrate once again that behavioral considerations are important factors in implementing computerized resource allocation. As mentioned at the outset of this section there are at least two dimensions

in evaluating the success of any computer application--the success of implementation and the system itself. In this case resistance has hindered the overall implementation of computer use, but it does not mean that the application has failed.

In fact, St. Louis continues to utilize the resource allocation program, even if only in a limited fashion. Twice a year "maps" outlining alternative and suggested beats for each shift are prepared by computer and distributed to each district. Whether or not these "maps" are used is a decentralized decision left to the District Commander. (At one point control over implementation of the resource allocation program was centralized.) The key to use in St. Louis now depends on whether or not the District Commander understands and likes the system. If he does, he'll use it; if not, he won't. It's as simple as that. In keeping with this, attitudes towards the system vary. As one of the people who has been working on the project for some time now put it: "Just tell me what you want to hear (good or bad) and I can take you there (someplace in the department) and you can hear it." Whereas several people in the department offered glowing reports, including the police commander who was initially responsible for the experiment, one district commander responded: "Resource allocation? Oh, I thought we gave that up!" Clearly, that District Commander was not using the system. Once again, though, the reason for this may not be a problem with the resource allocation application, but a matter of education or

a failure on the part of the top command and the computer staff to help assure that each District Commander has "internalized" the motives for using the system.

However, whether or not the details are accepted, it is clear that the overall philosophy of resource allocation has caught on in the St. Louis Police Department. As the person currently responsible for producing the resource allocation "maps" put it: "The big thing that they've accepted is a variable number of beats for a district, depending on time of day, week and year." The basic approach has become a fact and way of life. This in itself is a major change from when the project began, and thus reflects a significant impact on the department.

Fluid Patrols: Improved Effectiveness or Depersonalization.

Some law enforcement people feel that the time may come when specific patrol beats will be discontinued. Instead of going to a set beat, an officer when reporting for duty will simply call in and be assigned to patrol or answer calls in a particular area, an area which had been designated through the analysis of available information and the aid of computer technology, and an area which may vary considerably from the one patrolled the day before. Several of the police officers interviewed during site visits felt that the effect of such a system would be positive. Other law enforcement people, in contrast, feel strongly that such a move would be a step backward, not forward. They believe it is

important for the officer to have a beat and to get to know the residents in that area. An entirely "fluid" or moving force would prevent, or at least hinder, the development of appropriate relationships between the police and local citizens. Used in this way they believe that the computer would result in a "depersonalization" of the law enforcement task.

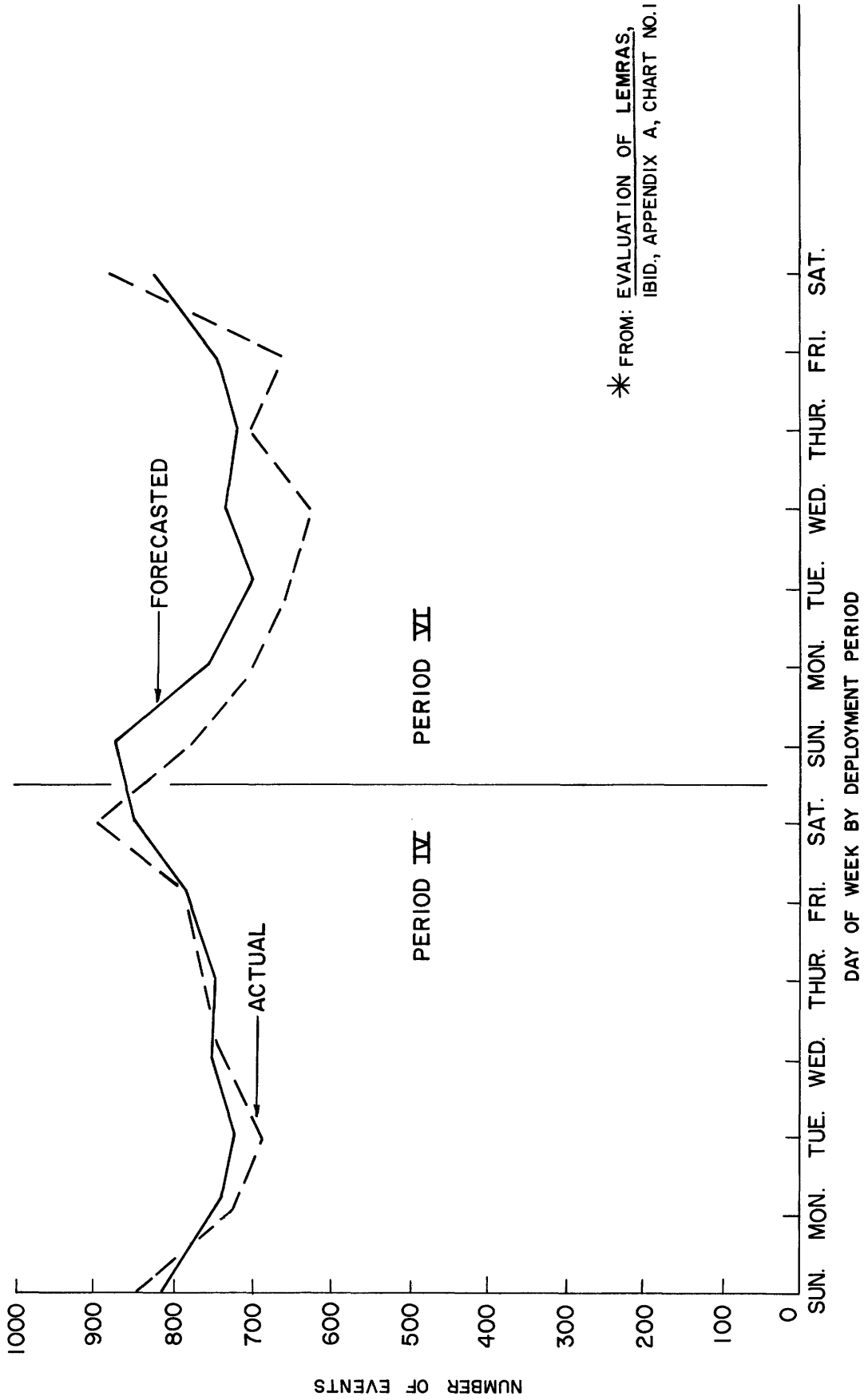
The resource allocation efforts to date in Los Angeles gives some indication of this basic dilemma. The Los Angeles Police Department has been using the IBM package, LEMRAS, (Law Enforcement Manpower Resource Allocation System) which is patterned after the program in St. Louis on an experimental basis in one division over the last several years. In this division the program is set so that 95% of incoming calls for service can be answered without delay. Other cars are assigned to preventive patrol. As opposed to St. Louis where the split patrol distinction had basically been dropped, in the Los Angeles division experimentation and use were still underway at the time of the site visit.

Based on certain quantitative indicators the system appears to have positive benefits. In one study of evaluation it was found that forecasts predicting the number of calls for service was 95.9% accurate.³⁸ (Figure V-6 indicates the comparisons

³⁸ "Evaluation of the Law Enforcement Manpower Resource Allocation System" prepared by the Advanced Systems Development section, Los Angeles Police Department, October, 1969, pp. 1, 3.

LEMTRAS FORECASTED EVENT DATA COMPARED WITH ACTUAL EVENT COUNT

DEPLOYMENT PERIODS IV AND VI 1969



* FROM: EVALUATION OF LEMTRAS,
IBID., APPENDIX A, CHART NO.1

FIGURE V - 6 *

between the actual event date and LEMRAS predictions for two deployment periods, March 23 - April 19, 1969 and May 18 - June 15, 1969.) It was also found that utilizing the LEMRAS suggested manpower allocations units were assigned in the field in sufficient numbers to achieve the goal of 95% of incoming calls being answered without delay. A communications survey indicated that a 95.2% factor was actually attained, a fairly positive record.³⁹ Further, a study which compared crime statistics for arrests before and after the introduction of LEMRAS indicated an observable increase in "efficiency". It was found that Part I crimes in the experimental division were down when LEMRAS was used in 1969 by 2.3% compared to a decrease in the surrounding area of 2.0% and a city wide increase of 3.4% (see Table V-2). Also indicating "improved" police service, Part I arrests were up in the LEMRAS division in 1969 by 16.0% over the 1968 figure, and this compared to an increase in Part I arrests in the surrounding area of only 11.9% and a city increase of 14.5% (see Figure V-7). The study goes on to note that this observable increase in efficiency can be "directly attributed" to LEMRAS.⁴⁰ This author would contend, though, that although the quantitative benefits achieved are interesting and perhaps indicative of a positive effect by LEMRAS, there are simply too many

³⁹ Ibid, pp. 1, 3.

⁴⁰ Ibid, p. 3.

TABLE V-2

1969 PART I CRIMES* COMPARISON
WITH 1968 AND JPL PREDICTIONS

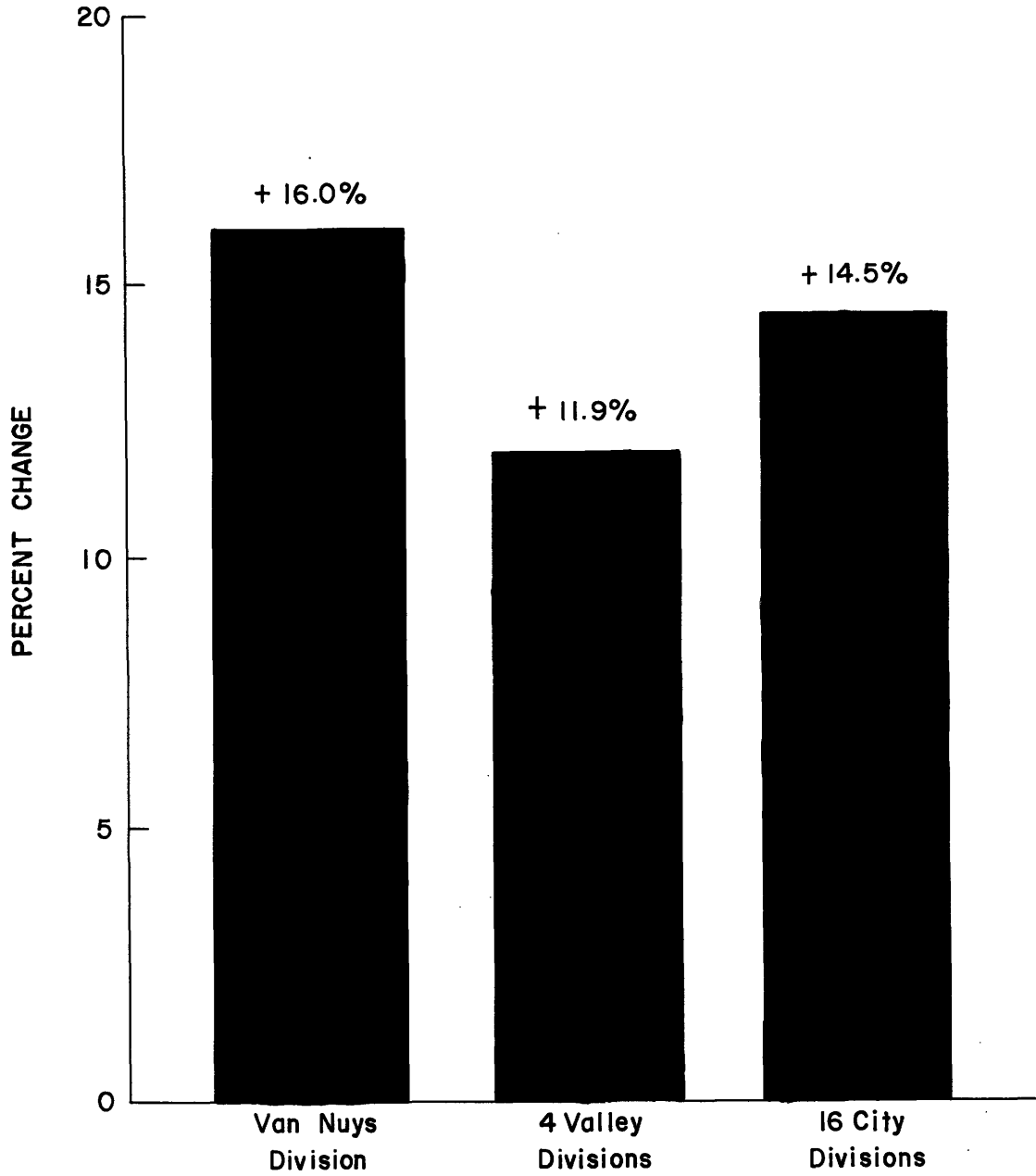
	<u>Van Nuys Division</u>				<u>1969 Variance</u>
	<u>April</u>	<u>May</u>	<u>June</u>	<u>Total</u>	
1968	1,087	1,145	1,171	3,403	- 2.3%
JPL 1969	1,350	1,333	1,340	4,023	-17.9%
Actual 1969	1,067	1,159	1,077	3,303	--
	<u>Four Valley Divisions</u>				
1968	3,098	3,192	3,068	9,358	- 2.0%
JPL 1969	3,520	3,532	3,555	10,607	-14.6%
Actual 1969	2,920	3,129	3,010	9,059	--
	<u>Sixteen City Divisions</u>				
1968	15,894	16,633	15,499	48,026	+ 3.4%
JPL 1969	17,137	16,999	16,953	51,089	- 2.8%
Actual 1969	16,520	16,697	16,418	49,635	--

Sources: 1. Jet Propulsion Laboratory's "Three-Year Forecast of Offenses"
2. L.A.P.D. Monthly Reports for months concerned.

