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STUDY OF POLICE MANAGEMENT INFORMATION SYSTEMS

VOLUME IV: TARGETED INFORMATION PROCESSING SYSTEMS (TIPS): A DEVELOPMENT PROGRAM FOR POLICE MANAGEMENT INFORMATION SYSTEMS

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CHAPTER I

INTRODUCTION

In the spring of 1976, Decision Dynamics Corporation was asked by the Ministry of the Solicitor General to conduct a study of police management information systems for Canadian municipal police forces.

The objective of the project is specified as: "develop management information systems specifications that could be used by Canadian police departments to guide future information systems development. Documents developed through the study would represent source books, handbooks or standards which police forces could use to identify first, their own information requirements, and second, the general specifications of information systems required to meet these needs".

This volume is the fourth of five separate reports which together comprise the total documentation arising out of the "Police Management Information Systems" study.

The five major volumes of the final study report are:

- Volume I: Technological Alternatives and Development Initiatives for Canadian Police; in this volume we project current trends in policing for Canadian municipal jurisdictions and their implications on the need for MIS in the future.

- Volume II: Police Management Information Systems Developments in the United States: A Comparative

Review; in this report, we review MIS development in American police jurisdictions and extract a number of basic "lessons" for the Canadian audience.

- Volume III: Police Management Information Systems: The Canadian Experience; here we describe MIS initiatives in a number of Canadian police forces and conclude with comments about the development process in the Canadian environment.

- Volume IV: Targeted Information Processing Systems (TIPS): A Development Program for Police Management Information Systems; this volume contains a conceptual framework for developing a management information system in a Canadian police jurisdiction. The major emphasis is on "why?" and "how?".

- Volume V: Targeted Information Processing System (TIPS): General Design Specifications; this final volume contains most of the technical design qualities of the TIPS framework presented in the previous Volume IV. Each TIPS component is described by a general flow chart illustrating inputs, output reports and file interactions. The contents of each file are described in terms of the various record types and data elements.

A. The Purpose of this Volume

In previous volumes of this study, we have extensively described the MIS initiatives in several police departments in the United States and Canada. We conclude that

police MIS developments in the United States are much more advanced. In Volume III, we conclude that the Canadian municipal police environment is characterized by:

- a low level of involvement with MIS; few Canadian police departments at the municipal level have developed any MIS applications.

- inadequate commitment of resources; most departments surveyed indicated no commitment of resources in terms of staff and money to the development of computer-based systems.

- misplaced responsibility for data processing functions; most departments considered that their planning and research sections should be responsible for the development of MIS. Only a few departments indicated that they had established a separate data processing or systems and procedures group responsible for the development and on-going maintenance of information systems.

Notwithstanding the negative tone of these comments, we believe that there is a growing interest on the part of police managers in municipal departments across Canada to explore the need for computer-based information systems. Many of those departments surveyed indicated that they had specific plans for future systems developments.

The purpose of this volume is two-fold:

- to define the basic elements of a police MIS in the Canadian municipal environment.

- to identify the major tasks involved in the development and implementation of such systems.

We accomplish these objectives through the development and presentation of TIPS - Targeted Information Processing Systems. TIPS is a conceptual framework of a police MIS. The major components are defined. The files and their contents are described. In addition, we identify the major phases and steps involved in the program of development and implementation.

The descriptions contained in the volume represent general design statements which do not relate to the problems and needs of any specific police department. TIPS cannot be viewed as an instant solution. However, this framework should provide a reasonable guideline to assist Canadian police managers with the rather difficult job of defining their data processing needs.

The chapter which follows this introduction provides descriptions of some basic MIS concepts. They include:

- MIS as a tool for controlling information resources,

- information supply and demand conditions,

- the computer as a technology alternative, and,

- MIS master planning.

These basic concepts are presented as background to main topics of this volume.

The following chapter describes the organizational aspects of MIS and the reasons why a police department should consider the development of computer-based information systems. It begins with a description of organizational development criteria and the effect improved information systems should have on a police organization. The concepts of information supply and demand conditions are described within the context of police command levels and functions. The concluding section describes, in general, some of the MIS related problems in Canadian police departments and the need for change.

The fourth chapter contains the descriptions of TIPS - the TIPS components and files. Additional, more detailed, descriptive material is contained in Volume V.

The last chapter of Volume IV identifies the five major phases involved in a system development program. This catalogue of procedures includes:

- feasibility study
- set-up
- system construction
- facility selection
- operations and system maintenance.

The concluding section contains descriptions of the cost elements of a development plan using TIPS as an example.

B. TIPS: The Catalogue of Procedures

We have used the term "catalogue of procedures" to describe the purpose of this volume - and, to a large extent, the subsequent Volume V. The term is an important comment on our intentions for the application of TIPS in an active police MIS environment.

We do not propose TIPS as the "ideal model" of police MIS. It is only one of many approaches. It is based on our understanding of police functions and information needs. The understanding was developed through numerous visits to police forces in both Canadian and U.S. jurisdictions. However, this understanding as a premise for an MIS development program may not be valid for a particular police force. The TIPS program is a logical and consistent set of development directions that must be carefully assessed and perhaps restructured, before a police force commits the necessary funds to an MIS development program.

CHAPTER II

MANAGEMENT INFORMATION SYSTEMS CONCEPTS

A major new discipline began to emerge during the Second World War. Generally known as "management science", it has had a profound impact on both private and public institutions. Productivity has significantly increased. Beyond this, the application of management science has forced decision-making to become much more precise. Management science is based on quantitative statements of what has happened, what is happening and what will happen. Impressionistic statements based on intuition, "gut" feeling or other vague notions of what was, what is and what will be, are still important, but in many areas they are supplemented with "hard" data.

The development of Management Information Systems is directly attributable to this increased awareness of the need for quantitative information. We define MIS as: the process whereby data is collected, stored and retrieved to provide specific information for decision-making. A management information system begins with the way decisions are made in the entire organization and is designed to target information to the various levels and functions of decision-making. An MIS within a police department must be targeted to meet the information needs at all levels - operations as well as management.

There is widespread confusion about Management Information Systems arising from misunderstandings about, first of all, the scope of the system and, secondly, the role computers play in MIS developments. A proper management information system encompasses the entire operation of an organization

and clearly supports management as well as operations. The computer is merely an alternative to the manual processing of data. The existence of a computer does not define the existence of an MIS. Moreover, the absence of a computer does not define the absence of an MIS; management information systems can exist without computer.

Nevertheless, MIS is, in many respects, the focal point of technological change for modern management. Traditionally, MIS developments are dominated by the data processing professionals, and are not well understood by the managers who make use of them. Computer technology has not been around long enough to wear away many of the "future shock" implications for the ultimate users and managers of this technology.

This chapter of our study is an attempt to circumvent the computer mystique and to dispell some of the myths and misconceptions about MIS, and computers in particular. In the remaining sections of this chapter, we have discussed various concepts which we feel are vital to gain an understanding of MIS. These include descriptions of:

- information as a resource and the need to manage and control it through the development of MIS.

- the supply and demand of information and the need to consider both the efficiency and effectiveness of information processing.

- the computer as a technology alternative.

- the need for a Management Information System master plan.

These discussions are rather general. It is important for readers to gain some insight into these fundamental issues of MIS before launching into the specifics of the why, what and how questions related to the development of MIS in Canadian police departments. These questions are addressed in the subsequent chapters of this report.

A. MIS - A Tool for Controlling Information Resources

Information is a resource as important to an organization as its people, its buildings and its equipment. Management Information Systems are a tool for controlling vital information resources.

To illustrate this concept of information as a resource, we have borrowed Peter Drucker's analogy for the information industry, as outlined below:

> "There is a great deal more to information and data processing than the computer; the computer is to the information industry roughly what the central power station is to the electrical industry ... information, like electricity, is a form of energy!"

The resource concept of information is generally not well understood. There are significant costs associated

with the generation, storage, transmission and retrieval of data and, often, the magnitude of these costs is not clearly understood. Information resources are probably the most poorly managed resources within the organization.

Recognition of the resource concept of information naturally leads to the recognition of the need to understand and control the various aspects of information processing. Simply stated, a management information system can be defined as a tool used to organize and control the information resources of an organization in an efficient and effective manner in order to support decision-making at all levels of the organization.

MIS is only a tool. MIS cannot and must not be viewed as the ultimate solution to most or all of the problems of an organization. Unfortunately, some data processing professionals lead senior management and other users to believe that MIS can cause many of their problems to go away if a larger computer is purchased or a specific data-base package is acquired. Clearly stated, MIS will <u>not</u>, by itself, lead to:

- more effective management,
- a better understanding of organizational objectives,
- better decision-making,
- higher quality staff and managers,
- a better organizational structure,
- a higher quality of training,
- a better allocation of scarce resources,
- a higher productivity, and,
- better service.

A Management Information System which has been properly developed and used can assist the organization in achieving the results listed above. But, the ultimate purpose of a Management Information System is to provide the means for understanding and controlling information resources in order to meet the needs of users at all levels within an organization in a cost-effective and cost-efficient manner.

The ultimate success or failure of an MIS development depends on the following:

- <u>Recognition of the Need</u>; senior management must clearly recognize the need for MIS, and this recognition must be impressed on all levels of authority.

- <u>Major Commitment of Resources</u>; senior management must make a major commitment of resources. MIS development projects are expensive and time consuming.

- <u>Willingness to Accept Change</u>; senior management must be willing to readily accept change. The introduction of the new technologies embedded in MIS can cause instability within an organization.

- <u>Development and Acquisition of New Skills</u>; MIS requires a significant commitment to the development and acquisition of data processing skills. These skills are essential to

development and operation of MIS.

- Senior Management Control of MIS Developments; senior managers must become actively involved in the direct management of MIS developments. Data processing professionals cannot be left to their own devices.

- High Level Accountability for MIS Development Group; senior management must recognize the need to have the MIS development staff reporting to a high level senior management. For example, an MIS development group should report to the Deputy Chief of Administration in a police department.

B. Information Supply and Demand - Efficienty vs. Effectiveness

We believe that there are two different perspectives of information systems for complex organizations - supply and demand.

On the one hand, there is the strictly technical perspective of information systems which we have labelled "supply-oriented". This perspective begins with a configuration of information based on how information is captured and stored through the current operating procedures of the organization. "Supply-oriented" information system tends to focus on the improvement of particular routines and procedures for capturing and displaying information.

To illustrate the "supply-oriented" approach, consider the occurrence reporting procedures for a police department. This procedure is responsible for a large proportion of the information collected and stored for use in a police department. It is a complex procedure. For many police departments, occurrence reporting involves numerous data collection forms, each containing literally hundreds of data elements. The supply-oriented approach to information system development would focus on the occurrence reporting procedure as an entity unto itself; design criteria would focus on improving this procedure so that it is capable of capturing and displaying information more efficiently.

The supply perspective on information systems is a fundamental and important element of information systems design. But it does not go far enough. It must be complemented by a "demand-perspective". This emphasizes the "demand for information", which in turn, is inspired by the police organization and the way it uses information to satisfy its aims and objectives. Consider again the occurrence reporting procedures. The "demand-oriented" perspective would focus on who in the police organization needs what type of information from the occurrence reporting procedure, to satisfy what kind of job function? The demand perspective on information systems brings information system design away from the technical world of computers and forms design into the mainstream of police management science. Information systems designers must be accomplished in the art of police management.

We do not suggest that supply and demand can be kept separate in the development of management information systems for police forces. We have separated them in this report for purely illustrative reasons, and to enable us to place the proper degree of emphasis on the "management elements" of management information systems for police.

Efficiency of an information system falls within the domain of the "supply" perspective of an MIS. "Doing things right" is the main concern of the efficiency expert. Costs associated with the generation, collection, storage and retrieval of information should be minimized. The introduction of a computer as an alternative to manual technology is perceived to be an efficiency move.

On the other hand, the effectiveness of an information system falls within the domain of the "demand" perspective of an MIS. "Doing the right things" is the key. The effectiveness of an MIS design depends on knowing and responding to the needs of end users of the information. Who needs to know, what information, displayed in what format, and when to do his job?

Efficiency of information processing does not necessarily lead to an effective system of data processing. Our entire report, and the fundamental concept of TIPS (Targeted Information Processing System), is based on the notion that both supply and demand conditions must be satisfied before an appropriate MIS can be developed by a police department.

C. The Computer - A Technological Alternative

There is little doubt that a revolution has occurred in management technology for all organizations during the post-war period. A major element of that revolution has been the development of computer technology. This new technology, which is still in a state of constant improvement, has made possible the efficient growth of large and complex organizations. We believe that this technology will have a profound effect on police management. However, computer technology must be carefully applied. Computers alone will not create management information systems which satisfy the needs of managers and other users. The computer simply provides an organization with the capacity to process data efficiently. It does not necessarily contribute to the effective use of information.

This is an important distinction. By efficiency, we mean "the cost of moving a particular piece of data from one medium to another". It typically costs less for a computer to search a file and display a piece of information than for a clerk to manually search a paper-filing system and transcribe an equivalent piece of information.

By effectiveness, we are concerned with the whole new range of management potential that is opened up by the development of computer systems. This question alludes to the way that computerized management information systems are developed to satisfy the maximum number of purposes and functions in the police department.

The computerized Management Information System should be designed to do more than replicate the existing records system. The essential power of the computer is to process information quickly and inexpensively. The more times that a particular bit of information can be used in analyses of different kinds, the more efficiently the computer operates to improve the effectiveness of management.

Consider a simple example from the domain of police management. Computer-aided dispatch systems are designed to manage information on patrol dispatches in order to improve call-for-service response time and, thereby, increase the effectiveness of the responding police officer. However, since the computer is being used as the technology alternative, there is potential for inexpensive electronic storage of field information recorded by the computer-assisted dispatch system. This information can also be used for other types of management purposes such as crime analysis, and a host of other purposes.

If a computer is introduced into a police department, the entire basis of information supply is changed. Opportunities are created for the development of information systems to serve all management and user requirements. However, the arrival of a computer does not guarantee that the demand conditions of information will be satisfied.

D. <u>The Need for a Management Information Master Plan</u>

The logic of supply, operating on its own course,

will not lead naturally to the development of an efficient and effective management information system in a complex organization. If a management information system development program follows lines of growth dictated by supply criteria exclusively, the result will be a system dedicated to the maintenance of records and the processing of daily paper flows.

We can draw two conclusions from this observation. They are:

- an information system is sufficiently complex, expensive and potentially useful for management purposes to justify a major "front end investment" in the form of a comprehensive Master Plan.

- the Master Plan should begin with a thorough analysis of the organization's demand for information. This analysis should define who in the organization needs what kind of information, for what purposes.

The aim of the Master Plan is to define the needs for information for each management function and level of the organization, then propose a scheme for developing, over time, a system which satisfies these requirements. In a sense, the Master Plan brings together the supply and demand conditions.

Without a Master Plan, MIS development tends to follow the logic of supply. The systems development effort concentrates on converting current manual systems

into computerized systems. Specific functional users of the information system may well be satisfied with the results; the general aims of management may only benefit marginally.

We are not suggesting that "supply conditions" are unimportant in developing and MIS; in fact, we would argue the opposite case. Every new scientific application requires practical, technological or engineering mechanisms before it emerges in the form of a tangible product. The modern automobile could not have been produced without the internal combustion engine. It could not have been mass produced, without the development of assembly line technology. Nor can management information systems be developed without all of the engineering conditions inherent in systems analysis and computer technology; these define the "supply conditions" of MIS.

We are simply stating that computer technology and systems analysis cannot be allowed to work alone to develop management information systems which claim to satisfy the needs of managers. The organization and its management processes are served by MIS; they must

determine its scope and purpose.

In conclusion, it is interesting to note that of all the U.S. police forces we visited during the course of this project, the two most successful Management Information Systems were built around comprehensive, well specified and well documented Master Plans. Both the Kansas City and Los Angeles police departments invested significant resources many years ago in the development of MIS Master Plans. Ten years later, the Master Plans still seem like reasonable and realistic documents. It is just as significant that both of these jurisdictions, especially Los Angeles, operate in a strict, objective framework of accountability to higher-level municipal and regional agencies for public appropriations. The Master Plans were designed to act as a basic reference point for public scrutiny in public investment projects created to satisfy objective rate of return criteria on these expenditures.

CHAPTER III

THE POLICE ORGANIZATION AND INFORMATION SYSTEMS

In the previous chapter, we outlined two different perspectives of management information systems - supply and demand. Supply conditions, including the logic of the way information is built up within an information system, the efficiency of storage media utilized, and other technological conditions, are essential to the success of MIS. We also concluded that, although adequate representation of conditions of supply is essential to the success of MIS, this is not a sufficient condition to the successful use of MIS by managers of complex organizations. The MIS must not only handle information efficiently, but must be designed so that it can satisfy the need for information in the organization. This is the "demand side" of the information equation. The demand for information begins with the way responsibility is allocated in the organization.

In the first part of this chapter we are interested in commenting on organization from the standpoint of its relationship with information systems design. Few police departments will look like the organization structure outlined in this chapter. However, we want the police manager to use

this framework for assessing the organization in terms of information consumption.

Why is organization important to the development of Management Information Systems? Let us begin by considering the converse question: How is information important to police organizations?

Few police managers are fully aware of the total dedication of resources within their own organizations, for preparing, storing and retrieving information for field operations and management purposes. Patrol constables spend a large portion of their working time preparing occurrence reports and related information for storage in records systems and criminal investigation. The Central Records Section of a police department is composed of police and civilian personnel who spend all of their time storing and processing this information. Senior management, by virtue of its more general responsibility, spends a large portion of its time manipulating numbers and creating information for decision-making. The processing of information is probably the most expensive service performed by police departments.

There is another key relationship between organization and information processing. All agencies experience significant organizational change, including police departments with their apparently rigid organizational structures. Officers are promoted; new functions are created; new priorities are realized and accepted. Both the formal and informal structures change accordingly. But information processes change less often. They tend to remain buried in standard operating procedures, long after they have become dysfunctional to the prevailing organizational structure.

They should be reviewed often and restructured, if only fine-tuned, to satisfy new, perceived organizational needs.

An organization is a framework for allocating specific responsiblities and authority to carry out an agency's mission. A multitude of decisions are made daily to support the organizational authority structure, relative to its goals and objectives. The decisions, tasks, activities, functions and authority structure of an organization define its information needs. Given the thorough analysis of the relationship between information needs and organizational factors, cost of information processes in police department is crucial to increasing productivity in police performance. The remainder of this chapter is dedicated to a discussion of these relationships and our perceptions of the basic problems of information processing in police organizations.

A. The Effect of Improved Information Systems on the Police Organization

An improvement in the information processes of a police force will have a major impact on the organization. In this section, we consider the type of impact that should be anticipated. We assess the impact on seven "organizational criteria", i.e.,

- clear definition of services,
- responsibility/authority balance,
- public accountability and responsiveness,
- clear scope for planning,
- development and application of expertise,

- satisfaction of individual career goals, and,
- organizational flexibility.

We do not consider these seven criteria to be the "aims" of good organization. Rather, they are presented in this report to illustrate the effect of MIS on police organization.

We have not yet clearly defined police information systems for Volume IV. So, for purposes of the explanations in this chapter, we will consider the broad spectrum of information supply in the following areas:

- field support information, delivered to patrol officers and investigators on specific conditions of field activities and crimes.

- performance information, available to middle and senior managers supporting a review of operational performance in all major police activities.

- planning information, supporting analysis of historical events in relation to probable future events.

In the seven sections that follow, we will examine each of the organizational criteria for how they are affected by improved information systems.

1. Clear Definition of Services

Improved information systems do not necessarily lead to a clearer definition of police services in a police department. The relationship between information systems and the definition of services (through a program structure or similar construction) can be enumerated in two different ways. First, the development of an information system requires a clear definition of services. Systems are designed to complement and improve operations in fairly-well-defined functional areas. Unless we know the objectives of, say traffic enforcement, we cannot design and implement an expensive information system to support the traffic enforcement operation.

Second, one of the major benefits of information systems is their ability to provide timely information on the "performance" achieved by particular police resources. Performance measures cannot be developed unless there is a clear definition of services.

2. Responsibility/Authority Balance

In every organization we can define separate structures of responsibility and authority. Responsibility describes the tasks individuals are expected to perform in satisfying the objectives of their jobs. Authority defines the scope of their power to provide individual initiative in satisfying these objectives. The ideal organization equates the level of authority

with responsibility, related to the tasks allocated to individuals in the organization.

Improved information systems will have a profound effect on a police force's responsibility/authority balance.

First, the information system will force a clear definition of responsibility/authority. Access to information defines a person's responsibility and authority in an organization. Access to information which describes an individual's performance identifies the degree to which responsibility has been satisfied. Access to the same information by superior officers provides substance for the exercise of authority. The ability of the information system to generate hard data on performance focuses the debate and negotiations on responsibility/authority to matters of substance; it removes some of the frustrations associated with indistinct and unclear responsibility/authority balance in an organization.

Second, the availability of new information on performance may promote tensions between different levels of authority in the police force. The lack of hard information on performance has enabled senior levels of command to direct lower levels on the basis of authority alone. Statements of authority can now be refuted with hard information. The existence of improved information systems forces all levels of command to become "scientific" managers. This will relieve tensions between levels of command that are

caused by poor relation of services to performance indicators.

3. Public Accountability/Responsiveness

The existence of improved information systems can only improve the ability of a police force to account to the public. Police management will be armed with more authoritative data to support its position in the public forum. Currently, the main source of authoritative information on crime and police services is Statistics Canada. It focuses on crime occurrences and various vague notions of crime clearance rates. It tells the public nothing about the way police resources are deployed to counter crime problems.

In our field studies and visits to police departments throughout North America, we were astonished at the inability of many police departments to respond to public criticisms. At the simplest level, budgets submitted to municipal agencies contained no reference to the way resources were being used in the jurisdictions. Municipal managers had no information for evaluation of the way police services were being applied. And, when public criticisms such as "what are the police doing about crime?" were launched, most police departments could not even provide a descriptive, informative response. Improved information systems could assist in this area.

4. Clear Scope for Planning

Until recently, strategic or long range planning in police departments has been carried out in an information vacuum. The lack of information, particularly hard data, has been the most significant barrier to strategic planning. Our field studies have confirmed that although police managers are interested in strategic planning, the expense of gathering the ad hoc data required for this initiative has been prohibitive.

Improved information systems will have a major effect on the strategic planning capacity of a police force. If the information system is properly designed, it will contribute to strategic planning initiatives. For example, MIS can create a "discipline" for collecting information and analyzing performance over past and current time horizons. This can lead to the questions: How do we proceed in the future?

By providing a standard, constant reference to past performance, MIS can generate a set of coefficients for carrying out forecasts of the future. For example, we would expect the MIS to collect and display information on call-for-service load, by time and geographic area. This basic set of statistics can be used to develop forecasts of resource requirements derived from future calls-for-service. This, in turn, can ask the question: How do we satisfy this future demand by alternative means?