*Less Homicides

From Evaluation of LEMRAS, Ibid., Appendix A, Table No. 3.

1969 PART I ARRESTS *
PERCENT CHANGE FROM 1968
PERIODS IV THROUGH VI



*FROM: EVALUATION OF LEMRAS, IBID, APPENDIX A, CHART NO. 4

FIGURE V - 7

other factors involved which influence the crime rate to make such a strong statement without qualification.

Quantitative indicators paint a positive picture, but interviews held with police personnel in the division where LEMRAS is being implemented also indicate that there were problems. Time permitted interviews with only five patrolmen, so it is impossible to reach any definitive conclusions. However, their observations are interesting. Patrolmen pointed out that although response to an average of 95% of calls could be accomplished without delay, there were too many occasions each day when backlogs of calls would occur, and citizens would have to wait too long for police service. They felt that LEMRAS was too inflexible and did not consider enough variables in arriving at its predictions. Calls for services did not seem adequate as the primary determinant; other suggested factors included number of arrests, response to crimes observed by the police, station calls for administrative business, and administrative duties which make an officer unavailable for patrol (e.g., station calls, court attendance, etc.).

The main problem cited, though, was that LEMRAS sometimes seemed to conflict with the Los Angeles Police Department "Basic Car Plan." The Basic Car Plan is a program under which one basic car is assigned to a geographic area. Enough men are allocated to the car to staff the vehicle twenty-four hours a day, and one

officer is made responsible. The idea is to improve police-citizen relations and to build a trust and pride in law enforcement service. Officers assigned to the "basic car" meet with the citizens in their area once a month. Presentations are made, and people in the community are given the opportunity to ask questions. By getting the people in the community together with the police officers who "work" their area it is hoped that people will begin to communicate and that a personal touch can be added to police work, perhaps even restoring some of the aspects of the role of the policeman years ago when he would walk the beat and serve as a social agent in his community. No attempt is being made to evaluate the basic car plan in this study, but during the site visit the author attended one of the monthly meetings in an area, and the overall reaction seemed to be quite positive.

One important aspect of the basic car plan is that a car is expected to spend 50% of its time working with the people in the area. However, LEMRAS's seems to contradict that principle. It was found in one rough survey in the division utilizing LEMRAS that the Basic Cars were responding to calls outside their area about 30% of their time, thus making it difficult for them to spend half of their time working with the people in their area.

Although effective overall allocation was being provided (as illustrated by the statistics in response to calls for service cited above), for at least some of the men in the division this meant a decreased opportunity to work with people and a deemphasis

on the sometimes forgotten human side of police work. The solution of one officer would have been to use LEMRAS, but to set the program so as to respond to as close to 100% of calls without delay as possible.⁴¹ This would mean taking most if not all cars off preventive patrol and putting them into "basic areas", thus allowing for smaller basic car beats and increase manpower to respond to calls.

CONCLUDING THOUGHTS ON RESOURCE ALLOCATION

In conclusion, then, it should be clear that the benefits and costs of computerized resource allocation are still mixed. The reality does not live up to some of the glowing reports which are sometimes made. However, at a minimum, planning and deployment efforts have already done much to show that there are more ways to fight crime than simply to "get more men out on the street". Naturally, most chiefs will continue to ask for more men and in some cases rightfully so. However, this approach will increasingly be supplemented by the concept of achieving a better utilization of the men who are available. It may take time, but as this type of thinking becomes more widespread, it highlights a major impact and change in law enforcement philosophy. In fact,

⁴¹In essence, it is mathematically impossible to set the programs so the 100% of calls could be responded to without delay. See, for example, Chaiken and Larson, Op. cit., pp. 16 - 22.

according to the ICMA survey, resource allocation and deployment was the area where police felt that the computer had had the greatest effect to date (Figure V-8). Although site visits show that this response is probably slightly overenthusiastic, the fact that police departments perceive this to be the application of greatest effect is of real significance. If policemen believe that the use of the computer in resource allocation is important, then they will behave as if it is, and the significance will continue to grow in the future.

The use of the computer for the allocation of police resources is also a good illustration of the complexities involved in implementing unstructured, innovative computer uses. Non-routine uses require creative approaches which meet the behavioral, organizational, and personnel problems which can be expected to arise. Further, an assessment of benefits versus costs is far more complicated. It is very difficult to pinpoint the precise cause of a decrease or raise in the crime rate, and to attribute such a change solely to a new system of deploying manpower is probably overstating the benefit and simplifying the causal relationship. Still, measures of effectiveness must be attempted.

Perhaps one of the primary lessons to be learned from observation of resource allocation applications may be that it will not be the sophisticated, elegant mathematical model alone that will assure the success of computer use. It is also essential

WHAT HAS BEEN THE COMPUTERS BIGGEST EFFECT ?

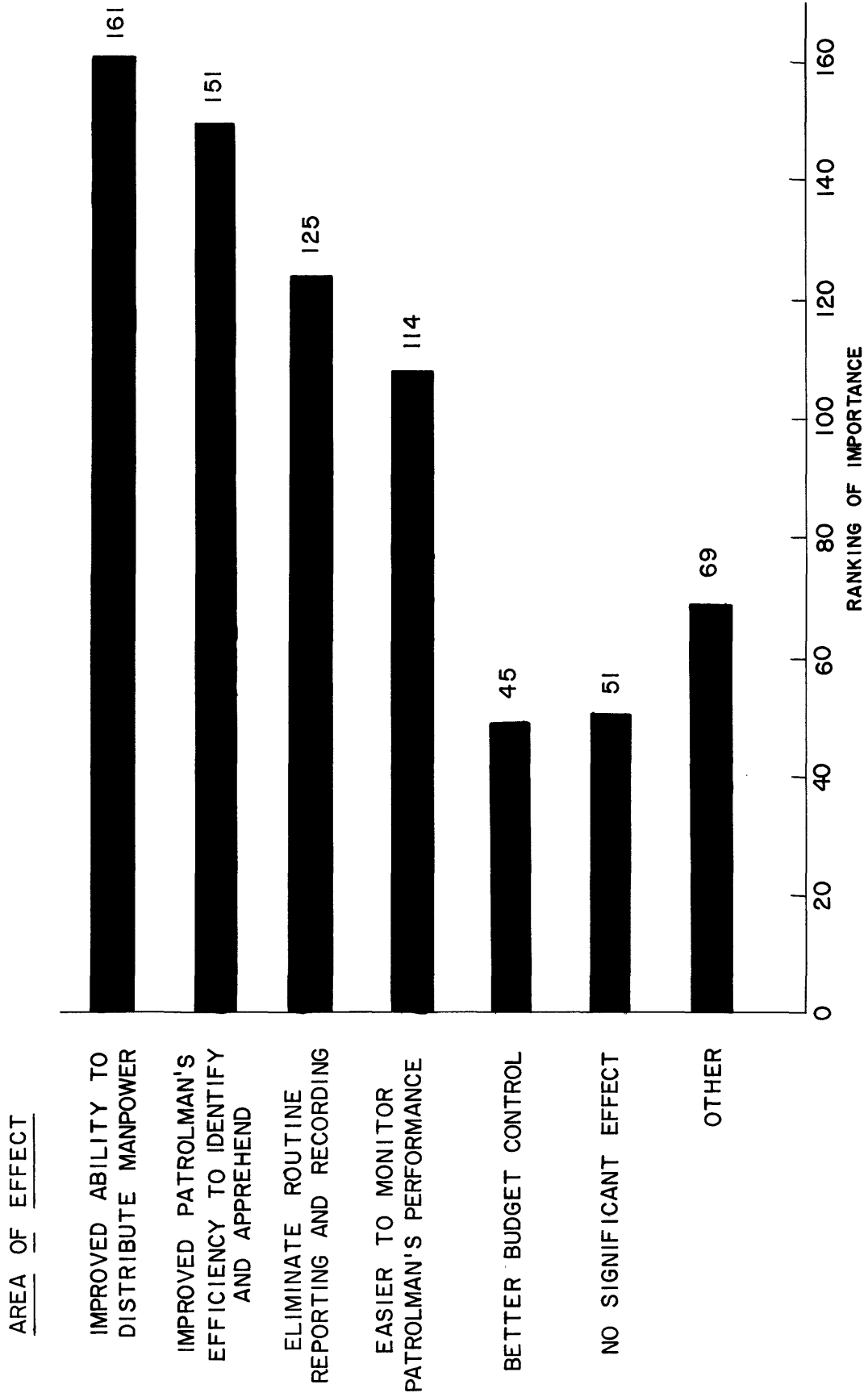


FIGURE Ⅴ - 8

that the factors which are important in implementing computer use such as education and the proper involvement of police personnel be given prime consideration. When the problems of computer use by the police were discussed in Chapter II, one of the basic conclusions was that it is not technical reasons that seem to be holding us back, but instead behavioral and people-oriented difficulties. Applications in the area of resource allocation help to confirm that proposition. The allocation model in St. Louis is heralded as the most advanced implemented to date, yet because police commanders don't understand the potential for them, in many districts the technology goes by the wayside. In contrast, the system in Dayton is simpler and has conceptual difficulties, but the fact of the matter is, it works. In this case, though, simply working is not enough as a criteria for success either. As stated earlier, both effectiveness in implementation and effectiveness in design are essential to the overall success of a computer application.

Finally, the analysis of resource allocation applications suggests a conflict between the use of technology and the achievement of a "personalized" police force. The conflict between LEMRAS and the basic car plan in the Los Angeles Police Department point to this dilemma. This is not to say that this potential clash cannot be resolved, but it should not be forgotten.

CONCLUSIONS ON UNSTRUCTURED POLICE COMPUTER APPLICATIONS

In this chapter the use of computers by police to aid in the areas of criminal investigation, command and control, and resource allocation have each been discussed in turn. It seems too simplistic to conclude that the ultimate impact regarding the use in these areas is still far from certain, and that both implementation and evaluation are complex due to the organizational, behavioral, and subjective issues which exist. However, such is the case. Further, as has been discussed, the benefits and costs in such unstructured areas are often difficult to value, as some of the previous pages will attest. Still, given the fact that police operations are highly labor intensive, it would be surprising if these types of innovations in computer technology could not be supported, at least on a cost basis and in terms of effectiveness. Richard Larson argues that this is probably the case. "Since one additional 24-hour two-man patrol unit costs in excess of \$100,000 annually, a new technology that improves operation by the same amount as a given number of additional patrol cars can be argued on cost grounds if its annual cost is less than that number times the unit cost of patrol."⁴²

Larson goes on to illustrate his point with a car locator system, and since such locators have been discussed in this

⁴² Richard C. Larson, Urban Police Patrol Analysis, M.I.T. Press, Cambridge, Mass., 1972, p. 10.

chapter it seems appropriate to refer to his illustration.

"Car locator systems have recently been justified on this basis. Such systems would provide the dispatcher with up-to-the minute estimates of the positions of all patrol units, thereby increasing the chance that the most appropriate unit is dispatched to the scene. Such improved information leads to smaller travel times. By computing the number of additional patrol units in the current system needed to achieve equivalent travel time reductions, one can compute the relative cost-effectiveness of the car locator system. Thus, for instance, if a car locator system reduces travel time in a city by the same amount as six full-time two-man patrol units each costing \$150,000 annually than the car locator system is said to be cost-effective if its equivalent annual cost is less than \$900,000."⁴³

Larson goes on to state that in reality the analysis is not nearly so simple as the illustration above implies. Changes in operation involve a number of other "softer" improvements such as increased officer safety, increased administrative and management capability, and greater flexibility. They also involve increased "softer" costs such as the depersonalization which may result when assigned beats are eliminated because of increasing cross-beat dispatching, and behavioral resistance to change. Such softer variables must receive careful consideration, and in some cases, they may be the most important factors.

It should be remembered that there is a difference between simply generating better data and providing real law enforcement benefits. People are still the most important element in utilizing

⁴³ Ibid., pp. 10 - 11.

any information acquired. New techniques can be devised, but if the people are unable to use them, little substantive change will occur. For example, a police officer in one of the cities visited felt that computers would have little impact on decision-making in his department, at least with the current administrators. "They're used to making decisions based on their seat of the pants judgement. Having a computer won't change that, not with these people." Or, as another officer put it, the potential is there, but there are only a few police departments in the country where they are really ready to put the computer to use in anything more than providing rapid retrieval of information.

The introduction of an information technology in a police department is the introduction of significant organizational change. With it comes uncertainty. Some people in the department will gain in power and influence, others will lose. Resistance is primarily a function of whether or not people view such a change to be to their benefit. As pointed out and examined in Chapter IV, the dynamics of change are vital in understanding the impact and implementation of computers.

Finally, it should be remembered that in most cases discussed in this paper, effectiveness has been defined in a very narrow way- -the improvement of police service with respect to a faster response time, a higher arrest rate, an increase in revenues through the collection of outstanding warrants, an increase in the number of tickets issued, and perhaps, a decrease

in the crime rate. These measures are related to a traditional definition of the police task and in most cases they imply that the things the police are doing are appropriate, that it is beneficial for the police to use the computer in order to increase their efficiency in carrying out these activities. Since these basic assumptions can be questioned, the measured "effectiveness" of police computer applications can also be questioned. This will be done in Chapters VI and VII. Further, payoffs from computer systems have not only technical implications, but power and service impacts. To the extent impact has been discussed in this chapter it has related primarily to the technical side. Chapter VI will discuss some of the power and service aspects of information technology and the influence of the computer on basic police issues.

CHAPTER VI

IMPACT OF THE COMPUTER ON THE POLICE

Our country is currently faced with a number of basic issues regarding law enforcement and police work. Chapter I identified three areas which seem to be at the heart of these issues: structure, people, and task. What should be the organizational and management structure of police departments? What type of people should be recruited by the police, and how should they be trained? What should comprise the principle task of the police?

So far in the paper the primary focus has been on identifying how computers are used in police departments and in trying to assess some of their advantages and disadvantages in a rather narrow way. Using Anthony Downs' definition outlined in Chapter III, the primary "payoffs" that have been discussed so far have been "technical"¹ in nature. It now seems appropriate to turn to a broader focus and to ask what impact, if any, the computer will have regarding "power"² and "service"³ payoffs as well, particularly as they relate to the basic issues which the police face.

As the analysis proceeds, though, a few basic qualifications

¹ As discussed in Chapter III, Anthony Downs has defined technical computer payoffs as technical improvements in data input, processing, and outputs. Examples are greater speed of

should be remembered. First, computer use is still in its infancy, relatively speaking. In its early stages of development few people imagined the widespread influence both positive and negative that the automobile would have on modern society. Information technology will continue to mature as did the motor vehicle and those police departments which resist will not be able to do so forever. It is therefore important to add a time dimension to the examination regarding computer impact. The implications to date will be discussed in this report, but the greatest "payoffs" will not be in the short run, but in the long run.^{3a} As a consequence, much of the information available in this chapter is not only descriptive but predictive.

processing, greater consistency among outputs, and wider distribution of information. (Anthony Downs, "A Realistic Look at the Final Payoffs From Urban Data Systems", Public Administration Review, September, 1967, pp. 204-210.)

²"Power payoffs" are gains in one person's decisionmaking effectiveness made at the expense of another person's. They are redistributions of the benefits of decision making.

³"Service payoffs", also discussed in Chapter III, are defined as the degree to which the taxpayer is serviced by municipal information systems so that their quality of life can be improved. These then are improvements in the service to the public provided as a result of or in connection with the use of the computer. (Myron E. Weiner, Service: The Objective of Municipal Information Systems, Institute of Public Service, The University of Connecticut, 1969, p. 29.)

^{3a}Perhaps one of the greatest eventual impacts will be in the area of privacy and influence on individual rights. Although this question is not covered directly in the text, Appendix C is devoted to a brief discussion of the issues of privacy as they relate to the use of the computer by the police.

It has also been demonstrated that the impact of computer use will vary widely from police department to police department, and this makes it more difficult to generalize regarding the influence of automation, at least in the short run. It is the feeling of this author, though, that eventually the greatest influence of the computer will not be through the "technical" improvements which they bring, but through the more subtle impacts on police administration, management, and politics. Naturally the subtle administrative "power" impacts of technology will be harder to identify and longer in coming, but they will come. For this reason it is important to begin to examine the use of the computer on police structure, people, and task.

THE IMPACT ON STRUCTURE

In an article referred to earlier in the thesis Harold Leavitt discusses organizations as complex systems with four basic components: structure, task, technology and people. He goes on to define the structural component as the "systems of communication, systems of authority, and systems of work flow" within the organization.⁴ Some of the most significant issues the police face have to do with their structure and the subsequent

⁴ Harold J. Leavitt, "Applied Organizational Change in Industry: Structural, Technological and Humanistic Approaches", found in James G. March, Ed., Handbook of Organizations, Rand McNally and Co., 1965, pp. 1144-1170.

communication, authority and workflow. However, after considering the research performed to date, it does not seem that the use of the computer by the police will result in dramatic structural changes, at least in the short run. Instead, the impacts will be more subtle. Direct major organizational shifts are not expected, but definite impacts of a different nature are contemplated. For example, it is perceived that the use of the computer has resulted and will continue to result in power shifts (raises in one person's decision making power primarily at the expense of another's) within the police bureaucracy. Trends of this nature which seem to be occurring include:

- 1) A shift in the work activities of those doing routine and recording tasks in police departments, but not a loss of jobs.
- 2) An increase in influence and importance of those who have technical backgrounds related to quantitative or computer skills.
- 3) A movement towards greater power for those at the higher levels of police bureaucracy.
- 4) A supporting and even stimulating effect for professional police departments vs. more traditional style forces.

Each of these will be addressed below.

A Shift in Work Activities Related to Routine and Recording

Tasks. One of the earliest hopes and fears of those who contemplated the coming of automation was the possibility that people would be replaced by machines. To those worried about losing their jobs the coming of the computer was a threat; to those who

were concerned about reducing costs in both the public and private sector there was a glimmer of hope that the use of the computer to reduce manpower would help. Experience over the course of the past decade, though, has generally demonstrated that computer use does not result in a reduction in personnel, and the observations pertaining to police departments clearly correspond. When asked by the I.C.M.A. as to what the major influence of the computer had been regarding the work activities of those doing routine and recording tasks, not a single police department indicated that people had been forced from their jobs by the introduction of the computer (see Table VI-1).

Besides the fact that police departments are insulated bureaucracies and would resist the "laying off" of men under practically any conditions, there are other good reasons for this reversal of earlier expectations. A large number of routine activities are required to facilitate automated data processing. People are needed to code information, key punch records, and verify recorded data. Many police departments in the I.C.M.A. survey (6 out of every 10 or 57.1%) indicated that the major influence of the computer was not an elimination of jobs, but a shift in work activities of those doing routine and recording tasks. People continued doing work of a routine nature, but instead of processing manual records, updating index file cards, etc., they were key punching, verifying, coding, etc. In fact, 30% of the police departments responding indicated that computer use

had lead to the creation of jobs when additional clerks were hired in order to handle EDP needs.

Besides shifting the activites of people in order to carry out computer data processing work, it also seems that increased automation in some departments has lead to a freeing up of people to do nonclerical and in some cases more creative work in their police department. Better than one out of every three police departments (34.8%) indicated that this had been the case (see Table VI-1). Whereas the major overall effect of computer use regarding routine work activities seems to shift people from clerical work related to manual information processing to clerical work related to automated data processing, in each department the precise impact seems to vary. In some departments people are simply retrained and additional people may even be hired. In other departments people are still retained but some are detailed to do computer clerical work while others are assigned to carry out nonclerical activities.

An Increase in Influence of Those With Technical or Quantitative Skills. As indicated earlier, power shifts will occur as a result of police computer use bringing about informal, subtle changes in structure. One such shift will be the increased influence within police departments of those who work with quantitative or automated methods.

In the I.C.M.A. survey chiefs of police were asked if

TABLE VI-1

INFLUENCE OF THE COMPUTER ON ROUTINE AND RECORDING TASKS

<u>Influence</u>	<u>Number Indicating (A)</u>	<u>Per cent of Total Number Responding (N=112)*</u>
People are still doing routine tasks	64	57.1%
Freed people to do non-clerical work	39	34.8
Has led to additional EDP clerical help	34	30.4
No significant effect	14	12.5
People have had to leave department	0	0
Other	<u>11</u>	<u>9.8</u>
TOTAL	162†	144.6†

*Of 146 departments using computers, 112 responded to this question.

†Total greater than 112 and 100% since multiple responses were allowed.

changes had "taken place in the amount of control or influence exercised by different people or divisions in the police department as a result of putting the computer into use?" Space was provided to indicate whether the chief, the assistant chief, precinct or division commanders, the planning-research division, the data processing division or the patrolmen in the field had gained or lost influence as a result of automation. In answer to this question, responding departments pointed out that the greatest gains in influence had been made by the research and planning divisions and the data processing divisions within police units. Six out of every ten responses (59.0% for data processing and 58.2% for research and planning) indicated that those divisions had received more influence (see Table VI-2). This was compared to only 43.6% indicating more influence for the chief of police and 42.2% point to an increase in importance of precinct or division commanders.

In further substantiation of this point, police chiefs were asked if the computer had created pressure to use quantitative or numerical information to justify decisions that were formerly treated as "intuitive", "seat of the pants" or "qualitative". Eight out of ten responded "yes" or "partially", and of those who did so, a large majority (81.3%) felt that this emphasis on quantitative rather than the qualitative decision making was about right (see Table VI-3). Not only is the quantitative approach becoming increasingly important, it is not being met

TABLE VI-2
CHANGE IN CONTROL OR INFLUENCE AS A RESULT OF COMPUTER

<u>Level or Division</u>	<u>Number Responding (A)</u>	<u>More Influence % of (A)</u>	<u>No Change in Influence % of (A)</u>	<u>Less Influence % of (A)</u>
Chief of Police	109	51 43.6%	66 56.4%	0 0 %
Asst. Chief or Chief's Direct Staff	105	46 43.8	58 55.2	1 1
Precinct, District or Division Commanders	109	46 42.2	60 55.0	3 2.8
Research, Planning Division	110	64 58.2	45 40.9	1 .9
Data Processing Division	100	62 62.0	36 36.0	2 2.0
Patrolmen in the Field	111	41 36.9	68 61.3	2 1.8
Other	17	6 35.3	11 64.7	0 0

TABLE VI-3

HAS THE COMPUTER CREATED PRESSURE TO QUANTIFY?

<u>Response</u>	<u>Number Indicating (A)</u>	<u>Per cent of Total Responding</u>
Yes	57	42.5%
Partially	52	38.8
No	<u>25</u>	<u>18.7</u>
TOTAL RESPONDING	134	

by major resistance at least by those police chiefs answering the I.C.M.A. survey. It only stands to reason that those who have a greater understanding of computers and quantitative techniques will continue to gain in power as the importance of such methods in police work grows.

Still, greater control for those at the top and a more quantitative approach to police problem solving will not come automatically with the introduction of the computer. People are still people, and the personalities and individual styles involved will have a major influence in determining the impact of computer use in each department. Speaking frankly, the computer will probably do little to alter these styles of approach in the short run if they are firmly entrenched. For example, in one department a patrolman working in data processing was asked if he felt that the computer would bring about a more quantified approach to decision making. His response was, "No, not with the current administrators. They're used to making decisions by the seat of the pants, and the computer is not going to change that." In the long run, though, it is felt that the computer will be an important influence in bringing about subtle, but significant shifts in the focus of police personnel and how they approach the solution of law enforcement problems.

Greater Power for Those at the Higher Levels of Police Bureaucracy. Police departments tend to have fairly rigid

bureaucracies with the chief playing a central, controlling role. The chief is usually responsible for rule-making and final decisions regarding innovation. Below the chief is a definite hierarchy with well-defined upward reporting relationships. Although the question remains complicated, first impressions are that computer use will tend to increase the power of the chief or at least to pass influence in an upward direction along the police department hierarchical ladder. It was found in the I.C.M.A. survey, for example, that respondents indicated that in half of the police departments around the country (50.8%) the chief made the initial proposal for the use of the computer (see Table VI-4), more than twice as often as the next highest proposer of computer use. It is possible that this figure is simply a reflection of official department "crediting" policy, but other indicators also point to the computer leading to an increase in control of those at the top. Of those interviewed by the author in the various site visits, 96% said that they felt that better information provided by the computer would lead to increased control of the police department by those at the middle and top management level.

Still, because the task of the patrolman on the street is so discretionary, it is impossible to dictate all police behavior, no matter the power of those at higher levels. The computer will not change this basic fact of police work. In fact, by providing rapid and accurate information to the patrolman, the computer will serve to increase his capability and effectiveness

Note: This table is
identical with
IV-

TABLE VI-4

WHO MADE THE INITIAL PROPOSAL FOR COMPUTER USE?

<u>Response</u>	<u>Number Indicating (A)</u>	<u>Per cent of Total Number Responding (N 118)*</u>
Chief of Police	60	50.8%
Asst. Chief or Chief's Direct Staff	23	19.5
Data Processing Manager	11	9.3
Planning, Research Director	15	12.7
Other Administrative Officer	12	10.2
Office of Mayor or City Manager	24	20.3
Outside Consultant	9	7.6
Other	<u>9</u>	<u>7.6</u>
TOTAL RESPONDING	163†	138.0†

WHAT STIMULATED THEIR INTEREST?

		<u>(N=111) Δ</u>
Professional Meetings	42	37.8%
Journals or Written Reports	29	26.1
Activity in other Cities, States	72	64.9
Computer Salesman	8	7.2
Outside Consultants	14	12.6
FBI Crime Reporting	19	17.1
IACP Department Surveys	17	15.3
Federal Assistance	16	14.4
Other	<u>15</u>	<u>13.5</u>
TOTAL RESPONDING	232†	208.8†

*Of 146 departments using computers, 118 responded to this question.

†Multiple responses possible.

ΔOf 146 departments using computers, 111 responded to this question.

as well. However, this type of data is somewhat different from the data received at the middle and top management level. At those levels the information provided by the computer will be information which can be used to evaluate behavior and to measure effectiveness. Despite the existence of rigid hierarchies among the police little such evaluation usually occurs, but it seems that if additional information and quantitative measures of evaluation are produced, they will serve to strengthen the control within police departments. Who actually benefits will naturally depend on the ability of various people to use the information generated effectively. Use of the computer then will not just automatically lead to a passing of power upward within police organization, but it will lead to a passing of power within the bureaucracy of those who know how to use the information generated, whether it be the chief of police, a district commander or whatever.