Nevertheless, it is important to note that improved Management Information System will not, in and of themselves, create improved strategic planning. More information will make strategic planning easier.

5. Development and Application of Expertise

Improved information systems will most certainly affect the development and application of a different type of expertise in police departments. This will affect two levels of police management: one at the operations level and another at the technical level.

At the operations level, improved information systems will expand the role of police officers as "consumers of information". Currently, a major portion of the resources of a police force are devoted to the "production of information" through record-keeping functions at all levels of the operation. Improved information systems would enhance the distribution of more information to operations personnel and significantly change the texture of their jobs. For example, patrol officers would have more information on crime occurrences in their patrol areas. They would be better able to deploy themselves during their shift. Criminal investigation supervisors would have more information on caseloads; they would be better able to manage the investigative resources at their command. A new type of management expertise would be called on, at most functional and command levels within the police force.

In the technical domain, improved information systems require a new type of management expertise. A new type of police officer, trained in both police science and the new management science of computers and systems technology, would be valuable to the police force. From our field visits, we are confident that such individuals currently exist in Canadian police departments. They would have to be encouraged to develop new skills in areas outside of the traditional police science and exercise initiative in their application.

6. Satisfaction of Individual Career Goals

Improved information systems simply expand the variety of career paths available to police officers. There would be new opportunities and technical disciplines which require police supervision and initiative. There would also be new opportunities for police officers in line activities, using a new technology to deliver police services.

7. Organizational Flexibility

In the comments above, on the various relationships between improved information systems and organizational development criteria, there has been one underlying assumption. Improved information systems will have a major effect on the way police services are managed. This suggests the need for flexibility in organizational response.

Let us illustrate with an example. Every institution, including police and all other public agencies, has, or can easily develop, a superfluous level of command. This could be a level of authority that was made superfluous by a major organizational change. Alternatively, a technological change such as improved communications or information systems can reduce the utility of a particular functional level of authority. This level of authority may contain a number of highly competent, senior officers who are too close to retirement age to reassign into more active activities. Often, the "superfluous level of activity" is responsible for a function which has particular authority but merely involves "sign-off" on a record form such as an occurrence report. If so, an improved information system will expose the existence of this level of authority. The organization must have flexibility to cope with this problem.

In one jurisdiction we visited, an organizational change related to the application of a new management technology made Watch Commanders superfluous to the operation. This reduced the effectiveness of six very senior and experienced police officers in the human resource complement. The management response was to give Watch Commanders additional duties which complemented their skills and experience and the new management technology. They were asked to take on specified Planning and Research functions. This approach showed both flexibility and imagination.

The analysis of police operations and procedures

which is an element of the MIS "feasibility study" (see Chapter V, Sections A and B, below) will, in many police forces, reveal organizational contradictions such as the above example. MIS will "force" a police department to adopt a more flexible organization.

B. Information Targeted to Levels of Command and Police Functions

Better information can make a positive impact on an organization if, and only if, the information is delivered to the right person, in the right form, and at the right time. This is our basic concept of a "Targeted Information Processing System" (TIPS). Procedures associated with an information system must be capable of "targeting" relevant information to the relevant end-users. We now examine the concept of TIPS and attempt to develop a scheme for describing the targets.

In this section, we outline a framework which should assist in the analysis of information targets in a police organization. This framework is based on three concepts. First, the distribution of authority of "command" in a police force determines the "need to know" dimension of information targets. Second, police functions determine the "job specific" information required and generated at the different levels of command within the various police functions. Third, there are a number of different generic types of information produced by an MIS.

1. A Hypothetical Command Structure

Earlier in this chapter, we commented on the authority/responsibility balance within an organization. This is a major point of departure for the understanding of organization. Responsibility refers to the specific tasks which are distributed throughout the organization and satisfy the organization's goals and objectives. Authority refers to the way "power" is distributed in order to provide the staff within an organization with the scope and ability to carry out the assigned tasks.

The classic definition of authority within a police command structure begins with an organization chart depicting levels of authority relative to the functional responsibilities in the department. This type of graphic representation would begin with the Chief of Police and extend through all the lower levels of the organization. At the bottom of this type of command structure are police officers who patrol a particular geographic area or carry out a specific police support function.

For this report, this type of organization chart approach is too detailed and complicated. Nor can we use the police "rank structure" to provide a generic definition of the command structure. Rank structures vary from department to department. In addition, police officers are awarded their ranks for a number of reasons; meritorious service, competitive examinations, and occasionally, length of service can determine rank designation. We are interested in establishing

a command structure which serves as a reference point in determining the demand for information. We have outlined below, four levels of command, as follows:

- senior management; this is a top level of police management. It begins with the office of the Chief of Police. The chief is responsible for the over-all direction and control of the force and is the principal public spokesman on all issues related to police matters.

  The senior management level may also contain deputy and assistant chiefs and their associated staff officers. They are responsible for the major divisions or bureaux in the department. Together with the chief, this level of authority is responsible for "senior management" policy formulation in all functional areas and all levels of command.

- function management; this is the heart of the line management structure in the police department. Managers at this level usually hold the rank of staff inspector or inspector, or, in the case of large municipal forces, superintendent. A manager at this level is responsible for the over-all direction of a unique police function. (These functions are outlined in the next subsection).

- first line supervision; this level of command is usually managed by sergeants and staff sergeants.

The first-line supervisors are responsible for the day-to-day supervision of small groups of individual police officers. For example, a patrol sergeant is typically responsible for the deployment and supervision of 10 to 12 police constables in a specific patrol area.

- non-supervisory; the lowest level in the command structure is defined by police officers who do not have supervisory responsibilities. In the case of patrol, the typical rank is police constable. In the case of the criminal investigation function, the typical rank is sergeant. A police officer at the non-supervisory level is usually thought of as the object of the command system or, in other words, a person to be "directed" instead of one who has authority in his own right. This may be true in the "regulatory" sense. However, from the standpoint of "information targets" or the "demand for information", a patrol constable has a significant level of discretionary authority. For example, if a patrol constable is assigned to a beat, he has significant discretion in the way he can deploy himself. The patrol sergeant responsible for that particular constable could attempt to direct his activity at a minute level of detail. However, that type of supervision is both extremely expensive and doomed to failure. The patrol constable's natural discretion must be employed. Therefore, the patrol constable requires specific types of information to assist

him in rationally allocating his own time relative to his role and assigned responsibilities. Using this example, we must be conscious of the need to build a major information target around this non-supervisory level within the command structure.

2. Police Service Functions

We are interested in assessing the demand for information which arises from the types of services which a police force delivers to the community. We now examine "police functions"; these can be defined from the different types of jobs which individuals are responsible for within the police force. In the first instance, we can separate police functions into two categories. These are broadly defined as direct services and support services. The direct service police functions could include the following:

- patrol
- traffic
- criminal investigation
- juvenile
- crime prevention
- special services.

Each of these functions has a number of similar characteristics. They are basic community services provided by the police. They involve some interface with the public. The public or the community at large identifies police in terms of their performance

of these services. In a sense, these are the "outputs" of the police delivery system. Goals and objectives, related to community level performance, can be established for each of these service areas. Finally, in each of these service areas, there are a range of strategic and tactical options available to police management. To some extent, the tactics are determined by resources available to the direct service functions (e.g., the success of traffic enforcement units in the field). On the other hand, there is scope for different operational philosophies in each of these service areas (e.g., in the case of the traffic enforcement function, strategies may involve selective or random enforcement techniques).

The support service functions are more varied in police departments. Some departments would separate them organizationally, between an Administrative Bureau and a Support Services Bureau. We combined them here because they have one similar aim: support services are designed to support direct service functions. The list could include the following:

- communications
- central records
- identification
- court liaison
- personnel training
- planning and research
- budgeting and accounting
- property
- vehicle maintenance
- stores
- data processing

This list of direct and support service functions is outlined for illustrative purposes only. We do not pretend that the given list of direct service and support service functions is either complete or represents a realistic configuration of functions for a particular police department. We do, however, believe that police functions can be differentiated between direct and support service categories, and such a distinction is an important step to an understanding of the demand for information.

3. Information Types

In order to facilitate the discussion of the organizational supply and demand for information, we have broadly categorized the information used and generated in a police department into seven types. These are outlined below:

- policy and procedure directives; senior management formulates policy which in turn is translated into procedures in consultation with the other levels of command. This information then filters down through the command structure. Standing Orders and Policy and Procedures Manuals are the most commonly used media for the distributions of this type of information.

- planning information; this type of data is generated by the functional managers with the assistance of the Planning and Research functions within the department. A variety of

sources are used to formulate future plans, including field and administrative statistics which are derived from internal information processing sources, and external forecasts such as population, housing, transportation, and other regional planning statistics.

- field statistics; this type of information is derived as a result of the processing of raw field information. For example, a statistical report on calls-for-service broken down by the various geographic areas served by a department would be generated from the original field records which are produced for each call-for-service.

- field records; this type of information is produced by the non-supervisory field personnel as an essential by-product of their day-to-day field related activities. For example, patrol officers must document basic facts about the calls-for-service which they respond to. These "basic facts" are stored by the Central Records Section for future reference and follow-up. The generation of field records is an essential part of the patrol officer's job.

- budgeting information; this information is generated by the managers of the various functions within a police department and represents the financial plan for the control of expenditures. The budgets are prepared based on a variety of

historical administrative statistics and departmental plans for the future.

- administrative statistics; this type of information is derived as a result of the processing of raw administrative information. For example, a summary personnel report describing the years of service and average salary by rank would be generated from the various personnel records which are maintained by the Personnel and Training Section of the department.

- administrative records; this type of information is produced by the personnel in a police department to support the administration of the agency. There are a number of different types of administrative records including:

  . personnel
  . accounting
  . payroll
  . activity reports
  . stores inventory
  . vehicle maintenance
  . property records.

C. Towards an Understanding of Information Supply and Demand Conditions in a Police Department

This section of Chapter III is designed to provide a supply and demand perspective related to the development of an information system for a police department. In our

field surveys we have learned that no two police departments have the same set of information supply and demand conditions. They are all either organized differently or have different notions of function and command. Nevertheless, we believe that it is important to develop a generic framework for describing information supply and demand. The goal of this generic framework is to help a police department deliver its individual information system goals. The basic ingredients for this framework have been described previously - namely, the four levels of command, the 17 police service functions, and the seven types of information.

Table III-1 represents our attempt to define, in general terms, the supply conditions for information generation arrayed by level of command and service functions. The major observations are:

- the senior management level is responsible for generating policy and procedure directives across all 17 functions (PPD).

- the function management level is responsible for generating planning (P) and budgeting (B) information for most of the functions.

- the first-line supervisors are responsible for generating administrative records (AR) (i.e., personnel reviews, vacation reports, sick leave, etc.).

- the non-supervisory level in the command structure

is typically responsible for the generation of administrative and/or field records (AR and FR). Without a doubt, this is the most active level in the command structure from a supply-oriented view of information processing.

In addition to these types of information, generated by a police force through its regular lines of command, three additional units play an important role in supplying information. Central Records obviously plays a key role in the processing of field records and the generation of field statistics (FS). Similarly, the Planning and Research Unit plays a special role in the preparation of planning information. Finally, the Budgeting and Accounting function plays an important role in the preparation of the budgets. All in all, the supply perspective of information processing is relatively simple compared to demand, as outlined below. The roles played within the four levels defined in this generic command structure are reasonably well-defined and understood by police managers.