If increased computerization leads to a potential shifting of power upward within the police, one may ask how this coincides and conflicts with the current pressures for decentralization of power and community control. Such pressures have appeared in a number of shapes and forms recently, but two of these threads seem to be of greatest significance. First, there are pressures to decentralize the control of the police, or in other words to disperse the authority that governs the police and to put it in the hands of local neighborhood communities and the supposedly

representative governing bodies that might be selected by these communities. And second, there are proposals to bring about administrative decentralization. This would not result in any drastic shifts of outside control of the police, but it could mean shifts of power within the police department. The question is how the computer might relate to these pressures? Anthony Downs has postulated that the use of automated information systems will result in gains in power by the government bureaucracy as a whole at the expense of the general electorate and non-governmental groups.⁵ It is likely that this will be the case with police computer systems. Certainly it is possible to centralize control with the police in certain areas (e.g., investigation of major crimes, centralized records, overall allocation of resources, etc.) and still leave a certain amount of local autonomy (e.g., citizen review of police behavior, local modification of resource allocation). Such a centralized-decentralized compromise is very unlikely to develop, however, unless forced by political pressure. Police administrators are unlikely to give up their control willingly both for reasons of personal power and a fear of what the results might be. At the most, a chief of police might be willing to establish a greater administrative decentralization, but in such a situation

⁵ Anthony Downs, "A Realistic Look at the Final Payoffs From Urban Data Systems", Op. cit., p. 208.

power will simply be passed down to precinct and district commanders and not to the control of various people within the community.

In this power conflict, the use of the computer and the information it generates cannot be expected to remain neutral. Information is power, and if automation provides greater information for evaluation and control, whether it goes to the chief or to his district captain, such data can be expected to be used to strengthen the role of evaluation and control. Police personnel are responsible for deciding what information should go into the system, and police personnel will basically decide the use which it receives. Anthony Downs had the following to say about the gain in power to government bureaucracy at the expense of the general electorate as a result of computer information systems, and his conclusions seem directly applicable to the police.⁶

"Government officials have continuous 'inside access' to the data generated by automated systems, and they also control which data are built into those systems. No matter how idealistic they are, they will resist universal accessibility to these data. This occurs because accurate and detailed reporting of the behavior of any large organization- -private or public- -will inevitably reveal operating deficiencies that would be embarrassing if widely known. Moreover, the general electorate and most nongovernmental groups are not technically sophisticated when it comes to understanding and interpreting complex data."

⁶ Ibid., p. 208.

Movement Towards Professional Police Departments vs. More Traditional Ones. In Varieties of Police Behavior, James Q. Wilson discusses eight police departments and their varying styles of operation.⁷ Three categories of style were identified: the legalistic style (professional), the watchman style (traditional), and the service style. Each of these were discussed in the first chapter of this paper. Later on in his book,⁸ Wilson makes a brief but interesting effort to generalize his conclusions to a wider sampling of cities around the country. Form of government, somewhat modified, is used as a substitute measure of political climate. Four kinds of cities are identified- -those with a mayor and council chosen by districts on a partisan ballot, those with a mayor and council chosen on a nonpartisan ballot, those with a council-manager government and a manager ranking low on a scale of "professionalism", and those with a council-manager government in which the manager scores high on such a scale.⁹

⁷ James Q. Wilson, Varieties of Police Behavior, The Management of Law and Order in Eight Communities, Atheneum, New York, 1970.

⁸ Ibid, pp. 271-277.

⁹ "Two extreme types of council-manager cities were used- -those with a manager having none of the 'professional' attributes and those with a manager having all or most of these attributes. The 'high professional' manager cities are in general those where the manager has a post-graduate degree, has had previous experience in city management or other public capacity, and was brought to the city where he was serving in 1960 from another community. The 'low professional' cities are those where the manager has no more than a bachelor's degree, has had no previous

Wilson goes on to explain that the theory underlying these categories is as follows:

". . . the more partisan the political system, the more politicians represent small geographic constituencies, and the more nonprofessional the executive head of the government, the more likely the city will have a political culture favorable to the watchman police style. By contrast, cities electing nonpartisan officials at large and vesting executive authority in a highly professional city manager will more likely have a political culture favoring the legalistic police style."¹⁰

In order to test this idea, Wilson uses the arrest rate for certain offenses as a substitute measure of law enforcement policy or police style. The offenses used are those where police discretion is great and as a consequence where police style is likely to be most evident: larceny, simple assaults, drunkenness, disorderly conduct, and driving while intoxicated. Controlling for such factors as city size, wealth, and disproportionately high non-white population, comparisons were then made between number of arrests and form of government. (Wilson is careful to emphasize that police style is not always best measured by arrest rates, even for high-discretion offenses.) In making

experience in city management, and was recruited from the same city where he was serving in 1960." Wilson, Ibid., p. 273.

¹⁰ Ibid., p. 272.

these comparisons, Wilson outlines his specific hypotheses as follows:

"Cities with professionalized 'good government' regimes would be likely to have legalistic police forces that made more arrests than other cities in law enforcement situations (that is, for larceny and driving while intoxicated); that cities with partisan, mayor-council regimes would be more likely to have watchman-style police forces that would make more arrests in order maintenance situations where the action is typically police-initiated (that is, for disorderly conduct); that in order maintenance situations where the police response is citizen-invoked (that is, assault), there would be relatively little difference between police departments, and thus between cities, because arrests in these cases require citizen cooperation and therefore depend more on the characteristics of the citizens than on the characteristics of the police; and finally that drunkenness arrests might or might not differ, depending on whether the police saw such matters as problems of law enforcement or order maintenance, but that professionalized cities would probably show a higher arrest rate because they were more likely to take the law enforcement point of view."

Naturally, this methodology is rough and Wilson is quick to qualify his subsequent conclusions. However, with a special note to remember these self-proclaimed difficulties, the results of his attempt are engaging and have an interesting connection with this study. Table VI-5 outlines the arrest rates for the selected offenses according to the community political groupings explained above. The data seems to confirm the basic hypotheses: city manager cities with "good government regimes" seem to be more prone to have legalistic police forces, while cities with more partisan mayor-council governments seem to be more likely to have watchman style police forces. "The arrest

TABLE VI-5*

Arrest Rates for certain common offenses by community political system, 1960.†

<u>Offense</u>	<u>High-professional Council-Manager Cities (N=43)</u>	<u>Low-professional Council-Manager Cities (N=19)</u>	<u>Nonpartisan Mayor-Council Cities (N=50)</u>	<u>Partisan Mayor-Council Cities (N=34)</u>
Larceny	251.1	204.6	230.1	121.9
Drunkenness	1,185.8	1,113.6	918.0	656.5
Driving while Intoxicated	194.6	159.2	136.8	132.2
Disorderly Conduct	224.9	259.1	211.9	318.2
Simple Assault	108.2	101.2	66.3	94.0

Source: 1960 reports of arrests by local police departments to the FBI.

†Arrest rates are the total for all cities of that type; that is, the total number of arrests for all cities in each column is divided by the total population for cities in that column.

*Found in James Q. Wilson, Varieties of Police Behavior, Op. cit., Table B, p. 275.

rate per 100,000 population for larceny and drunkenness is nearly twice as high in the professional as in the partisan cities, whereas the rate for driving while intoxicated is about 50% higher. The arrest rate for disorderly conduct, on the other hand, is 42% higher in the partisan than in the professional cities. The assault arrest rate, however, is about the same in the two extreme city types."¹¹

Once again pointing out the crudeness and inadequacy of statistical tests, Wilson concludes:

" . . . there is good reason to believe that police professionalism and municipal reform apparently have real consequences for the substance of law enforcement not just in the eight cities studied intensively but perhaps in cities generally, even though the effects may be less dramatic in the typical case than in the 'pure' types selected for this study. And thus there is good reason to believe that politics, in the broadest sense, influences law enforcement but that the influence is more direct than deliberate."¹²

It is engaging, now, to relate Wilson's findings discussed above with some that were pointed out earlier in Chapter II as a part of this study. Tying the two together is revealing concerning the relationship between style of police operation and the use of computers.

In the I.C.M.A. survey it was found that police departments in city manager cities were more likely to use computers than

¹¹
Ibid., p. 274.

¹²
Ibid., p. 277.

those in mayor-council cities. This relationship held true despite the fact that most large cities which are prone to use computers are mayor-council cities. (See Table II-1 and Figure II-7, both in Chapter II.)

If police departments in city manager cities are more likely to use computers (based on I.C.M.A. study) and to have a legalistic or professional style of operation (according to Wilson's study), then it leads to several interesting hypotheses: first, that legalistic or professional police departments are more likely to use a computer; and second, that the use of the computer might eventually lead to a more legalistic or professional approach by a police department.

For a legalistic police department the computer offers the perfect tool to begin to evaluate success and to continually move towards standards of performance. That is one reason why police departments in city manager cities are more prone to a professional style and in turn are more prone to use a computer. In keeping with this, it seems that professional police departments would have a greater chance for success in the implementation of computer use due to the responsive atmosphere which most likely exists.

The evidence gathered during the site visits seems to confirm this idea. The two police departments visited that were most effective in using computers were Kansas City, Missouri and Los Angeles, California (see Chapter IV). Los Angeles is noted

throughout the country for its professional approach to police work, and Kansas City, Missouri is fast developing a similar reputation. Both are illustrations of a professional approach to police work coupled and aided by an "effective" computer system. On the other hand, several of the police departments (especially Boston) which would tend to be classified as more watchman or traditional style departments, seemed to be having difficulty by comparison.¹³ Clearly, it would be fallacious to conclude that Los Angeles' success in computer use is aided only as a result of their professional style and that Boston has suffered problems only because of their traditional approach. Still, it is a viable hypothesis that police style will have a definite influence on police computer use.

Not only is a professional department more likely to use a computer, though, it also seems that computer use will reinforce and even foster a professional approach. Within the last several years computers have become status symbols for police departments. With the availability of federal dollars even police departments with a more traditional style have purchased computers, and it is the feeling of this author that the result has been a subtle push towards the professional, a push towards measuring effectiveness quantitatively and towards

¹³In Thomas Repettos' Ph.D. Thesis, Boston is clearly identified as a traditional, watchman style police department.

utilizing quantitative analysis. Although perhaps nonmeasurable in some departments, the overall influence will be towards a more legalistic approach to police structure and task, and an attempt to move matters of order maintenance in the direction of law enforcement activities.

THE IMPACT ON PEOPLE

Many of the effects of computer use on police personnel will come as a result of possible modifications in structure and/or redefinitions of task and have therefore already been discussed. In summary, it has been found that the importance of personnel with quantitative backgrounds will increase. Further, the computer will result in a shift in work for those doing routine tasks, but it does not seem that it will result in a loss of jobs. If the computer influences a redefinition or reemphasis in police task, then the work of police personnel will be altered accordingly.

Still, the real impact of the computer on police departments will depend on the way it is received by the people within the department and on their perception and utilization of the machine as an effective tool. The amount of information collected may or may not have any bearing on the outcome of a decision, depending on the people and perspectives involved. Politics, environment, and human nature all can, and perhaps should, overshadow the quantitative approach.

In one of the cities visited, one policeman who has been involved with computers from the early days of their application in law enforcement felt that due to the attitudes and reactions of people, there were really only four or five police departments throughout the country where they were ready to use the computer as an effective management tool, as more than simply a provider of rapid and useful information to the man in the street. The primary reasons were twofold: first, the lack of vision and direction on the part of the chiefs of police; and second, a lack of enthusiasm and understanding on the part of the patrolman on the street. According to the officer interviewed, most policemen, particularly at the lower levels, "go to sleep when you talk about using computers or better information for decision making."

On the other hand, a number of police officers were enthusiastic about the potential of the computer, particularly regarding the impact that it might have on people within the police department. Several police officers felt that one of the greatest potential long run, subtle impacts of the computer would be to raise the quality of personnel in the department at all levels and to force better administration. According to one assistant chief of police, "As the computers come in, we're going to see the last of the old time policeman, and that's good. It's going to take a bright young man to learn how to use this thing. Either I'm going to learn to think computers, or I'm

going to have to get the hell out of here." This does not mean that a man must be able to use the computer in order to advance in rank in a police department. It does mean, though, that police administrators will increasingly be required to digest statistical information; and in the view of the assistant chief quoted, this would have an affirmative effect in the long run on the quality of law enforcement personnel.

In summary, the computer cannot be expected to resolve the major law enforcement issues regarding police personnel. But with time, subtle impacts may evolve. Increased emphasis will be focused on the quantitative, and eventually automation may serve to stimulate better information in the department and a higher quality of police personnel. Still, such results are in the future and in the short run basic "people" questions still remain, such as what type of people should police departments recruit? What should be the criteria for promotion? And what training should be involved?

THE IMPACT ON POLICE TASK

Although the influence to date may be small, some impact on police task as a result of law enforcement use of the computer can already be identified, and this effect will continue to grow. Two of these impacts will be discussed at this time: first, the improved efficiency and reinforcement of current police tasks; and second, alterations in the way police work is performed.

Improved Efficiency and the Reinforcement of Current Police Tasks. First, improved "police efficiency" will occur as a result of implementing computer use. Improved "efficiency" will be somewhat narrowly defined here to refer to the fact that certain computer application will bring an increased output or performance regarding aspects of law enforcement activity. As reported earlier in the thesis in Chapter IV, applications for police patrol and inquiry have already shown increased arrests from outstanding warrants and in some cases subsequently increased revenues as a result of rapid computerized response to requests or inquiries from the field (especially in such cities as Kansas City, Los Angeles, and Long Beach). In some cities, preliminary data has even shown that reductions in the crime rate have occurred at the same time that computer applications have been installed. Such was the case in Kansas City with computer assisted resource allocation for traffic control as reported in Chapter V. Causal relations have not been proven, but there are strong probabilities that such relationships exist. Improved efficiencies in police administration and record keeping have brought better reports and more accurate records. It is now possible for a number of police departments to keep better tabs on what is happening in their department and who is performing well.

Still, the definition of efficiency as used here is a limited one. Since law enforcement needs are so closely meshed with a variety of currents in our society, it is difficult to

establish direct relationships between new techniques and even such basic indicators as changes in a city's crime rate.

In an exploratory study such as this, time has not permitted the collection of the data that would be necessary to attempt such an effort. As a result, measures of efficiency have been reduced to such indicators as increases in the number of persons arrested, the recovery of stolen cars, and increased city revenues stemming from better traffic enforcement and collection of parking tickets.

Using such measures, particularly illustrated in Chapter IV, computer applications have proven successful in increasing efficiency. However, outside this narrow context, it is difficult to evaluate success regarding police task. By improving efficiency in carrying out various aspects of police work, the current tasks of police are reinforced. Although only a small portion of the policeman's time is actually spent performing "law enforcement" type tasks, many policemen still view themselves as crime fighters and their orientation is biased in that direction. In most departments little time is spent training a policeman how to settle a family disturbance; instead the focus is on enforcing the law. To the extent that the computer aids the policeman in improving his efficiency in carrying out law enforcement tasks, automation will serve to reinforce the current focus of the police.

If evaluation of performance is based on number of arrests made, and the computer makes it easier to determine that number, then automation will reinforce the importance of making arrests.

The paper has already pointed out that the computer has brought an increased influence for quantitative measure and those people who are best at using them. Since quantitative indicators are often developed in those areas where emphasis in the department is being placed, computer use will support that emphasis. In addition, it can be expected that those tasks which are most easily quantified will receive increased attention.

Naturally, a final determination as to whether this is good or bad must remain as a value judgement. To many it is a positive factor and will serve to bring a greater precision to the police task. To others who question the current emphasis of police work or who do not believe that the current task focus is correct, the implementation of quantitative measures of effectiveness and the computer is a potential threat and tends to place emphasis on the wrong areas. Although saying little about computers, James Q. Wilson has this to say about the use of only numerical indicators to measure police success:

"The central problem of the patrolman and thus of the police is to maintain order and to reduce, to the limited extent possible, the opportunities for crime. Neither objective is served by judging men on the basis of their arrest records. Both objectives may be served by organizing and supervising the patrolmen so as to increase their capacity to make reliable judgements about the character, motives, intentions and likely future actions of those whom they must police The police supervisor, in turn, would have to judge his patrolmen on the basis of their ability to keep the peace on their beat, and this, like the judgement the patrolman must make about the citizen is necessarily subjective and dependent on close observation and personal familiarity. Those departments that evaluate officers by 'objective' measures¹⁴ (arrests and traffic tickets) work against this ideal."

Related to this if the hypothesis presented in the previous section of the paper is true, the use of the computer will also serve to support the legalistic approach to police tasks. In fact, it may even move some more traditional departments towards professionalization. In the eyes of some this is a positive direction, for others it is a negative and even threatening possibility. According to William A. Westly,

" . . . professionalization, which has been the major goal of modern police administration during the past two decades, has the effect of insulating the police from public pressures. In addition, it presumably is accompanied by higher standards and better training (the methods of insuring professionalization). That we want better trained, more competent policemen, insulated from the political influence of graft is evident. Yet we must be wary, since insulation from political influence without other methods of integration such as a positive relationship to the community, can mean insulation from all of us, and if the goals of the police should vary from those of the citizens, it can become a very serious problem."¹⁵

To the extent that the computer reinforces this professionalization unquestioned, its impact, too, may be negative.

Alterations in the Way Police Work is Performed. Improved efficiency, professionalization, and the reinforcement of prevailing approaches to police task are not the only impacts that the computer may bring on the task performance of the police. Use of

¹⁴ James Q. Wilson, Op. cit., p. 291.

¹⁵ William A. Westley, Violence and the Police, A Sociological Study of Law, Custom, and Morality, The M.I.T. Press, 1970, pp. XV-XVI.

the computer may also result in major alterations in police operations. Perhaps the most striking potential stems from the linking of an automated command and control system with new approaches to resource allocation. Such a link is postulated by the President's Commission on Law Enforcement and Administration of Justice:

"A computer assisted command and control system offers many new possibilities for the deployment and control of a police force. As the crime pattern in a city changes hour-by-hour its patrol force could be deployed to respond to it. As parts of the city are stripped of patrolman by called-for-services, other units could be assigned as backup. Under a riot or other emergency situation contingency plans could be programmed so that appropriate units would be deployed to the emergency and adequate backup maintained. With all information on calls stored in the computer, complete analysis of the operations of the patrol force could be conducted regularly to aid in assigning forces in response to changing crime patterns."¹⁶

If such computer applications are ever implemented, it will mean major alterations in police work. A patrolman would not be assigned to a particular beat, but a "fluid patrol" would exist instead. When reporting for work he would be told where to cruise, and a car locator device would keep constant track of where he was at so that his time could be put to optimum use. It is entirely possible that such a method may lead to greater efficiency, increased officer safety, and improved administrative capability. However, such changes in the operations

¹⁶Task Force Report; Science and Technology, Op. cit., p. 28. A similar description is also found in Task Force Report; The Police, Op. cit., pp. 59-60.

of the police and their performance of law enforcement tasks will not come without major difficulties as well.

Financial constraints exist and aspects of technical feasibility still remain to be worked out. One of the greatest problems is the potential for depersonalization of police work which may result and the resistance and difficulties which may occur as a consequence. In Chapter V this was illustrated by pointing out the conflict which existed in Los Angeles between the resource allocation experiment and the department's basic car plan. The idea of more effective deployment of patrol forces was well accepted, but the specific application of LEMRAS, their computerized resource allocation package, lead to a reduction of the time that a man could spend in his "basic area" because of increased cross-sector dispatching. The problem in part was that LEMRAS did not consider enough variables in making allocation decisions. As a consequence, though, much of the advantage of the basic car plan was lost. This resulted in patrolmen complaints of depersonalization and in at least a partial disapproval of the computer application.

The introduction of fluid patrols has interesting potential, but it also has psychological and behavioral drawbacks. In most departments policemen are currently assigned to a beat and usually remain in that area for some time. This means that they not only have the opportunity to get to know the people in the area (some policemen fail to take advantage of this opportunity),

but they also become familiar with the locations of where crime is most likely and where preventative patrol can most effectively be performed. Further, they get used to eating in certain locations on their beat and in doing such odd jobs as taking in and picking up their laundry at certain spots while on patrol. However, Dick Larson has shown that even when assigned a particular beat, ". . . the physics of radio-dispatch patrol operation often causes an officer to leave his sector to respond to calls in other sectors in his command. . . . Thus, the one-man, one-sector concept often breaks down in practice, thereby making it difficult to assign responsibility for the delivery of services in the sector."¹⁷ With this in mind then, to place too much emphasis on the one-man, one-beat approach may be a popular myth. Still, to alter somewhat fixed patterns of behavior through the introduction of fluid patrol will not only meet resistance on the logical grounds of not providing the policeman with the opportunity of getting to know a community well, but it will also be fought because it means a new style of operations and the necessity of learning a whole new set of behavioral patterns.

In conclusion, then, this is not to say that such alterations in operation will not come. On the contrary, some form of

¹⁷Richard C. Larson, Urban Police Patrol Analysis, Op. cit., p. 244.

command and control and automated resource allocation is quite likely within the next five to ten years. However, it does suggest that difficulties should be expected and disadvantages to fluid patrol exist. As a consequence, perhaps the best alternative will eventually be some type of compromise- -fluid patrols for some officers but more specific, personalized beats for others. The question is whether such a compromise can actually be achieved.

At a minimum careful planning, selective enforcement, and the use of computer technology will bring an end to the idea that the only way to fight crime is to "get more men out on the street". Hopefully, this approach will be supplemented by the concept of doing an increasingly good job of utilizing the men who are available. It is important for police departments to realize that employing more policemen is not the only alternative solution to the cries of law and order. Not only can computer technology be expected to help, at least in a narrow way, but other options such as increased communication with the community, better efforts at education, increased emphasis on an effective correction process, and support for programs which may be helpful in removing some of the causes of crime should all be considered as alternative methods for improving the law enforcement picture in any one city and in our country.

CHAPTER VII

CONCLUSIONS AND PROSPECTS ON THE USE OF COMPUTERSBY THE POLICE

Over the last few years use of the computer by the police has grown significantly. The application of technology has become a reality in law enforcement work. This utilization will continue to expand. Certainly much of the growth must be attributed to the fact that federal dollars have been available to help finance the costs. A determination as to whether or not this expense is appropriate is contingent upon an examination of the benefits and impact of computer use.

At the beginning of this paper the question was raised whether the expansion of computer use by the police is an unnecessary waste stimulated by industrial pressure. The conclusion at this stage is that although industrial pressure and the existence of money from the Law Enforcement Assistance Administration have played a major role in promoting and making possible computer use, in many instances the application of such technology has proved to be efficient and effective, as long as the criteria for efficiency and effectiveness is a narrow one as outlined in Chapter III. Response to the I.C.M.A. survey demonstrated that favorable reaction to computer use among law enforcement

personnel was a widespread phenomenon; and a variety of examples from the site visits have shown that computer use, particularly structured applications, can save time and dollars. Since the traditional approach to meeting increased law enforcement demand has simply been to "hire more men", the use of analysis aided by the computer offers a viable alternative which should be carefully considered.

Still, departments vary widely in the success or failure of implementing such technology, and a number of the factors outlined in the previous chapters seem important in achieving favorable performance. The computer is viewed by some departments as being a nice but dispensable luxury, and there is always the potential for waste. What proves successful in one police department may be far less profitable in another.

There has been an evolution of computer use over the last ten years, and there is no doubt that some applications are easier to implement than others. Applications pertaining to routine or structured areas, particularly, have proven effective, although even there major differences remain among departments. The computer has demonstrated its utility in providing rapid real-time inquiry to the questions of patrolmen in the field and in improving police performance, although questions of privacy must constantly be considered (see Appendix C). Use of computers in police administration, traffic control, and crime reporting has been shown to bring added revenues and to lighten the paper

work burden of law enforcement personnel. This level of implementation is primarily one of handling somewhat routine activities which were already being performed manually, although most often far less efficiently. Institutional and major behavioral changes have not been required for their implementation.

Beyond these basic areas where computer implementation begins to take on unstructured applications, the design and execution becomes more difficult. The potential for impact is greater, but the results are more difficult to measure. The theory as presented in the literature is often better than the reality that exists. Most police departments collect large amounts of information, but often it is not the data that would be most useful in providing relevant inputs into major patrol and tactical decisions. Further, when it comes to such uses as computer aided dispatching command and control systems, and resource allocation, behavioral factors must be considered carefully, and the results still remain uncertain. In many cases it is not the technical but the behavioral, organizational, and administrative difficulties that keep the police from realizing the full potential of computer use.

The computer will not change people's basic nature. In fact, it seems likely that there are only selected departments that are ready to use the computer for more than a useful, but relatively routine system of retrieving information rapidly. 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." The state of the art as portrayed in the literature often exceeds reality, and a lot of computer hardware has been sold to police departments which do not need it or do not know how to use it.

The field of computer technology is still in its infancy, though, and with this in mind, computers should not be expected, at least in the next few years, to make major alterations in the law enforcement function. Certainly, technical benefits will be achieved, but it would be misleading to predict that the major issues of law enforcement will be solved immediately through the use of a machine. Law enforcement problems are a function of society as a whole. Still, as time goes on, subtle, yet far-reaching effects may begin to emerge. In fact, some impacts are currently being felt on structure, people, and task as reported in Chapter VI. One of the critical questions to ask, is whether or not these impacts will have a positive or negative effect.

One of the primary reasons for police computer use is to increase departmental efficiency and effectiveness. Implicit in such objectives are the assumptions that the law enforcement task as currently focused is correct, that the activities in which the police are engaged are appropriate and worthwhile, and that the goals and tasks of the police are legitimate and defined so as to represent the interests and well-being of most segments

of the community served. However, if one does not accept these underlying assumptions and tries to raise the question of efficiency beyond its narrow focus and to ask the question whether the current tasks of the police are the correct ones, then an evaluation of the use of the computer becomes far more complicated. The issue is no longer whether or not the computer "works", but if it "works", will it move the police in the wrong direction or have potentially negative implications.

First, the use of the computer may serve to reinforce and legitimize the current task of the police, thus making it even more difficult for people to question its basic focus. Although there has been a great deal of discussion on the appropriate role for the policeman in our modern society, the majority of the "experimental" and "innovative" programs for the police funded by both foundations and the federal government are based on the idea that law enforcement as practiced now is essentially all right, and that in most cases improving it only requires more of the same--more money, greater efficiency, etc.--not basic changes in the kinds of activities being performed. Similarly, police computer use seems to be focused on efficiency and effectiveness and to have little potential for solving the problems surrounding the definition of police task. By reinforcing the accepted task, computer use may focus attention in the wrong direction and thus make it more difficult even to question, let alone resolve the issue of what the police should do.