Turning now to the demand side of the picture, we are faced with a much more complex view of the need-to-know dimension in information processing. Table III-2 represents our attempt to illustrate what types of information are required by the four levels of command across the 17 generic police functions. Several observations are outlined as follows:

- senior levels of command have a greater need for aggregated (statistical) information than lower levels of command;

- access to field and administrative records should primarily rest with the bottom two levels of command;

- planning and budgeting information are the ultimate concern of the top two levels of command;

- only field personnel and line supervisors need to have access to individual field records and detailed field statistical reports; and,

- the demand for field and administrative statistical reporting may strain the capacity of Central Systems if there are no automated systems to analyse and summarize the field and administrative records.

Thus far, our conclusions about the demand for information in a police force are general in scope. Our level of generalization is determined by the variations in management (command and service functions) which exist in various Canadian municipal police forces. We cannot establish a truly general specification at any level of detail. Each police department contemplating MIS must go through its own analysis of information demand. This analysis will focus on policies, procedures and operations in the force. It will attempt to define: Who needs what kind of information to satisfy what kind of job responsibility? An efficient and effective MIS can be built from these specifications - one which "targets" information to needs.

We have developed an analytic format for identifying the demand for information in a police force. It focuses on policies, procedures and operational rules in a police

force. We call this format "The Position/Activity Review". Its objectives are as follows:

- to analyze all policies and procedures of a police force to determine the demand for information.

- to focus on individuals accupying positions responsible for activities as the basic source of information on Policies and Procedures.

- to produce a number of documents essential to the MIS design, i.e.,

  . a review of existing systems and procedures in the police force,
  . a review of existing Policies and Procedures,
  . a flow chart illustrating the decision-making process in all functional areas of the police force,
  . a definition of the functional and organizational areas in the police force which requires clearer definition of responsibilities, and,
  . a specification of the types of information required at each level of command and functional responsibility in the police force. This final document essentially defines the demand for information.

The general elements or procedural steps required to carry out the Position/Activity review are as follows:

- select personnel in the force who occupy "key positions", in terms of their contribution of a unique, specialized service within the total framework of the organization. In a medium-sized police force, we believe that approximately 50 "positions" and individuals will be selected.

- all of the individuals occupying these positions should be interviewed by the members of the team responsible for the Position/Activity review. The interview should be extensive, lasting between one and three hours.

- in the interviews, interviewees should provide information on:

  . where and how is that position managed within the organization structure?

  . what activities and tasks are associated with each position?

  . what type of information is currently required to satisfy the performance of the tasks included in that position's mandate?

  . what other information would be useful?

  . what information is supplied by that position to other branches in positions in the police force?

  . how does the incumbent in each position define

the success or failure of the responsibilities associated with his position?

A summary of the information required is shown on Table III-3 where we have outlined a form which can be used for collecting the required information. We have used the concept illustrated in this form for interviewing in a number of police departments and have met with reasonable success.

There is only one conceptual drawback to the Position/Activity review. This arises from its focus on individuals and their perception of activities related to their positions. Individuals who have occupied a job for any period of time, become affected by the "conventional wisdom" or standard operating procedures associated with the job. Often it is difficult for them to conceive of circumstances beyond the current perspective of their job. As a result, they find it difficult to cope with the question of: "what kind of information do I need to satisfy my job responsibilities better?"; this is why we have asked for success/failure information. Discussion of success indices can act as a probe to move incumbents into a more imaginative domain of thought with regards to the type of information they could use to improve their job performance.

D. Our Understanding of the Problems

To conclude this chapter on the police department and information, we outline some perceptions about the

problems and the need for change in the ways in which police departments cope with their data processing needs. We provide a commentary on the current state of affairs. We obviously run the risk of being too general with our criticism and recognize that these comments do not apply to all municipal police departments. However, our survey of Canadian municipal police forces (reported in Volume III) has shown that there are some major constraints on the development of police MIS in Canada. We restate our observations, using the language of this chapter, as a general guide to MIS development.

We can make 11 specific comments about the state of affairs of information processing systems in Canadian municipal police departments. The perceptions embedded in these comments have contributed to the development of TIPS. The comments are as follows:

- police information systems are "supply-oriented"; the primary focus of data processing procedures and systems is on the generation of data. This "input" orientation has led to the development of the Central Records function which is concerned primarily about the capture and storage of field data and only secondarily about data retrieval.

- police information systems are non-responsive to "demand"; the lack of response to information demands, especially at the higher levels of police management, has led to a situation where information "demand" is reduced. If a police manager perceives that he cannot have a particular report, he will not ask for that report.

- internal systems are dominated and constrained by the use of manual technology; most Canadian police departments are seriously under-automated. This is not to say that computerization will solve all of the problems; we know it will not. The excessive volumes of paper flows in the typical police department are, no doubt, contributing to the over-all problems with the processing of information. During the last ten years, significant improvements have been made in computer technology. It is cheaper and more reliable. Finally, the application of this technology is better understood.

- the Central Records function dominates the formally recognized data processing facilities in a police department; this has led directly to an over-centralization of data processing services in the typical police department. As a result, the Central Records function has difficulty keeping up with the demand for services, and in fact, can only meet the bare essentials.

- there is limited access to information; the use of manual technology and the over-centralization of records has led to the situation where the end user has limited access to the data stored. He must operate within a narrowly defined scope of information retrieval. He can typically have access to individual records. However, special ad hoc requests for reports are often beyond the scope of the typical Central Records function.

- there are limited analytical reporting capabilities; again, the lack of automation has resulted in the situation where the typical Canadian police department possesses limited information processing facilities for generating statistical reports. For example, the generation of an extensive statistical report reflecting the field occurrences broken down by the nature of the occurrence and the various levels of geographic boundaries (i.e., area, beats and atoms) would stretch the staff in a typical Central Records section beyond the limits of its resources.

- fragmented informal systems are built to overcome the resource deficiencies of the Central Records function; the problems associated with the over-centralization of information, the lack of automation and the limited access to information are compounded and made worse by the proliferation of informal systems throughout the police department. These informal systems are built as a result of the frustration of police managers; they have a job to do and must have information in order to fulfill their responsibilities. These fragmented systems represent duplication of effort. The data are entered into these systems many different times. There is no common access to these files. For example, Criminal Investigation sections often maintain files which are of particular interest to Crime Prevention sections. Access must be negotiated on an informal basis. The resources of time and space used to

maintain these fragmented systems are probably comparable to the resources dedicated to the Central Records function within a police department.

- there is a noticeable absence of formal and regular management level reports; regular weekly, monthly or quaterly management reports are not produced by the typical system. As a result, police managers must often make ad hoc requests of the Planning and Research function.

- the range of systems which have been developed are limited mostly to the field operations functions; systems have typically been developed for the field operations areas (e.g., occurrence reporting, motor vehicle collision reporting, traffic ticket processing, etc.). Many areas of application on the administrative side have been neglected, including personnel, vehicle maintenance, stores inventory and property.

- the existing systems are poorly documented; the policy and procedures manual is a common and valuable asset in a police department. However, the documentation of information processing standards and procedures is often non-existent. Police officers do not have formal, written users manuals which explain how, when and where forms are to be used in their jobs.

- the responsibility for the development and maintenance of information systems is unclear and often undefined; apart from the Central Records unit, which focuses on the storage of papers, a group responsible for the data processing and systems function is not a common feature in Canadian police departments. There are few departments which employ a sufficient complement of full-time, technically-skilled and trained staff who are responsible for the on-going design, development, implementation and control of the information processing systems. Managers are often forced to look after their own information needs. As a result, most municipal police departments in Canada lack the capacity to effect meaningful change in the information processing systems.

We believe that there is a fundamental need for change in the way in which police departments manage their information resources. This need for change is outlined in four specific areas.

First, information must be recognized as a resource which is vital to the operation of the police departments. Information systems are a critical and integral part of police work. Senior police managers must make the commitment to understand these tools so that they can be effectively applied to the management and operation of their agencies.

Second, senior police managers must be willing to commit significant resources to the development of

information systems. Such a commitment entails the acquisition of technical staff who have the basic skills required to design, develop and implement these tools. It is not good enough to assign the Planning and Research section responsibility for the development of information systems. Such partial solutions will fail. Senior management must commit themselves to new data processing functions with a specific mandate for the development of systems.

Third, there is a need to change the basic systems perspective - away from an overwhelming concern about the supply conditions and, subsequently, towards the information demand conditions. Truly effective and responsive management information systems are designed according to the demand for information. Information should satisfy the aims and objectives of the force. It should be delivered to the individuals who need it! Such a change in perspective should result in a significant increase in the awareness of the need for management reporting - an area which has been seriously neglected.

Finally, in view of the earlier comments about the lack of access to information, the lack of statistical and analytical reporting capabilities, and the serious problems with high volume paper flows, police departments should think seriously about acquiring computers. The need for change must be based on economics. The acquisition of computer technology must be clearly identified with an increase in efficiency. Existing manual systems are probably constraining the demand for certain types of information which include field and administrative statistics. No matter how great the demand, the demand is

constrained by the supply technology. Manually produced statistical reports, requiring many hundreds of man-hours, are just not requested, no matter how important. As a result, the arrival of computer technology should have a major impact beyond the efficiency of supply. This involves the ability to effectively and efficiently respond to specific user requirements for information.

In the next chapter, we outline the various components of a Targeted Information Processing System - TIPS. TIPS is our attempt to illustrate the need to consider both the demand and supply conditions in information processing in a police department.

CHAPTER IV

TIPS - A CONCEPTUAL FRAMEWORK OF A POLICE MIS

In previous chapters, we discussed some fundamental concepts associated with management information systems in police departments. In this chapter, and in Vol V, we describe in more specific terms the basic data processing aspects of MIS for police departments. We do this by developing a conceptual framework called TIPS (Targeted Information Processing System). The descriptions are stated in user terms rather than the technical jargon of the data processing professional. Detailed technical specifications are well beyond the intent and scope of this report.

Simply stated, the intent of TIPS is to promote a common understanding of the basic components of an MIS for a Canadian police department. It is essential that the TIPS descriptive material be treated only as a guideline for those interested in developing and implementing and MIS. TIPS is not a set of functional specifications. It is certainly not a set of systems design specifications.

In the first section of this chapter, we briefly describe some of the basic structural elements of an MIS. In the remaining sections, we describe TIPS in terms of its scope, the basic components, and the TIPS data base. In Volume V, which is really an appendix to this chapter, we provide a reasonably comprehensive set of descriptions of the TIPS components and the TIPS data base including file contents, record contents and data element definitions. The main focus in this chapter and Volume V is on the automated data processing aspects of MIS.

A. Basic Structural Elements of MIS

The systems analyst delights in describing information systems to non-technical users as: "nothing more than inputs and outputs". This statement is correct; however, we believe that the non-technical user has a right to know more about the information systems which are being built to serve his needs. To this end, we describe some of the basic structural features of an MIS.

Figure IV-1 represents a simplified structural overview of an information system. The pyramid represents the types of components or applications which make up the typical MIS. The rectangular base represents the data base upon which all components are built.

In terms of the types of components, the diagram depicts a pyramid with three levels including:

- at the bottom, transactional components;
- at the middle level, statistical and management reporting components; and,
- at the top, planning components.

The pyramid allusion leads to the understanding that transactional components are the foundation of an MIS. Transactional components are primarily concerned with the processing of individual records of information (e.g., occurrence records).

The next level - statistical and management reporting - is built on top of the transactional

components which process the individual records on a day-to-day basis. Finally, the highest level component is planning. Planning systems require statistical information as a basis for future plans and forecasts. Again, in terms of the architecture of system construction, planning systems can only be built after the necessary statistical reporting systems have been constructed.

Figure IV-2 describes the basic processing steps involved in the design of an individual component in an information system. These are outlined as follows:

- data input; this step involves the retrieval of data either from data base files or as a result of direct data entry by a user via an on-line keyboard terminal.

- data manipulation; this step involves the manipulation of data through the use of various logic and arithmetic operations in order to prepare the data for output and/or storage.

- data output; this step involves the generation of output reports. There are basically two different processing methods used for data output.

  . hardcopy reports refer to printed computer outputs which are generated by high speed printers.

  . on-line terminal reports refer to the keyboard terminal reports which can be displayed on either a cathode-ray-tube screen or by slow-speed terminal printer.

- data storage; this step involves the storage of the modified data on files. The two most common forms of computerized file storage include disk and tape.

These four processing steps serve as the basis of our descriptions of the TIPS components according to the following:

- input
- output reports
- files accessed and updated.

The data base referenced in Figure IV-1 consists of all the files which are accessed and updated by the different components of an information system. Our use of the term "data base" is strictly generic. We are not suggesting that an information systems design is dependent on the use of "data base technology" or a specific "data base package". Data base is a convenient term which describes the total collection of files, records and data elements as defined below:

- a data element is a specific, isolated piece of data that is easily recognized by a non-technical user of an information system.

- a record is an orderly collection of data elements where the data elements are logically structured and interrelated to one another.

- a file is an orderly collection of records. The

records may all have the same format; or a file may contain records of a number of different formats.

These terms are used throughout the remainder of this section and serve as an introduction to the descriptive material on TIPS.

B. TIPS Overview

In the previous chapter, we outlined our understanding of some basic data processing problems encountered in Canadian police departments. A summary statement of these problems would describe the existing information systems as being as follows:

- information "supply" or input oriented.

- non-responsive to the "demand" for information.

- seriously under-automated and encumbered by the use of manual technology.

- narrowly defined in a formal sense by the data processing activities in a Central Records section.

- restrictive in terms of limited user access to information sources on a timely basis.

- limited or non-existent capabilities for the efficient generation of analytical management and statistical reports which are timely and responsive to user requirements.

TIPS is a conceptual design of a computer-based information system which represents a viable alternative to the type of system characterized by the problems listed above. TIPS serves as a guideline for police managers to explore information systems alternatives which will greatly expand the scope and capabilities of their information system. The main features of TIPS include:

1. Centralized On-Line Data Entry

The TIPS descriptive material relates to the development of a system which has most of the data entry functions centralized within a Central Records section because of the need to maintain proper quality control. Field staff submit written reports to the Central Records Section where the required data are extracted and entered into the system via on-line keyboard terminals.

2. Decentralized Data Retrieval

Even though direct data input may continue to be centralized (similar to an existing Central Records function), access to the information stored on file would be decentralized. Keyboard terminals would be located throughout the department in key areas such as patrol, traffic, criminal investigation, communications, etc. These terminals would be used to retrieve reports according to user needs.

3. Comprehensive Indexing of Files

Three different index files including a Master Name

Index, Master Address Index, and Master Vehicle Index, are updated automatically whenever field data are input into the system. This feature allows the user to perform name, address and vehicle checks against the local files.

4. Extensive Menu of Statistical and Management Reports

In the TIPS component descriptions, we have identified a large number of statistical and management reports which would be generated on a regular basis (i.e., daily, weekly, monthly).

In Figure IV-3, we present an overview of TIPS, based on the three-level pyramid structure which was outlined in Figure IV-1. In defining the TIPS framework, we have identified 19 separate, but integrated, components and 29 different files which comprise the TIPS data base. Twelve of the TIPS components are classified as "transactional". They include:

- Field Reporting
- Juvenile Reporting
- Court Liaison
- Officer Scheduling
- Summons and Summary Conviction Ticket Reporting
- Motor Vehicle Collision Reporting
- Evidence and Property Control
- Registration
- Computer Assisted Dispatch
- Stores Inventory
- Vehicle Maintenance
- Personnel

These 12 components are concerned with the daily information processing related to a broad spectrum of direct and support service functions.

Seven of the TIPS components are classified as "statistical and management reporting". These include:

- Field Statistics
- Activity Reporting
- Case Tracking
- Crime Analysis
- Resource Allocation
- Budget Control
- Management Reporting

These seven components are designed to generate reports for the higher levels of the command structure. These types of reports reflect a summation or aggregation of a number of individual records or "transactions".

The TIPS framework provides a wide range of reports which are clearly intended to have a broad impact on all levels of the command structure. The existing systems in many police departments ignore the information needs of the higher levels of the command structure. The data processing capabilities embedded in the typical Central Records Section are targeted to the operational and individual record needs of the lower levels in the command structure. Regular statistical and management reports are not a common feature of these systems. Table IV-1 broadly defines those levels in the command structure which are directly affected by the various TIPS components.

Similarly, the TIPS components have a direct impact on virtually all direct and support service functions in a police department. Many support service functions are poorly served by their existing information systems. Table IV-2 identifies those service functions which are affected by each component in the TIPS framework.

In order to define the scope of TIPS more clearly, we have identified a number of areas which are beyond the content and scope of the TIPS framework. These are discussed below.

First, TIPS involves internal system components. In Figure IV-3, we have indicated four external system components which are beyond the scope of TIPS. These include:

- Payroll
- Accounting
- Provincial Motor Vehicle Registration
- CPIC (Canadian Police Information Centre)

These four components are represented as part of the pyramid in Figure IV-3 in order to place them in the over-all systems context. However, we will not describe these systems in this report. Payroll and accounting systems are typically used by municipal police departments. Similarly, police departments have some form of access to provincially-run motor vehicle registration systems. Finally, CPIC is used by all Canadian police departments. The TIPS framework has been designed to complement CPIC. For this reason, we have avoided specifications within this conceptual framework of a number of systems functions, including:

- wants and warrants control,
- stolen vehicle and property control,
- criminal history reporting, and,
- arrest reporting.

These functions are well within the scope and intent of the CPIC system functions and capabilities, and should not be duplicated.

Second, the TIPS framework does not include descriptions for any system components at the planning level (as represented in Figure IV-3). Components at this level would be characterized as planning models. We recognize that such models have been developed and implemented in a number of police jurisdictions, primarily in the United States. However, we believe that these types of systems can only be built and used effectively after the transactional and statistical systems have been installed. In addition, specific user needs involved in the development of planning systems are constantly changing. Finally, we believe that planning is an integral part of the over-all management function of an organization. To this end, many of the information needs of planning are served by statistical and management reports generated by the components at the second level of the pyramid.

Third, the TIPS framework does not include descriptive commentaries related to court generated information. There is no doubt that the processing of many court documents such as Crown Sheets, Informations, Appearance Notices, etc. have a profound impact on over-all police operations. The design and definition

of the need for these types of documents are the responsibility of the courts. Exploration of such court-related systems is well beyond the scope of this interface between the courts and a police department. The TIPS framework contains a component which is targeted to some of the needs in this type of function. However, the primary purpose of the Court Liaison component is to define the type of scheduling required by the police department to better manage and deploy police officers. This component does not include a description of "court required" paper flows. These are the responsibility of court administration.

Finally, the TIPS framework does not include the use of two advanced forms of technology - mainly AVL (Automatic Vehicle Locators) and MDTs (Mobile Digital Terminals). These are beyond the scope and intent of TIPS.

AVL is primarily concerned with monitoring patrol units which have been deployed throughout the patrol areas and beats. The AVL technology does include a data collection feature involving the capture of status data for each patrol by computer. However, we believe that a needs study is required on the need for real-time surveillance of patrol units before the value of AVL can be confirmed. The data capture aspects of AVL are strictly secondary. The development and introduction of AVL technology cannot be justified on any efficiency or effectiveness criteria related to improvements in the over-all data processing capabilities in a police department. For this reason, we have excluded AVL from the TIPS framework.

Similarly, MDTs represent another advanced form of technology which is beyond the scope of TIPS. The development and use of MDTs clearly falls within the scope of police communications technology. In Canada, the main purpose for the introduction of MDTs would be to provide police officers located in mobile patrol units with a facility for direct and on-line access to the various CPIC files. In view of this, we believe that any developments related to the introduction of MDTs fall within the scope and responsibility of CPIC.

C. TIPS Components

The TIPS framework consists of 19 components which cover a broad spectrum of information processing needs in a police department. Each of these components are described in terms of the type of input data, the type of output reporting, and a summary of the major processing features. Volume V contains component descriptions which are more extensive and explicit.

1. Field Support

Field Support is, without a doubt, the single most important component of TIPS. It is designed to support the field reporting activities related to three basic types of input, including:

- Occurrence Reports
- Field Observation Reports
- Dispatch Records

Data are extracted from these input document types in the Central Records Section, and entered into the system via on-line terminals. The system automatically creates entries in the following index files:

- Master Name Index
- Master Address Index
- Master Vehicle Index

An abstract record is created for each input document and stored on the appropriate file.

Six different types of on-line reports have been identified, including:

- Name Check
- Address Check
- Vehicle Check
- Occurrence Abstract
- Field Observation Abstract
- Dispatch Abstract

These on-line reports allow the user decentralized access to the files containing the cross-reference indices and abstracted data.

Nine different hard copy batch reports have been identified. These include:

- Patrol Beat Summary
- Patrol Area Summary
- Departmental Summary
- Criminal Occurrence Summary

- Primary Occurrence Follow-Up Request
- Departmental Occurrence Exception
- Dispatch Summary
- Special Attentions
- Bulletin

These reports are used in the daily management and control of field activities, primarily in the patrol service function.

Finally, a number of summary statistical records are generated for each input transaction and deposited in the following files:

- Field Statistics
- Activity Log
- Case Follow-Up

2. Juvenile Reporting

The Juvenile Reporting component is targeted to meet the specific information processing needs of the Juvenile Service function. Juvenile Reports are abstracted and input into the system via on-line terminals. For each Juvenile Report entered into the system, the following files are updated:

- Juvenile Report Abstract
- Activity Log
- Case Follow-Up
- Field Statistics
- Master Juvenile Index

Two different on-line data retrieval formats have been identified, including:

- Juvenile Name Check
- Juvenile Report Abstract

This feature allows officers in the Juvenile Section to perform name checks and retrieve juvenile case records via an on-line keyboard terminal when and as required. We have identified one hard copy batch report format which provides managers in the Juvenile Section with a daily summary of reported juvenile Occurrences. The basic features and facilities of the Juvenile Reporting are similar to those of the Field Support component. However, the scope is obviously narrower; it involves a restriction of access of sensitive juvenile information by the officers in the Juvenile Section.