As an illustration of this, a wide variety of sources have pointed out the fact that the majority of most crimes are not reported.¹ The question raised is what happens when sophisticated technology is applied to such imprecise information? The possibility that the computer may give legitimacy to material that ought to be treated with skepticism is an issue that must be resolved.

Further, because police work is highly discretionary and often subjective, much of police behavior (whether it be with or without computers) is determined by the attitudes and personal backgrounds of the individuals involved. If we are ever going to solve the ultimate problems which face the law enforcement community, success or failure will depend upon our ability

¹ For example, the President's Crime Commission on Law Enforcement and the Administration of Justice initiated the first national study ever made of crime victimization. The National Opinion Research Center of the University of Chicago surveyed 10,000 households and found that the actual amount of crime in the United States was several times that reported in the FBI's Uniform Crime Report (UCR). The amount of personal injury crime reported was almost twice the UCR rate, and the amount of property crime more than twice as much. Forcible rapes were more than three and a half times the UCR reported rate, burglaries three times, aggravated assaults and larcenies of \$50 and over more than double, and robbery 50% greater than the reported rate. Only vehicle theft was lower and then by a small amount. (These statistics are reported in The Challenge of Crime in a Free Society, Op. cit., pp. 20-21.)

to work with people, not in introducing the application of new technology. Computers cannot be expected to make the enforcement of the law nondiscriminatory and equal, to improve the relations between the community and the police, to do a better job of recruiting and training policemen, or to make a wise determination as to the focus of police task. These problems must be resolved at a more basic level by people.

In the mean time, the lack of training of police officers, the background of recruits, and the existence of conflicts between the police and racial minorities may make some policemen and law enforcement agencies incapable of handling some of the computer applications and their consequences. As stated earlier, it is not the technical, but the behavioral organizational and administrative difficulties that will hold the police back from achieving the full potential of computer use.

Even if computers were programmed to effectively predict criminal activity, such procedures would be useless unless policemen themselves change. Before we rely too heavily on police computer use, perhaps we should develop alternative roles for policemen and an environment with a minimum amount of such negatives as racism, hostility, and antagonism. Obviously this is a herculean task which is not going to be accomplished overnight. Perhaps planning for the increased use of computer technology by policement throughout the country cannot wait until these issues are resolved, but it must at least take their existence into

consideration.

With people it is often the case that a person's greatest strengths are closely related to their greatest weaknesses. An aggressive, forceful person may achieve success as a consequence of his dynamic personality, but he may also alienate many because of his strong and singlesighted approach. His greatest strength- -being forceful and dynamic- -is closely tied to his greatest weakness- -being overpowering, threatening and alienating.

Such is the case with computer use by the police. There is great potential to aid in the more effective enforcement of the law through rapid communication and a more rational, structured approach to decision making. On the other hand, these very benefits, if not properly controlled or planned, may lead to misuse and a reinforcing of an inappropriate approach to police work. For example, it is easy to brush aside critical questions involving privacy and the protection of individual rights as "progress" marches forward, Computer technology in police departments should not simply be introduced and controlled by police and computer experts. What is needed is a broadly based role for the community and other interested groups in overseeing these activities, and relating them to changing concepts of police work.

In summary then, 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. This study has found such arguments to be valid in a few cases, but in the majority, it appears that the benefits of the computer do justify the costs, particularly with structured applications. (Naturally, success regarding use varies from department to department.) Further, this effectiveness and efficiency will continue to develop with time as computer technology becomes more sophisticated, and particularly as police departments get better at handling the organizational and behavioral problems which often accompany the introduction of technology and the implementation of change. Certainly at this stage oversell and unmet expectations exist in some departments. Still, information technology is in its comparative infancy, and time will probably bring some major alterations in the operations of law enforcement work as a consequence of the computer.

However, there are other issues surrounding the use of the computer that are ever more important than those of costs and benefits. The use of information technology by the police must be placed in perspective. The most pressing law enforcement questions at this time are to define the basic task of the police, to identify where the patrolman's time is really being spent, to determine whether or not this is a correct allocation of resources, and to examine whether or not current recruiting and training practices compliment the basic needs and focuses of the police. The computer along with proper analysis may help

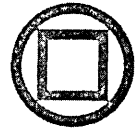
in a small way to resolve these issues, but until this is done, the implementation of the computer may also serve to reinforce the status quo, to lock in and substantiate our present approach, and to indirectly work against major renovation if it is required. As a consequence, it is possible to be worried about the negative effects of the computer on the grounds of the changes that it won't bring instead of those that it will. The computer would be a fantastic tool if it could solve some of the inherent problems of our society such as racism, inequality and poverty; or even at a less significant level if it could answer some of the basic issues which the law enforcement community faces today such as what is the basic task of the police, how should police departments be structured, and who should be selected to serve? The computer has a role to play in police departments, but it is only a machine and as such, its use should always be considered in the context of the larger law enforcement issues of our time.

APPENDICES

Municipal Year Book

Urban Data Service

International City Management Association



Application of Automated Data Processing in Police Departments - 1971

PART A: To be filled out by the CHIEF OF POLICE of all police departments.

1. Are you currently using a computer in your police department (whether it is owned by your department or city, another jurisdiction, or a service bureau)? YES () NO () 7
- If "YES," please go on to Question 2 and answer questions 2 through 8.
- If "NO," please skip to Question 9 and answer only questions 9 through 12.

2. Has the police computer system met the expectations which you originally had? (Check one)
- 8- _____ 1. Yes, in fact it has exceeded expectations.
- _____ 2. Yes, it has met expectations.
- _____ 3. No, it has not met expectations.
- _____ 4. No, and major change(s) must be made.
- _____ 5. Reactions are still mixed.
- _____ 6. It is still too early to tell.
- _____ 7. Other (please specify): _____

3. In your judgement, are the benefits which come from your computer worth the cost? (Check one)
- 9- _____ 1. Yes.
- _____ 2. Maybe, the yardsticks for measuring benefits are still very crude.
- _____ 3. It's still too early to tell.
- _____ 4. Not now, but I believe they will in the future.
- _____ 5. No.
- _____ 6. Other (please specify): _____

4. The following questions are included to get some idea as to how accurate and useful the computer system is to you. (Please check your opinion in response to each question.)

	Yes (1)	No (2)	Sometimes (3)	Don't know (4)	
a. Does the system provide you with information you need to make decisions?	_____	_____	_____	_____	10
b. Do you have confidence that the information in the system is almost always accurate?	_____	_____	_____	_____	11
c. Is the response of the system to your inquiry fast enough to suit your needs?	_____	_____	_____	_____	12

5. In your judgement, what is the biggest effect that the computer has had in your police department up to now? (Please indicate the top three by ranking them 1, 2, or 3 in order of their importance in the space provided.)

- 13 _____ a) Eliminated routine reporting and recording tasks.
- 14 _____ b) Made it easier to oversee and monitor the performance of police units or patrolmen.
- 15 _____ c) Improved the ability to distribute manpower in the department (e.g., selective enforcement, more effective allocation of patrol resources, etc.).
- 16 _____ d) Improved the patrolman's efficiency in identifying and apprehending criminals.
- 17 _____ e) Provided better control of the budget and allocating dollars.
- 18 _____ f) No significant effect has been noticed up to now.
- 19 _____ g) Other (please specify): _____

6. Have changes taken place in the amount of control or influence exercised by different people or divisions in the police department as a result of putting the computer into use? (Check one space for each person or staff level.)

	More influence (1)	Less influence (2)	No change in influence (3)	
a. Chief of Police	_____	_____	_____	20
b. Asst. Chief or other direct staff of Chief	_____	_____	_____	21
c. Precinct, district, or division commanders	_____	_____	_____	22
d. Research, planning division	_____	_____	_____	23
e. Data processing division	_____	_____	_____	24
f. Patrolmen in the field	_____	_____	_____	25
g. Other (please specify): _____	_____	_____	_____	26

7. Has the computer created pressure to use quantitative or numerical information to justify decisions that were formerly treated as "intuitive," "seat of the pants," or qualitative? (Check one)

- 27- _____ 1. Yes _____ 2. Partially _____ 3. No

If "YES" or "PARTIALLY," how do you feel about this emphasis towards the quantitative as opposed to the qualitative? (Check one)

- 28- _____ 1. Too much _____ 3. Too little
 _____ 2. About right _____ 4. Other (specify): _____

8. On the basis of your police department's experience with a computer, what major recommendations would you make to a department that is considering using one? _____

Exp. 10/1/75

9. Do you plan to use a computer within the next 3 years? (Check one)

29- _____ 1. Yes _____ 2. No _____ 3. Uncertain

If "YES," in what year? (Check one)

30- _____ 1. 1971 _____ 3. 1973
 _____ 2. 1972 _____ 4. 1974

10. What have been your reasons up to now for not using a computer? (Check as many as apply.)

- 31- _____ 1. Our department is too small.
- _____ 2. We have not been able to afford such facilities.
- _____ 3. The cost outweighs the benefits for us.
- _____ 4. Our present methods of operation are satisfactory.
- _____ 5. We do not feel the computer will be useful for our police department.
- _____ 6. Using one would have an unfavorable impact on the police force.
- _____ 7. Other (please specify): _____

11. Although you do not have local computer facilities for *your own* information processing, do you have direct terminal access to information generated from any of the following computer facilities? (Check as many as apply.)

- 32- _____ 1. FBI National Crime Information Center (NCIC)
- _____ 2. State Police Information Systems
- _____ 3. Regional Police Information Systems (Networks of local police departments or other local government units).
- _____ 4. Other (please specify): _____

12. If you are planning to use a computer, are you hoping to receive aid from the Federal Law Enforcement Assistance Administration (LEAA) in developing your use of the computer? (Check one)

33- _____ 1. Yes _____ 2. No _____ 3. Uncertain

Signed: _____ Title: _____

Thank You!

Municipal Year Book **Urban Data Service**

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**Application of Automated
Data Processing in Police
Departments – 1971**

PART B: To be filled out by all departments using computer or punch card equipment.

NOTE: This part of the questionnaire is designed to collect information on the use of both computers (referred to as electronic data processing equipment and abbreviated EDP) and punch

card equipment (referred to as electronic accounting machines and abbreviated EAM). Computer and punch card equipment will jointly be referred to as data processing equipment (or more technically automated data processing equipment and abbreviated ADP).

1a. Who has immediate responsibility for data processing in your police department?

Name: _____ Title: _____

1b. To which division within the police department does this person report? (Check one)

- 1. Directly to the Chief
- 2. Asst. Chief or other direct staff of the Chief
- 3. Operations (field services) division
- 4. Auxiliary services
- 5. Administration division
- 6. Research and planning
- 7. Other (please specify): _____

2. What kind of data processing equipment are you currently using (whether it is owned by the police department or city, another jurisdiction, or a service bureau)? (Check one)

- 1. Computer (EDP)
- 2. Punch card equipment (EAM)
- 3. Both computer and punch card equipment

If you are using *only* punch card equipment (No. 2), please move on to Question 6.

If you are using a computer or both a computer and punch card equipment, please continue with Question 3.

3. Which statement below best describes the ownership of the computer(s) used by your police department? (Check one)

- 1. Use only outside service bureau equipment.
- 2. Owned or leased solely by the police department.
- 3. Owned or leased solely by the municipal government.
- 4. Owned or leased solely by the state or state agency.
- 5. Joint ownership (lease) by the city and police department.
- 6. Joint ownership (lease) by the police department and other criminal justice agencies.
- 7. Other (specify): _____

If using *only* outside service bureau equipment (No. 1), please move on to Question 6. Otherwise continue with Question 4.

4. Please supply the following information concerning the computer(s) your police department currently is using. (If you are using one computer, simply answer Section A. If you are using two, please complete both Section A and Section B. If you are using more than two, place others on a separate sheet and attach.)

Information needed	Section A Information on 1st computer	Section B Information on 2nd computer
a. Manufacturer (please check):	<input type="checkbox"/> 1. IBM <input type="checkbox"/> 7. NCR ¹⁰ <input type="checkbox"/> 2. RCA <input type="checkbox"/> 8. GE <input type="checkbox"/> 3. CDC <input type="checkbox"/> 9. Other: _____ <input type="checkbox"/> 4. UNIVAC <input type="checkbox"/> 5. Honeywell <input type="checkbox"/> 6. Burroughs	<input type="checkbox"/> 1. IBM <input type="checkbox"/> 7. NCR ¹¹ <input type="checkbox"/> 2. RCA <input type="checkbox"/> 8. GE <input type="checkbox"/> 3. CDC <input type="checkbox"/> 9. Other: _____ <input type="checkbox"/> 4. UNIVAC <input type="checkbox"/> 5. Honeywell <input type="checkbox"/> 6. Burroughs
b. Model No.	_____ 12-16	_____ 17-21
c. Memory size	_____ K Bytes 22-24 _____ K Words 28-30	_____ K Bytes 25-27 _____ K Words 31-33
d. Is the computer dedicated solely for the use of the police dept.?	<input type="checkbox"/> YES <input type="checkbox"/> NO 34	<input type="checkbox"/> YES <input type="checkbox"/> NO 35
e. Does your department utilize any remote terminals?	<input type="checkbox"/> YES <input type="checkbox"/> NO 36	<input type="checkbox"/> YES <input type="checkbox"/> NO 37
If "YES," number of teletype remote terminals	_____ 38-39	_____ 40-41
If "YES," number of visual display terminals	_____ 42-43	_____ 44-45
5. Do other police departments utilize your computer facilities?	YES () NO () 46	
If "YES," how many?	_____ 47-48	

6. In the chart below, for each application currently being processed by ADP, please indicate which you are now using — either computers (EDP) or punch card equipment (EAM). If you are using EDP please indicate whether or not you have real time access, and the year the computer was first implemented. (By real time access we mean direct access through a terminal to computer files at any time so that all inquiries will receive almost immediate response — for example, real time access to a file of stolen vehicles through a video display terminal.)