3. Summons and Summary Conviction Ticket Reporting

The purpose of the Summons and Summary Conviction Ticket Reporting component is to generate reports on various enforcement statistics. All summonses and summary conviction tickets are abstracted and input into the system via on-line terminals. Field Officers have a remote access capability whereby individual abstracts of summonses and summary conviction tickets can be displayed on a terminal. Two different hard copy output report formats have been identified:

- Area Enforcement Summary
- Departmental Enforcement Summary

These reports are used by the higher level officers in the command structure to determine the level of enforcement, broken down by the various geographic areas in the jurisdiction. The Summons and Summary Ticket Conviction Reporting component updates a number of files including:

- Activity Log
- Field Statistics
- Master Name Index
- Master Address Index
- Master Vehicle Index

4. Motor Vehicle Collision Reporting

The Motor Vehicle Collision Reporting component provides facilities for storing and reporting on traffic accidents. The Motor Vehicle Collision Report is the only source of input. Data from the MVC reports are abstracted and entered into the system via on-line terminals located in the Central Records section. Officers in the Traffic section have remote access to abstracts of individual collision reports via on-line terminals. Three hard copy reports are produced by this component, including:

-Area Summary of Collisions
-Departmental Summary of Collisions
-Collision Follow-Up Investigation Request

The first two reports are statistical summaries used by higher level officers in the command structure. The third report is used as a reminder for traffic officers to perform further investigation on specified

accidents. A number of files are updated by this component including:

- Activity Log
- Field Statistics
- Case Follow-Up
- Master Name Index
- Master Address Index
- Master Vehicle Index

5. Property and Evidence Control

The purpose of the Property and Evidence Control component is to facilitate the control and disposition of various articles which are turned in as lost and found or confiscated as evidence. There are types of input, including:

- Property/Evidence Tag
- Property/Evidence Disposal Notice

The Tag is used to uniquely identify an item stored in the Property section. The Disposal Notice is used by the Property section to initiate the disposal of articles being held as evidence or lost and found. This component provides an on-line data retrieval feature whereby a Property/Evidence Status Report can be displayed on a terminal located in the Property section. The hard copy report formats include:

- Property Disposal Notice
- Evidence Disposal Notice
- Property and Evidence Summary

The two disposal notices are used by the Property section to control the disposition of various articles. The Property and Evidence Summary is used to provide a statistical summary to senior management.

6. Field Statistics

The Field Statistics component is designed to generate a variety of statistical reports using the Field Statistics file which is updated by a number of components at the transactional level, including:

- Field Support
- Summons and Summary Conviction Ticket Reporting
- Motor Vehicle Collision Reporting
- Juvenile Reporting.

Ten different report formats have been identified. These include:

- Weekly Operations Summary
- Occurrence Summary
- Day of Week Dispatch Summary
- Time of Day Dispatch Summary
- Response Time Summary
- Statistics Canada Summary
- Field Observations Summary
- Collision Summary
- Enforcement Summary
- Juvenile Occurrence Summary

With the exception of the Weekly Operations Summary, all of the other statistical reports are produced monthly. The primary purpose of these reports is to

provide a breakdown of what is happening within the various patrol areas and beats. A special report request feature is also designed into this component so that unique requests for displays of field data can be generated from the Field Statistics files. Some possible examples include:

- detailed breakdown of calls-for-service by type of complaint, day of week, time of day, area and beat for a specified period of time.

- detailed breakdown of calls-for-service by type of complaints for each atom within the patrol beats and areas for a specified period of time.

- detailed breakdown of collisions by type of collision for each atom within the patrol beats and areas for a specified period of time.

7. Crime Analysis

The Crime Analysis component is designed to generate statistical reports which are keyed on the crime or nature of occurrence dimension of field statistics. In the Field Statistics component, the reporting capabilities were focused primarily on the geographical breakdown of occurrence and calls-for-service or dispatch data. The Crime Analysis component consists of a special report request feature which allows the user access to the Field Statistics file in order to generate "crime" related statistical reports. For example, the typical criminal analysis report request may involve the generation of a hard copy report displaying the number of robberies for a whole year,

distributed by time of day, day of week, beat and patrol area. The Crime Analysis component is intended to be used primarily on an exception basis as required.

8. Personnel

The Personnel component is designed to manage and report on all historical data related to police department staff. These data include:

- Biographical Information
- Service Record
- Discipline History
- Commendation History
- Training History
- Skills Inventory
- Education History
- Accident History
- Performance and Evaluation Information

In view of the sensitive nature of this type of information, all data entry is performed by staff in the Personnel and Training section using on-line terminals. Two hard copy report formats have been identified, including:

- Performance Review Notice
- Personnel Summary

In addition, a special report request feature is specified as part of the Personnel component. This should allow users to request special reports which may include the following types of listings:

- skills inventory by skill type and rank
- educational background by diploma type and rank
- turnover rate by rank
- average sick-time by rank
- etc.

The Personnel component is second only to the Field Support component in terms of importance and impact on departmental decision making.

9. Court Liaison

The purpose of the Court Liaison component is to provide an information processing interface between the police department and the courts. The utilization and deployment of police manpower resources are profoundly affected by court decisions on the scheduling of court cases. The Court Liaison provides the officers working in the Court Liaison section a facility for capturing court docket information and generating police defined and required court schedule reports. Two different report formats have been identified, including:

- Individual Court Appearances
- Court Schedule Summary

In addition, we have identified one on-line data retrieval format whereby a Court Case Summary can be displayed on a terminal. The data entry function is performed using terminals in the Court Liaison section. A Court Docket file is updated for each addition or change in the court docket.

10. Officer Scheduling

The purpose of the Officer Scheduling component is to facilitate the preparation of officer shift schedules. The input types include:

- court case scheduling information captured by the Court Liaison component and stored on the Court Docket file
- master shift rotation schedule
- special assignments
- changes to duty roster

The hard copy output report formats include:

- Patrol Area Duty Roster
- Individual Officer Schedule
- Manpower Schedule Summary

11. Activity Reporting

The purpose of the Activity Reporting component is to generate statistical reports which reflect the time spent by staff on various field and administrative activities. There are two types of input, including:

- Time and Activity Reports
- Activity Log File

Time and Activity Reports reflect the time spent by staff on various special activities including court time, sick time, overtime, special assignments, etc. The Activity Log file is updated by a number of components at the transactional level, including:

- Field Support
- Motor Vehicle Collision Reporting
- Summons and Summary Conviction Ticket Report

These reports generated by this component include:

- Weekly Staff Summary
- Overtime Summary
- Court Time Summary
- Sick Time Summary
- Special Assignment Summary
- Monthly Staff Summary
- Monthly Activity Summary

12. Case Tracking

The purpose of the Case Tracking component is to assist with the assignment of cases which require some form of follow-up action and assist with the management of office caseloads. A record is created for cases requiring follow-up by the appropriate transactional component. For example, a record on the Case Follow-Up file is created for a criminal case reported and processed in the Field Support component. The Case Tracking component accesses the Case Follow-Up file and accepts on-line input of Case Assignment data in order to create an up-to-date status on each case requiring follow-up. Status reports on individual cases can be displayed on on-line terminals. Five different hard copy reports are generated by this component. These include:

- Caseload Summary
- Case Status Review

- Case Follow-Up Reminder
- Case Follow-Up Summary
- Case Management Summary

Five files are updated by this component. These files include:

- Personnel History
- Property and Evidence
- Occurrence Report Abstract
- Motor Vehicle Collision Report Abstract
- Juvenile Report Abstract

13. Resource Allocation

The purpose of the Resource Allocation component is to generate projections of caseloads and patrol requirements based on trends in the historical data. The following files provide the historical data base:

- Field Statistics
- Activity Log
- Daily Roster
- Case Follow-Up
- Personnel

Three different reports are generated. The Patrol Manpower Projections report displays estimates of the number of calls-for-service and the number of patrol officers required to respond to these calls-for-service broken down by beats and patrol areas. The Caseload Projections report provides estimates of caseload levels for the various police service functions based on projected calls-for-service and

follow-up ratios. The third report - Resource Allocation Summary - provides a comparison of projected manpower requirements and caseloads relative to the availability of manpower resources based on duty roster schedules. All of these reports are produced on a monthly basis and are targeted to the higher levels in the command structure.

14. Budget Control

The Budget Control component is an extension of the accounting systems designed to assist police managers with the preparation of budgets and the generation of monthly reports comparing budgeted versus actual expenditure levels.

During the budget preparation portion of the overall annual budgeting cycle, the Budget Control component is used to generate Budget Work Sheets which serve as a guide to police managers to complete their plans for the following year. These Work Sheets are used to capture the following types of data:

- estimates of the number of staff of each rank required by month
- estimates of expenditure levels broken down by account code for each month

During the regular monthly reporting cycle, the Budget Control component generates reports which compare the following:

- the number of man hours of each rank reported versus the budgeted estimates

- the amount expended for each account code versus the budgeted amount.

The two types of inputs include:

- man hour expenditures which are derived from the Activity Log file
- actual cost expenditures which are derived from accounting reports.

The following files are updated by the Budget Control component:

- Budget
- Actual Expenditures
- Budget Summary

15. Management Reporting

The Management Reporting component is designed to generate high level management reports which provide comparative cost and field performance statistics. The comparisons involve four different time frames. They include:

- previous month
- current month
- last year-to-date
- this year-to-date

The types of data elements being compared include:

- budgeted man hours
- actual man hours

- budgeted costs
- actual costs
- number of calls-for-service
- average response time
- average arrival time
- average service time
- number of occurrence reports submitted
- number of collision reports
- number of field observations
- number of cases investigated
- number of cases cleared
- clearance rate

There are two files which provide the input data. They include:

- Activity Summary (produced by the Activity Reporting component)

- Budget Summary (produced by the Budget Control component)

The Management Reporting component is designed to generate reports at two levels of detail:

- responsibility centre (i.e., individual police service functions as defined by section or organizational unit), and,

- departmental (an aggregation of costs and activity levels for the police department as a whole).

16. Computer-Assisted Dispatch

The Computer-Assisted Dispatch is the only truly on-line, real-time application described within the over-all TIPS framework. The main purpose of the CAD component is to assist the communcations staff with the four main data processing functions associated with the dispatching of patrol units to the scene of an incident in response to calls-for-service.

Also, a CAD can act as the primary tool for data entry of occurrence records into the MIS. We describe two such CAD systems, for the Dallas, Texas and Miami, Florida police forces, in Volume II.

The first function involves the capture of data about the complainant, the nature of the complaint and the location of incident by dispatch clerks. The dispatch clerk uses an on-line keyboard terminal to key the information into the system as it is received from the complainant.

The second major data processing function involves the dispatching of a patrol unit to the scene of the call-for-service. With the CAD component, this function is performed by the dispatcher who is assisted by the system to determine the most appropriate unit to be dispatched. The system automatically records the time the call is received, and the time the patrol unit is dispatched.

The third function involves the recording of the status of the individual patrol units. Again, the

CAD component assists the dispatcher in maintaining a file containing the status of individual units. After arriving at the scene of a call-for-service, the patrol unit informs the dispatcher who, in turn, enters this into the system. After a patrol unit has cleared the scene, the dispatcher is notified and enters the current status into the system.

The fourth major function involves status checking. How many calls-for-service are awaiting dispatch? How many and what units are available for dispatch? Again, the CAD component assists the dispatcher by maintaining updated lists of patrol unit status and calls-for-service awaiting dispatch. These can be retrieved and reviewed by the dispatcher using an on-line terminal.

The CAD component provides access to two files. The Active Duty List provides an updated list of those officers on duty assigned to various patrol units and beats. The Master Address Index is used to determine whether the reported address is hazardous.

Beyond the real-time processing associated with the functions described above, the CAD component produces two types of output. First of all, for each reported call-for-service, a dispatch record is created and deposited on the Dispatch Record Abstract file which is later processed through the Field Support component. Secondly, a hard copy report displaying summary statistics related to the dispatch function is generated at the end of each shift. The Shift Dispatch Summary provides the managers in the communications section with a concise breakdown of

calls-for-service during the shift by type of complaint within the patrol areas and beats.

17. Vehicle Maintenance

The purpose of the Vehicle Maintenance component of TIPS is to provide the police department with a facility for capturing and reporting important cost information related to purchase, operation and maintenance of departmental vehicles. There are three types of input processed by this component. These include:

- Gas and Oil Consumption Reports
- Service Reports
- Vehicle Purchases

Data on these input documents are recorded by the staff in the Vehicle Maintenance section. The data are entered into the system via on-line terminals located in the Central Records section. One on-line terminal report format has been designed to display summary cost information on a vehicle as requested. In addition, two hard copy reports are generated by this component. These include:

- Vehicle Cost Summary
- Vehicle Service Request Notice

18. Stores Inventory

The purpose of the Stores Inventory component is to assist the Stores section with various functions

related to inventory control. These functions include the control of:

- inventory levels
- re-order quantities
- storage space
- distribution of inventory items to police personnel

There are four types of input documents which are processed by this component. They include:

- Items Descriptions
- Inventory Distribution Notice
- Inventory Receiving Notice
- Inventory Order Notice

These four types of documents are used to update the Stores Inventory file whenever an item in stores is:

- modified to reflect changes in the status information (e.g., storage location, re-order quantity, order lead time, supplier, etc.)

- withdrawn from stores and distributed to an employee

- received as part of a shipment from a supplier

- placed on order with a supplier.

All data entry is performed by the staff in the Stores section using an on-line terminal. An Inventory Item

Status report can be requested and displayed on a terminal. Four different hard copy batch reports are output. These include:

- Inventory Receiving Summary
- Inventory Order Summary
- Inventory Distribution Summary
- Inventory Summary

The Personnel History file is updated whenever a police officer receives a piece of equipment or uniform which is intended for personal use while on duty.

19. Registration

Most police departments perform a registration function within their Central Records sections. Three examples of different types of registration are:

- Firearms
- Block Parent
- Business Security

For these examples, the Registration component would have different input types, including:

- Firearms Summary
- Business Summary
- Block Parent Summary
- Business Listing
- Block Parent Listing

D. TIPS Files

The 19 components of TIPS access and update 29 different files. The purpose of this section is to present an overview of the TIPS files. More detailed descriptions of these files in terms of record types and data elements are provided in Volume V.

We recognize that there are several ways of structuring and storing information in files. We have chosen to describe the types of data required to support the data processing functions of the 19 TIPS components according to a scheme consisting of 29 different files. Detailed file specifications and designs are beyond the scope of this study, and can only be determined during the design phase of systems development projects. Nevertheless, the TIPS files, as outlined below and in Volume V, should provide a reasonable definition of the types of data necessary for TIPS.

The TIPS files are classified according to three broadly defined categories. These include:

- index
- transactional
- statistical

There are five different index files. Four of these include the following files:

- Master Name
- Master Address Index
- Master Vehicle Index
- Master Juvenile Index

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1 OF 2

These four files are designed to provide a cross-referencing facility whereby all occurrences of names, addresses, vehicle licence numbers and names of juveniles are indexed and stored together in order to facilitate the searching of local files for specific occurrences. The fifth file included in this group is the Geo-Coded Address Index. This file is used to classify each reported address according to the following geographic breakdown:

- atom code
- beat code
- patrol area code

This coding scheme is used to display field related data summarized by the three levels of codes. Table IV-3 summarizes the relationships of each index file to the other files.

The next category of files consists of 17 transactional files containing 46 different types of records and 502 data elements, as summarized in Table IV-4. These transactional files contain records which describe specific events, individuals, addresses, vehicles, items in stores inventory, etc. The reader is referred to Volume V for more thorough descriptions of these files. These files are outlined below.

Active Duty List; this file provides an updated list of all police personnel on-duty and an indication of their specific assignments.

Block Parent; this file contains records which describe the name and address of individual involved in a Block Parent program.

Business Security; this file provides a listing of possible contacts in the event that there is a security problem with a business premise after normal business hours.

Court Docket; this file contains records describing each scheduled court case requiring the appearance of a police officer.

Dispatch Record Abstract; this file contains records describing each call-for-service received by the department.

Duty Roster; this file provides a listing of pre-scheduled duty assignments of police officers to specific shifts and days off.

Field Observations Report Abstract; this file contains records describing individuals, their associates and their vehicles as reported on field observation reports.

Firearms; the purpose of this file is to provide a record of the owners of all firearms registered by the police department.

Juvenile Report Abstract; this file contains records describing all criminal occurrences reported to the police department involving juveniles. Access to this file is restricted to the Juvenile section of the department.

Motor Vehicle Collision Report Abstract; the purpose of this file is to provide summary data related to the reporting of all motor vehicle accidents describing the nature of the accidents, injuries, place, time, etc.

Occurrence Report Abstract; this file consists of ten different types of records which are to describe all criminal and non-criminal occurrences reported by the police departments. These record types include:

- occurrence summary
- complaint
- witness
- victim
- missing person
- suspect

Personnel History; this file contains a number of different records for each employee which describe the following:

- biographical background
- equipment and uniform issued
- summary service record by rank
- monthly activity summary
- duty roster assignment
- current case assignments
- discipline history
- commendations history
- training history
- skills inventory
- education history
- performance review and evaluation history
- accident history

Property and Evidence; this file contains a record for each item turned in as lost and found or recovered as evidence. In addition, records of impounded motor vehicles are maintained on this file.

Special Attention; this file provides a facility for storing messages related to situations which require some special action. These special attention augment the daily bulletin report.

Stores Inventory; the purpose of this file is to provide a record of all items held in stores describing the nature of the items, inventory level, re-order quantity, etc.

Summons and Summary Conviction Ticket Abstract; this file contains records for each Summons and Summary Conviction Ticket issued by the department.

Vehicle Maintenance; this file contains records for each departmental vehicle describing the complete cost, maintenance service and assignment history.

The last category of files consists of seven statistical files containing 18 different types of records and 148 data elements, as summarized in Table IV-5. These statistical files contain records which represent a summation of records contained in a number of transactional files as displayed in Table IV-4. The statistical files are ultimately used for the generation of management and statistical reports. These seven files are outlined below:

Activity Log; this file contains a summary of all field activities related to the following types of transactions:
- Dispatch Records
- Occurrence Reports
- Juvenile Reports
- Field Observations
- Activity and Time Reports
- Summons and Summary Conviction Tickets
- Motor Vehicle Collision Reports

Activity Summary; this file contains records which provide a monthly summary of the records contained on the Activity Log file.

Actual Expenditures; this file contains records which reflect the actual level of expenditures for each budget line item or account code during a one month period.

Budget; this file consists of two types of records which reflect, for each month, the budgeted manpower levels by rank and budgeted costs by account code.

Budget Summary; the purpose of this file is to provide a monthly summary of the data contained on the Budget and Actual Expenditures files.

Case Follow-Up; this file contains a summary record for each case requiring some type of follow-up action.

Field Statistics; this file contains five different

record types which represent a statistical summary of all field events. The record types include:
- Occurrence/Dispatch Summary
- Field Observation Summary
- Motor Vehicle Collision Summary
- Enforcement Summary
- Juvenile Summary

CHAPTER V

ELEMENTS OF A PROGRAM FOR THE DEVELOPMENT OF INFORMATION SYSTEMS

In the previous chapters of this volume, the major emphasis has been on "why?" and "what?". Why should senior managers in police departments consider the development of information systems within their organizations? What are the main features of these systems as illustrated by the TIPS framework? We must now turn to the question - "how?". How does a police department acquire these systems?

In response to this question, we propose to outline in this chapter the major elements of a five-phase program. The five phases include:

- the feasibility study
- set-up
- system construction
- facility selection
- operations and system maintenance

Figure V-1 provides a graphical representation of these five phases.

The first phase is clearly the most important. During the feasibility study, police managers will be forced to make decisions about the acceptance or rejection of an unfamiliar technology. In order to make these decisions, existing systems and procedures must be reviewed; a clear definition of the problems must be developed; alternatives must be explored and finally, plans must be formulated and approved.

The second phase involves the development of standards and procedures which lead to the creation of a viable organizational entity within the police department responsible for the data processing function. During the set-up phase, the following must be defined:

- job specifications
- system and documentation standards
- data base administration function
- user training programs.

In addition, staff must be hired and/or transferred to fill the required positions.

The third phase involves the actual construction of the systems according to the priorities specified in the Master Plan document produced during the feasibility study. There are a number of different steps involved, including:

- definition of detailed user requirements
- development of detailed design specifications
- development of programming specifications
- development of user documentation
- programming
- system testing
- implementation and acceptance testing

The fourth phase involves the selection and installation of the computer facilities. During this phase, system hardware requirements must be specified; tendering procedures defined; tenders written; vendor proposals evaluated; suppliers selected; and finally, the installation of facilities must be supervised.

The fifth and final phase is the ongoing operations stage. We have identified six different functions which define the types of tasks performed to operate and maintain computerized information systems. These include:

- operations
- system hardware and software support
- applications maintenance
- data base administration
- user training
- data processing staff training

These phases are described in more detail in the first five sections of this chapter. These descriptions represent a "shopping list" of ideas which we believe define the basic steps required to complete the development of information systems. A number of factors will influence the precise approach taken by a particular police department. First of all, needs vary by department. It may not be necessary to establish an extensive data processing function, and the elaborate procedures as outlined, in those departments where perceived needs are minimal. Secondly, management styles are different. The approach used will, and should, be greatly influenced by the police managers in a particular organization. Finally, there is no "cookbook" approach. The data processing field abounds with a proliferation of jargon which describes the phases, steps, tasks, activities, etc. involved in building information systems. There are no standard approaches. Our "shopping list" of descriptions should serve as a catalogue of major elements of a systems development program.

In the last section of this chapter, we provide estimates of time and resources required to build systems using the

TIPS framework as an example. Again, these "estimates" are intended to create some reasonable understanding of the magnitude of a major systems development effort. They are not intended to pre-define the resource requirements in any particular police department.

A. Feasibility Study

The first phase is clearly the most critical. The work done during the feasibility study will lead to decisions which will have a profound and lasting effect on the over-all direction of all future systems development work. The major outcomes from this phase include:

- a decision to proceed with the development of systems, and,
- a master plan which defines the future course of the system development efforts.

We have identified six steps during the feasibility study. These are outlined below:

1. Project Initiation

This step involves the detailed planning and the definition of organizational requirements for the whole first phase. The activities involved include the following:

- selection of the project team
- definition of the scope and objectives of the first phase

- creation of a Project Management Committee
- creation of a User Review Committee
- development of a detailed work plan for the feasibility study phase.

The project team should consist of a combination of experienced police officers and systems analysts. The analytical skills may have to be hired or borrowed from the municipal data processing department. The two committees referred to above should be used as a sounding board and approval mechanism throughout this and all subsequent phases.

2. Review Existing Systems and Procedures

The main purpose of this step is to gain a thorough understanding of the systems and procedures currently being used in the department. The activities include the following:

- review of existing systems documentation
- review of existing policy and procedure manuals
- design of the field interview questionnaires
- development of the field interview plan and a schedule of interviews
- interviews with a representative sample of field users at all levels in the command structure
- documentation of information flows and procedures throughout the department
- estimation of processing volume and turnaround time at all points in the system
- consolidation of user statements about problems with the existing systems
- documentation of the existing systems.

3. Review Information Demand Conditions

In the previous step, the project team focuses on the existing conditions. In this step, the team turns its attention to the future. This is accomplished through questions which lead the various users in the department to speculate on their requirements for more information, better information, quicker turn around, better access, etc. It may be necessary for the project team members to develop speculative statements about future systems developments in order to create the type of truly innovative thinking required. The activities involved in this step include the following:

- design of field interview questionnaires
- development of a field interview plan and a schedule of interviews
- field interviews with user groups
- documentation of user requirements.