If specific planning is already underway for additional applications to be installed sometime within the next three years, please follow the same procedure outlined above under *Future Planned Use* as to equipment and real time access.

Applications	CURRENT USE:					FUTURE PLANNED USE:			
	(Check either one or both)		Real Time Access?		If using EDP, list year 1st implemented	(Check either one or both)		Real Time Access Planned?	
	EDP (1)	EAM (2)	YES (1)	NO (2)		EDP (1)	EAM (2)	YES (1)	NO (2)
<i>Crime Related Applications</i>									
1. Criminal Offense File (Including info on type of crime, where, when, etc.) 49-			50-		(51-52)	53-		54-	
2. Criminal Arrest File (Including info on type of crime, where, when, etc.) 55-			56-		(57-58)	59-		60-	
3. Modus Operandi File (criminal patterns, techniques) 61-			62-		(63-64)	65-		66-	
4. Juvenile Criminal Activity (who, where type of crime) 67-			68-		(7-8)	9-		10-	
5. Warrant File (file of wanted persons, bench warrants, etc.) 11-			12-		(13-14)	15-		16-	
6. Stolen property file (file of stolen autos, guns, other) 17-			18-		(19-20)	21-		22-	
7. Intelligence Compilations File (Info on organized crime, subversive activities, etc.) 23-			24-		(25-26)	27-		28-	
8. Field Interrogation Report File (field reports on suspicious persons, etc.) 29-			30-		(31-32)	33-		34-	
9. Automated Fingerprint Searching 35-			36-		(37-38)	39-		40-	

Question 6 Continued

Applications	CURRENT USE:					FUTURE PLANNED USE:			
	(Check either one or both)		Real Time Access?		If using EDP, list year 1st implemented	(Check either one or both)		Real Time Access Planned?	
	EDP (1)	EAM (2)	YES (1)	NO (2)		EDP (1)	EAM (2)	YES (1)	NO (2)
<i>Police Operations Applications</i>									
10. Computer Aided Dispatching	41-		42-		(43-44)	45-		46-	
11. Police Service Analysis (info on type of call, location, time, arrest, etc.)	47-		48-		(49-50)	51-		52-	
12. Patrol Allocation and Distribution (predict crime level, establish beat boundaries, etc.)	53-		54-		(55-56)	57-		58-	
13. Jail arrests (info on who was booked, time, disposition)	59-		60-		(61-62)	63-		64-	
14. Communications switching (communication with other computers, message switching)	65-		66-		(67-68)	7-		8-	
15. Geographic Location File (computer "geographic map" for dispatching, analysis, etc.)	9-		10-		(11-12)	13-		14-	
16. Vehicle Registration File (info on registered vehicles)	15-		16-		(17-18)	19-		20-	
<i>Traffic Related Applications</i>									
17. Traffic Accident File (info on nature of accident who, etc.)	21-		22-		(23-24)	25-		26-	
18. Traffic Citation File (citations, court docket preparation, disposition)	27-		28-		(29-30)	31-		32-	
19. Parking Violation File (violations, collections)	33-		34-		(35-36)	37-		38-	
20. Personnel Records	39-		40-		(41-42)	43-		44-	
21. Payroll Preparation	45-		46-		(47-48)	49-		50-	
22. Budget Analysis & Forecasting (PPBS Systems)	51-		52-		(53-54)	55-		56-	
23. Inventory Control File (info on police inventory)	57-		58-		(59-60)	61-		62-	
24. Vehicle Fleet Maintenance (accounting for police vehicles)	63-		64-		(65-66)	67-		68-	

7. Please indicate (by number) the three applications listed in Question 6 which you feel are most important or will be most important to your department.

7-8 _____ 9-10 _____ 11-12 _____

8. Do you include information in your data processing data base about the Court disposition of crime (i.e., information on convictions and/or acquittals?)

- 13- _____ 1. Yes
 _____ 2. No
 _____ 3. Not now, but plan to in future

9. What were the *total data processing expenditures for your police department* for your last budget year ending between January 1, 1970 and December 31, 1970. If exact numbers are not available in this form, please estimate.

Personnel	\$ _____	14-18
Equipment (including maintenance)	\$ _____	19-23
Service Bureau (either public or private)	\$ _____	24-28
Consultant or other outside expense	\$ _____	29-33
Other (please specify): _____	\$ _____	34-38

TOTAL	\$ _____	39-44

10. If no data processing costs in any of the categories listed in Question 9 are charged to the police department, but instead are paid directly by the city or another jurisdiction, please check here.

45- _____ Yes, no data processing costs are charged to the police department.

11. For each category of data processing personnel, please indicate the number of full time police department employees, both sworn and civilian, as of January 1, 1971, and January 1, 1966.

	1971		1966	
	Sworn	Civilian	Sworn	Civilian
Supervisory	_____ (46-47)	_____ (48-49)	_____ (50-51)	_____ (52-53)
Systems Analysts	_____ (54-55)	_____ (56-57)	_____ (58-59)	_____ (60-61)
Programmers	_____ (62-63)	_____ (64-65)	_____ (66-67)	_____ (68-69)
Machine Operators	_____ (7-8)	_____ (9-10)	_____ (11-12)	_____ (13-14)

12. Is your police department presently connected with the computer facilities of any of the following, either by access through a terminal or by direct computer to computer hook-up? (Check all appropriate spaces.)

	Yes, Terminal Access (1)	Yes, Computer-To- Computer Hook-Up (2)	
a. FBI National Crime Information Center (NCIC)	_____	_____	15
b. State Police Information Systems	_____	_____	16
c. Regional Police Information Systems (Networks of local police departments)	_____	_____	17
d. Other (please specify): _____	_____	_____	18

IMPACT AND EVALUATION OF COMPUTER USE

The remaining Questions, 13-25, pertain strictly to the application of the computer. Only those departments which are using computer services should respond. If your department is using only punch card equipment, please sign the questionnaire on the last page, attach to Part A of the survey, and return.

13a. Who in the department made the initial proposal for the use of the computer? (Check more than one if necessary.)

- 19- _____ 1. Chief of Police
- _____ 2. Assistant Chief or Other Direct Staff of the Chief
- _____ 3. Data Processing Manager
- _____ 4. Research, Planning Director
- _____ 5. Other Administrative or Operations Officer
- _____ 6. Office of the Mayor or City Manager
- _____ 7. Outside Consultant
- _____ 8. Other (specify): _____

13b. What stimulated their interest? (Check more than one if necessary.)

- 20- _____ 1. Professional meetings
- _____ 2. Journals or written reports
- _____ 3. Activity in other cities and states
- _____ 4. Computer salesman
- _____ 5. Outside Consultants
- _____ 6. FBI Univorm Crime Reporting
- _____ 7. IACP Departmental Surveys
- _____ 8. Possibility of Federal Assistance
- _____ 9. Other (specify): _____

14. What are your major reasons for using a computer? (Please indicate the top three reasons by ranking them 1, 2, or 3 in order of their importance in the space provided.)

- 21 _____ a) To make internal operations more efficient
- 22 _____ b) To monitor the performance of police precincts or units
- 23 _____ c) To improve the patrolman's ability to rapidly identify and apprehend criminals
- 24 _____ d) To improve the ability of the department to investigate crimes
- 25 _____ e) To improve surveillance capacity
- 26 _____ f) To improve service to the public
- 27 _____ g) To get better management information
- 28 _____ h) As a part of the "professionalization" program of the department
- 29 _____ i) Other (please specify): _____

15. How often have you used an outside consulting service in the planning and preparation of the various computer applications in your department? (Please check how often for each of the various types of consulting services listed below.)

	Never (1)	Occasionally (2)	Often (3)	
a. Analysis of compuer operations (feasibility study)	_____	_____	_____	30
b. System design or analysis	_____	_____	_____	31
c. Program preparation	_____	_____	_____	32
d. Installation planning	_____	_____	_____	33
e. Review and evaluation	_____	_____	_____	34
f. Other (specify): _____	_____	_____	_____	35

16. Is the computer based system in your police department likely to become part of a citywide information system? (Check one)

- 36- 1. Yes 2. No 3. Uncertain

If "YES," would there be any question about losing the control of police information in such a citywide system? (Check one)

- 37- 1. Yes 2. No 3. Uncertain

17. In your judgement, who should control the computer system used by the police? (Check one)

- 38- 1. Police department only
2. City or county government only
3. Joint ownership between police department and city or county government
4. Joint ownership between police department and other criminal justice agencies
5. Other (please specify):

18. Who usually initiates recommendations for new computer applications? (Check more than one if necessary.)

- 39- 1. Chief of Police 2. Assistant Chief or Other Direct Staff of the Chief 3. Data Processing Manager 4. Research, Planning Director 5. Other administrative or operations officer 6. Office of the Mayor or City Manager 7. A Police Dept. Computer Committee 8. Outside Consultant 9. Other (specify):

19. How do your operations officers (not including your data processing manager) usually participate in computer projects? (Check more than one if necessary.)

- 40- 1. They usually do not 2. They pose problems they hope the computer can solve 3. They act occasionally as consultants regarding their operations 4. They staff and/or manage those projects relating to their operations 5. Other (please specify):

20. Have you used any education or training programs connected with the introduction and use of computers in your police department? YES () NO () 41

If "YES," please indicate the type of education or training programs at the various staff levels within your department. (Check all appropriate spaces for each staff level.)

Table with 5 columns: Individual Briefings (1), Special Training Classes (2), Question-Answer Sessions (3), Only Written Materials (4), Other (please specify) (5). Rows include: a. Civilian, b. Patrolmen, c. Precinct or District Commanders, d. Other Superior Officers (Sgt., Lt., Captain), e. Top Command (Above Captain).

21. In what areas of the computer operation have you had or are you having problems? (Check all spaces which apply.)

	Past Problems (1)	Present Problems (2)	
a. Planning	_____	_____	47
b. Recruitment	_____	_____	48
c. Training	_____	_____	49
d. Equipment performance	_____	_____	50
e. Equipment reliability	_____	_____	51
f. Equipment maintenance	_____	_____	52
g. Programs	_____	_____	53
h. Scheduling & Priorities	_____	_____	54
i. Management acceptance of the computer operation	_____	_____	55
j. Integrating the operation with the rest of the department.	_____	_____	56
k. Organizational or Personnel Problems	_____	_____	57
l. Other (specify): _____	_____	_____	58

22. Have you received money from the Law Enforcement Assistance Administration (LEAA) to aid in the use of computers in your department? (Check one)

- 59- _____ 1. Yes
 _____ 2. No
 _____ 3. No, but we have applied or are planning to apply for a grant

23. Has the Law Enforcement Assistance Administration (and the funds which this Administration dispenses) made a difference regarding the use of the computer in your police department? (Check one)

- 60- _____ 1. Yes, we would not have had a computer without assistance
 _____ 2. Yes, our computer efforts would have been smaller without assistance
 _____ 3. Uncertain
 _____ 4. No, our computer usage would have been the same
 _____ 5. Other (please specify): _____

24. It has been said that the computer would eliminate the work of those doing routine and recording tasks. What have been the major influences, if any, of the computer in this respect in your police department? (Check all spaces which apply.)

- 61- _____ 1. It has not had any significant effect
 _____ 2. It has freed people to do other nonclerical work in the department
 _____ 3. People are still doing routine tasks, but now they relate to data processing and the computer
 _____ 4. It has led to hiring additional clerical help to handle EDP needs (e.g., keypunchers, data collectors, etc.)
 _____ 5. People have had to leave the police department because their jobs have been eliminated
 _____ 6. Other (specify): _____

25. On the basis of your department's experience with a computer, what major recommendations would you make to a department that is considering installing one?

Signed: _____ Title: _____

THANK YOU!

APPENDIX B

SUMMARY OF EXPECTATIONS/HYPOTHESES

As a review it seems appropriate to group the basic hypotheses of the study in summary form. In the course of the thesis, each of these has been dealt with or discussed in one way or another. Although many of these hypotheses were outlined several years ago at the start of the research in one form or another, it is important to point out that some have been modified and even derived from the research effort. By this point it is a little difficult to separate hypotheses from conclusions, and certainly I would not purport that the two are entirely independent.

The specific expectations which guided the research are as follows:

General Expectations

- ... Computer use will be growing rapidly among police departments, with one of the greatest contributors to this rise being the existence of money from the LEAA.
- ... The acceptance of the computer in police departments will be positive but not striking. Evaluation of the accuracy, speed, and utility of information provided from the computer will vary from city to city, but overall will be positive.

- ... Computers will bring increased effectiveness (narrowly defined--see Chapter III) but primarily only in routine or structured areas where the machine is used to duplicate operations which were previously being carried out on a manual basis.
- ... In computer applications which are less routine (more unstructured) the results to date will be less clear. Greater difficulties regarding implementation, and organizational and behavioral resistance will exist.

Influence on police task

- ... Improved efficiency in carrying out the activities of the police (narrowly defined).
- ... Greater emphasis on a quantitative approach to defining and evaluating police task (and related to this the potential exists for a greater emphasis on the law enforcement aspects of police task).
- ... Potential alterations in the way police work is performed, and related to this, a potential for a certain depersonalization of the role of the policeman.
- ... A greater sharing of information among various police jurisdictions (local, regional, state, and national).

Influence on police structure

- ... A movement towards greater centralization of power for those at the top level.
- ... An increase in influence and importance of those who have technical backgrounds related to quantitative and computer skills.

Influence on people

- ... An increase in influence in police departments of technically educated people.
- ... Increase in the "quality" of people holding positions of responsibility.
- ... A shift in work activities of those doing routine and recording tasks, but not a loss of jobs.
- ... Behavioral/people problems will be the primary difficulties holding back computer use.

Other influences

- ... Greater reception of computer use in a legalistic or professional police department.
- ... Potential influence of the computer to move a police department towards a more legalistic or professional approach.
- ... Negative potential impacts in the area of privacy and protection of individual rights.

APPENDIX C

A NOTE ON PRIVACY AND THE POLICE COMPUTER

Although they will not be examined in great depth in this dissertation, questions pertaining to security and privacy are of major concern as they relate to the use of computers by the police. In particular, it is important to consider questions pertaining to privacy, the handling of information, and access to computerized records. These questions reflect some of the most important "power payoff" issues surrounding the impact of automation. The computer has great ability to perform tedious tasks precisely, rapidly, and without fatigue, tasks that would drive mortal man out of his mind. However, as a machine it is without a sense of values. It is therefore the user's responsibility to determine how the machine should be used and to ensure the necessary protection of individual rights.

According to Alan F. Westin, the basic issue of privacy raised by computerization is

whether the increased collection and processing of information for diverse public and private purposes, if not controlled, could lead to a sweeping power of surveillance by government over individual lives

and organizational activity. As we are forced more and more each day to leave documentary fingerprints and footprints behind us, and as these are increasingly put into storage systems capable of computer retrieval, government may acquire a power-through-data position that armies of government investigators could not create in past eras.¹

In October 1966 a special government task force on the storage and access of government statistics chaired by Carl Kayson, Director of the Institute of Advance Study in Princeton, proposed that a "national data center" be established to improve the usefulness of available statistics for policy planning purposes by funneling such statistics into a central information bank.² The proposal received Congressional attention and national publicity, but after strong debate both for and against, it was eventually tabled, at least for the time being. However, although such a direct proposal was put off, whether good or bad, the fact is that a great deal of indirect efforts are already underway to make the processing of data regarding both statistical and individual information more efficient and effective from our government's point of view.

¹Alan F. Westin, Privacy and Freedom, Atheneum, New York, 1967, p. 158.

²Report of the Task Force on the Storage of and Access to Government Statistics, October, 1966, U.S. Government Printing Office, Washington, D.C.

This is particularly true with law enforcement. A number of efforts are already underway to utilize the benefits of high speed information technology to establish more effective local, regional, state, and national networks for maintaining records and processing data.

It seems that the critical issues raised are of two types: 1) what kind of information should be placed in the computer system? and 2) what should be done with the information once it is in the system and what safeguards can be found to prevent error and misuse? Melvin Bockelman, Manager of the Computer Facilities of the Kansas City, Missouri Police Department distinguishes between privacy and security by stating that issues revolving around the first area are basically questions of privacy, while those in the second area are problems of security.³ Utilizing this distinction, there are basically two kinds of issues involving security and privacy: first, those of a social, legal, and constitutional nature; and second, questions which are more technical in nature. Sometimes questions of privacy are

³Melvin F. Bockelman, "Privacy and the Computer in our 20th Century Environment," unpublished speech made available to the author while at the Kansas City Police Department. The exact date and place was not indicated.

more often related to social and legal questions while those of security are more technical in nature. The distinction, though, is only of use at the extremes.

The key privacy issues revolve around deciding what individual or aggregate data should be placed in the computer system. Who should be given the right to define parameters? When, where, with whom, what, how and why should information be stored in a data system? These are difficult social questions and they require long and careful thought. The ultimate solution will require long hours of congressional, judicial and administrative work, and it seems that there is not enough thinking in this area underway. Great care should be made to insure that information placed in the system is completely accurate. Sometimes this can be reduced to a technical question of source and data verification. The basic question, though, of "what data?" still remains.

The primary security concern is that of safeguarding and insuring the proper use of stored information. At the heart of the issue is the solution to such questions as: Who should have access to the information? Who should control and monitor the process of dissemination? And, for what purposes should the data be used? Should you insure that a person always has access to the

information in such files concerning him? And if so, how? Once the basic questions have been answered, certain technical safeguards can be applied. Users may be allowed access only to certain portions of the information in the system by requiring careful "id codes" and by "keying" certain computer terminals so that they can be used to access only a small portion of the actual records in the computer files. Still the solution to the basic questions is at the heart of the problem.

From an operational point of view, there are three basic problems areas that are relevant to security and privacy:⁴

1. Unintentional errors. There is always the possibility that the data finally stored in the system will be incorrect due to typographical errors, mistaken identities, etc., even if there is no deliberate attempt to do so. For example, it is possible to keypunch data incorrectly; thus instead of a man having "1" criminal conviction he might be recorded as having "11."
2. Misuse of data. Information can be used out of context or for purposes beyond legitimate criminal justice functions, both by persons who are actually authorized access, and by those who acquire the information without authorization. For example, the Kansas City, Missouri Police Department goes to great extremes

⁴Found in Security and Privacy Considerations in Criminal History Information Systems, Technical Report No. 2, Project SEARCH (System for Electronic Analysis and Retrieval of Criminal History Files), Committee on Security and Privacy, Dr. Robert Gallati, Chairman, July, 1970, p. 5

to maintain proper security. However, in 1970-71, two known violations of data confidentiality occurred regarding the police computer system. In one case, a police official in a neighboring city used the system to check out prospective tenants for apartment owners. The violator was "reprimanded" by the Kansas City Police Department and the department he was a part of was told they would be taken out of the regional network if another violation took place. In another instance, a police officer used a remote terminal to obtain an arrest record and then made it available to an employer. Again a strong reprimand was given. As a consequence of these two instances, security has been tightened all around and strong notices were issued to all users warning against any such practices in the future. Still, no one has been dropped from the Kansas City system yet, and such abuses remain difficult to guard against.

3. Intentional data change. The data maintained can be destroyed or modified for personal reasons or to restrict the proper and effective performance of criminal justice functions. For example, it has been suggested that organized crime may attempt to penetrate criminal justice systems, particularly those on a national scale, for the achievement of this purpose.

Perhaps the best illustration of a criminal justice information system where special effort must be made to consider problems of privacy and security is the federally funded Project SEARCH (Systems for Electronic Analysis and Retrieval of Criminal Histories). Project SEARCH began as an 18-month multi-state effort in June 30, 1969 to develop a prototype computerized criminal justice information system. It was financed by the Law Enforcement Assistance Administration and ten participating

states (Arizona, California, Connecticut, Florida, Maryland, Michigan, Minnesota, New York, Texas, and Washington).

The objectives of Project SEARCH were twofold:⁵

1. Establish and demonstrate the feasibility of an on-line system allowing for the interstate exchange of offender history files based on a compatible criminal history justice offender record integrating basic information needs of police prosecution, judicial and correctional agencies.
2. Design and demonstrate a computerized statistics system based on an accounting of individual offenders proceeding through the criminal justice system.

The project has now gone beyond the developmental phase, and implementation is underway. According to a letter from Mr. Jerris Leonard, LEAA Administrator, to SEARCH Project Group Chairman O. J. Hawkins, January 25, 1972, the LEAA now intends to provide for all 50 states in the U.S. to participate in future SEARCH activities. Letters were being written to the Governors of each state asking them to nominate a representative to serve on an expanded 50-state Project Group. The first meeting of this group was scheduled for April, 1972.⁶

⁵SEARCH, Systems for Electronic Analysis and Retrieval of Criminal Histories, p. 2. Fifteen page information brochure prepared as a part of the information dissemination effort of Project SEARCH, Grant Project 69-DF-022 and 69-DF-041. No date given.

⁶ Project SEARCH, newsletter, Volume 4, Issue 1, February, 1972, pp. 1-2.

Although consideration is being made of questions of privacy and security as a part of Project SEARCH, the idea of an automated national criminal history file is one that should not be viewed lightly. The potential for increased law enforcement efficiency and effectiveness seems great, but there is also great potential for unintentional errors, misuse of data, and intended data change. In Project SEARCH, the basic questions of what information should be included in the system and who should have access to such data have been addressed, but not on a sufficient scale with national public exposure. There is a real need for national guidelines regarding the implementation of such systems. Project SEARCH has developed a set of guidelines, but the issue is so important, that a continuing public discussion on such policy should be held at a general, judicial, legislative and administrative level.

In a speech on "Privacy and the Computer in our 20th Century Environment" Melvin J. Bockelman outlined ten major guidelines which he felt provided a foundation for "reasonable privacy within ethical and acceptable

⁷Melvin J. Bockelman, "Privacy and the Computer," footnote 28.

standards of our society." They were as follows:

1. Data included in the system must be limited to that based upon a source document maintained on file in the agency which exercises management control over the system.
2. Adoption of a careful and permanent program of data verification against source documents. I believe we must be committed to the spending of approximately 5% of our total automation budget in support of validation of automated information files. This could be accomplished effectively in 4 steps.
 - a. Printout of automated files for validation against source documents which were the original authority for the data entry in the first place.
 - b. Creation of computer programs which can identify incorrect codes and data, earmarking these for correction against the source document of entry.
 - c. Creation of computer programs which can edit against relationship conditions and requirements. This is a very valuable "caution indicator" and has in many instances alerted our department to a whole series of inconsistencies.
 - d. Provision of the clerical staff necessary to insure proper validation.
3. Education programs should be instituted for all who might be expected to employ system data especially those who access data from remote terminals.
4. The computer system should be programmed to screen all inquiries to exclude those inquiries inconsistent to system rules.
5. Those systems operating in a telecommunications environment should log all actions occurring on the network, so that any or all transactions taking place may be examined at any time from the real time log file.

6. Program Systems should be designed to provide for "Locked Data Files" in which such files cannot be accessed until the proper codes or passwords are read and matched by the computer which then authorizes access to the files.

7. Rigid security and inventory controls should be implemented in computer library operations to prevent duplicating files and removal of same to unauthorized sources.

8. Remote terminal operations should be under programmed control to rigidly control access to only those real time files that the user has prior clearance to access.

9. Users of system data should be clearly informed that careless use of system data represents unprofessional conduct and may be subject to disciplinary or litigation action. It is of the utmost importance that a procedure be written which clearly identifies to whom data may be released, under what circumstances, and should identity of the citizen named be removed before release?

10. Of major importance I believe is the need to give the citizen the right to some control over when his name is being considered for reference to another agency. It is the constant receipt of unwanted credit cards and unsolicited business ventures that is very repulsive to many citizens. To counter-balance this trend and to gain the confidence of our citizens I suggest application forms include a column on the card which simply asks the citizen to indicate simply YES or NO, whether his name can be referred to other prospective business interests. So what if 95% say no, we will probably have a much more active prospect list and we are also doing our part in upgrading the quality of automation in the eyes of the general public.

This listing of policy guidelines is a place to start, and it is certainly necessary. However, the guidelines seem mainly to deal with the more technical

side of assuring accurate information and preventing misuse. The idea of technical security seems to be fairly well covered but the basic issues of who and how to determine what information should be in the system, and who should be given access still remain unanswered. It is these issues that this author feels to be most important; and it is these issues which seem most neglected.

In summary, these issues of privacy and security are perhaps the most critical in considering the potential impact and application of computers in the area of law enforcement. Certainly, a great deal more thinking and debate must be carried out. The ultimate solution will revolve around the trade-off relationship between the "need to know" on the one hand in order to increase police efficiency and performance, and on the other hand, the right of the individual to privacy and security.

The words of Alan Westin are important to consider in closing:

For planning, efficiency, and social control, these government data centers, computerized transaction systems, and central record files of the future could bring enormous benefits to society. But unless safeguards for privacy are placed carefully in the

planning and administration of systems that most computer experts feel to be inevitable developments of the next two decades, the growth in data surveillance will be awesome. Meanwhile, the present dossiers and computerized information systems continue to increase, without many legal or administrative guidelines as yet to cope with the issues of privacy that they raise.⁸

⁸Alan F. Westin, Privacy and Freedom, pp. 167-168.

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BIOGRAPHICAL NOTE

Kent Winterton Colton was born November 21, 1943 in Salt Lake City, Utah. As an undergraduate he attended Utah State University graduating with a major in economics in 1967. The next year he studied at the Maxwell School at Syracuse University where he graduated first in his class with highest honors and received the Masters of Public Administration (M.P.A.) in June, 1968. Since the fall of the same year he has been a doctoral student at the M.I.T. Department of Urban Studies and Planning. From 1970 to 1972 he was at the Joint Center for Urban Studies of M.I.T. and Harvard where he held a Samuel Stouffer Fellowship. Mr. Colton's professional and consulting experience include such activities as Research Analyst at the Boston Redevelopment Authority where he designed and implemented a management information system, and work as the founder and partner of a small health planner consulting group, Health Planning Associates, Cambridge, Massachusetts.