4. Problem Definition

The problem definition step involves the production of a document which provides a comprehensive review of the problems associated with the effectiveness and efficiency of the existing systems. The documents produced in the two previous steps serve as the basis for the review of problems. The problem statements should focus on the following:

- the accessibility of data,

- the completeness of data processing and reporting procedures,

- the statistical reporting capabilities,

- policies and procedures which impact on the data processing functions,

- system controls and auditing features,

- the information demand conditions and the areas where user requirements are not being met,

- the organizational aspects of data processing.

At the end of the problem definition step, the project team must review the problem statements with the Project Management and User Review committees. Both of these committees must agree with the problem statement before proceeding to the next step in this phase.

5. Explore the Feasibility of Alternative Solutions

In response to the problem statements, the project team must speculate on a broad range of solutions. This step consists of the following types of activities:

- review of literature describing the experience of other police departments with the development of computer-based information systems,

- visits to other jurisdictions to investigate

operational systems and approaches taken during the development of these systems,

- review of packaged system solutions,

- definition of a specific set of alternative solutions,

- estimation of development and operating costs of each alternative,

- definition of the advantages and disadvantages of each alternative,

- presentation to both the Project Management and User Review committees describing each alternative in terms of costs, advantages and disadvantages,

- selection of favoured alternative,

- approval of both committees,

- documentation of the full range of alternatives and the approved solution.

At the end of this step, the project team should also document all recommendations concerning issues which are beyond the scope of data processing per se. These issues may involve changes to departmental policies, operating procedures or the organizational structure. These recommendations should lead to specific action by senior management to resolve these issues and make the necessary changes. From this

point on, the scope of the project must be narrowed to address the data processing issues and changes only. At the end of this step, there should be a clear understanding of the feasibility of the selected approach and a commitment in principle to this approach.

6. Develop the Information Systems Master Plan

The purpose of this step is to move from a "commitment in principle" to an "approved" operational plan for the entire systems development process. The activities involved in the preparation of a Master Plan should include the following:

- definition of the scope and an operational set of objectives for the proposed system,

- development of a general statement of user requirements,

- development of a system design including general specifications of the major system components, the files and record contents, input data types and output reporting capabilities,

- definition of the over-all system development strategy. (Options may include strictly internal, strickly external - e.g., municipal data processing facilities and staff - or a combination of both internal and external development).

- development of a sketch of the proposed hardware configuration which broadly defines the

scope and capacity of the computer hardware required to meet the needs of the proposed system.

- determination of specific development priorities.

- development of a schedule of the major steps and milestones involved in all subsequent phases.

- development of cost estimates related to each subsequent phase.

- development of a detailed staffing plan which specifies the number of required staff, by various levels and types of data processing skills required.

- production of a master plan document which contains all of the above.

- presentation of the master plan to both the Project Management and User Review committees for their approval.

If a computer-based information system is found to be desired and feasible, at the end of the first phase, senior management must be prepared to make significant commitments; these commitments will involve a significant appropriation of funds to hire staff, and to buy or lease computer hardware and software. Beyond this, these commitments will lead to fundamental changes in the fabric of the police department. We stress the importance for senior

police managers to take sufficient time to understand the problems, the alternatives, the costs and, finally, the operational implications of the proposed solutions. It is relatively inexpensive to change approaches or re-think some aspect of a proposed system during the first phase. Beyond this phase, changes to the fundamentals of the system will become expensive.

B. Set-Up

The second phase in the system development process involves the creation of an organizational component within the force responsible for the development, maintenance and operation of the proposed systems. The steps are outlined below:

1. Develop Organizational Structure for the Data Processing Function

Based on the staffing plan contained in the master plan, a number of activities are required to create a viable Data Processing function within the department. These activities include:

- definition of the various job positions.

- development of detailed job specifications for each position outlining duties, responsibilities and skill requirements.

- development of a policy on technical training.

- definition of technical training needs.

- hiring and/or internal transfer of staff required to fill the defined positions.

2. Develop Systems and Documentation Standards

This step in the set-up phase involves the development of detailed standards which define the programming languages, system design conventions, system controls, and the format of all system documentations. The types of documents include:

- detailed User Requirements
- detailed System Design Specifications
- Programming Specifications
- Manual Procedure Specifications
- Acceptance Test Plan
- Production Guide
- User Manuals

The documentation and system standards will serve as a guideline for all future systems development.

3. Establish Data Base Administration Function

In view of the large number of files, record types and data elements, we believe that it is necessary to create a data base administration function within the data processing area. This function involves the control and development of a common set of terminology and codes related to all data elements. For example, there will be a requirement to develop a comprehensive geographic coding scheme defining all patrol areas,

beats, and atom codes. There are a number of additional examples outlined in Volume V.

4. Develop User Training Program

The last major step in the set-up phase involves the development of a comprehensive training program for all users of the system throughout the department. This program should include:

- an explicit policy statement approved by the Project Management Committee defining the need for user training throughout the department and a commitment of the appropriate resources.

- a specific plan for training all departmental staff.

- the instructional materials required.

C. System Construction

The purpose of the System Construction phase is to design, build and implement the various components of the system as broadly defined by the information system Master Plan. Clearly, all components of the system are not built simultaneously. The various components must be grouped and then built in stages. The steps involved in each stage of system construction are outlined below:

1. Preparation of Work plan

The first step involves the preparation of a detailed work plan defining staff requirements and a

schedule of the major tasks involved throughout the construction period. This work plan must be reviewed and approved by the Project Management Committee.

2. Definition of Detailed User Requirements

During the Feasibility Study phase, user requirements are broadly defined in terms of systems inputs, outputs and processing features. These descriptions are, and should be, general.

The main purpose of this step is to develop specifications which precisely define user requirements. The type of activities required include the following:

- review of the appropriate general design material contained in the master plan.

- development of a preliminary set of input data specifications (i.e., forms, layouts, data entry formats, etc.) and output report specifications (i.e., detailed report layouts, terminal data retrieval formats, etc.).

- presentation of these specifications to User Review Committee for approval.

- development of an interview schedule involving a representative sample of field users.

- field interviews and observations using the preliminary user specifications as a reference point for discussions.

- consolidation of user comments and modifications to the original user requirements.

- review of the modified unput and output specifications with the User Review Committee.

- modifications of the User Requirements and a second round of interviews with field users.

- consolidation of user comments and final modifications to input and output specifications.

- documentation of detailed user requirements.

- presentation of the Detailed User Requirements document to the User Review and Project Management committees for final approval and sign off.

The output document from this step should clearly specify user needs in terms of:

- input data formats
- output report formats
- turn around and service time requirements
- error detection rules and procedures
- error correction procedures

3. Develop Detailed Design Specifications

The purpose of this step in the Construction phase is to develop a technical solution to the information processing needs of the users as defined in the Detailed User Requirements document. The scope of this technical solution is constrained by the basic

approach documented in the Master Plan and by the system standards and conventions created during the Set-Up phase. As the design activity progresses, changes to the Detailed User Requirements may become necessary. The User Review Committee must be involved to approve any such changes. The major output from this step is the Detailed System Design document. This document should include descriptions of the following:

- the over-all system
- each major program module
- the processing flows and interfaces between the program modules
- the over-all file structure
- the files
- the record layouts
- the data elements
- back up and recovery procedures
- hardware, system software and communication facilities used
- the conventions and standards used

4. Develop Programming Specifications

The purpose of this step is to produce detailed technical specifications for each program module contained in the system. These specifications should include descriptions of the following:

- the purpose of each module and the language to be used

- the processing rules and general flow/chart

- the inputs

- the outputs

- interfaces and calling conventions of each module

- data edit and error condition procedures

5. Programming

The programming step should only begin after all design issues have been resolved. During this step, the system evolves from a design, described on paper, to a tested set of application software, operating on the computer. Programming is the most tedious and time-consuming step in the Construction phase. The success of programming depends directly on the completeness of the design work performed in the previous steps of the System Construction phase.

6. Develop Manual Procedures

This step involves the creation of detailed descriptions of all manual procedures. These manual procedures serve as the basis for the users' understanding of the system and their ability to operate and use the system effectively. The Procedures Manuals should be documented using terms which are easily understood by the user. In addition, they should be documented on a need-to-know basis and targeted to

individual users within the department. The development of the manual procedures should be done in parallel with the development of programming specifications and the actual programming.

7. System Implementation and Acceptance Testing

The last step in the Construction phase involves the full implementation of all software and manual procedures, and the development and execution of a comprehensive acceptance test of the system. The activities in this step should include:

- development of System Production Guide, for computer operations personnel.

- intensive training sessions for users and computer operations staff.

- initial implementation of the system on a dry-run or pilot basis.

- full testing of all software and manual procedures based on the pilot tests.

- correction of "bugs".

- full implementation of the system and parallel operations with existing systems and procedures.

- further correction of "bugs".

- acceptance test period for the users

- final approval by both the Project Management and User Review Committees.

- post-implementation and acceptance test.

- evaluation of system performance.

At the end of this final step in the Construction phase, the system should pass from a development mode into the operations and ongoing system maintenance mode. The system should be fully documented and tested.

D. Facility Selection

The fourth phase involves the selection and installation of computer hardware facilities. The Facility Selection phase is complicated by the existence of countless different computer manufacturers, all offering innumerable models and options for consideration. The steps involved are outlined below:

1. Define Hardware and System Software Requirements

A number of major decisions concerning the capabilities and features of the system configuration must be made before any hardware is purchased. These decisions should be based on the general system design contained in the Master Plan. The specifications developed during this step should include:

- estimates of processing volumes (i.e., daily transaction volumes, reporting volumes and frequency of on-line inquiry).

- estimates of file storage requirements.

- definition of basic system features including batch and on-line processing features.

- definition of on-line terminal requirements in terms of number and type.

- definition of system performance characteristics in terms of response times, turn around times, peak period processing loads, etc.

- definition of reliability constraints in terms of tolerable down-time and back up requirements.

- definition of system software requirements, including:
  - . operating system features
  - . data base capabilities
  - . data management and file handling facilities
  - . compilers (FØRTRAN, CØBØL, etc.)
  - . teleprocessing facilities
  - . general description of computer configurations in terms of:-
    - . the mainframe
    - . peripherals
    - . terminals

All of the above specifications must be documented in a form suitable for presentation as part of the terms of reference in the tender.

2. Develop Tendering Procedure

The purpose of this step is to define the tendering procedure to be used to procure the required computer hardware and software. This procedure should include:

- specification of tender document format
- definition of proposal evaluation criteria
- definition of tendering rules of submission.

3. Define Space Requirements

This step involves the specification of the space required to house the computer hardware facilities and the operations staff. Particular attention must be given to special service requirements such as air conditioning, electrical power, and floor supports.

4. Produce Tenders and Release to Suppliers

During this step, the actual tenders are written and distributed to the appropriate suppliers. The tenders should include:

- a sketch of the system describing the proposed applications.
- system hardware and software specifications as discussed in Step 1.
- requested proposal format.
- deadline for submissions.

5. Review Proposals and Select the Desired Supplier

After all proposals have been received, they should be reviewed and evaluated according to the criteria established in Step 2. At the end of the proposal review, a decision should be made to accept the proposal of one of the suppliers. Obviously, this decision must be made with the approval of the Project Management Committee.

6. Select and Modify Space

In preparation for the hardware installation, appropriate space must be found and modified to meet the requirements as defined in Step 3.

7. Install Computer Hardware

The last step in this phase involves the installation of the computer hardware by the chosen supplier.

E. Operations and Systems Maintenance

The final phase in the system development cycle involves the ongoing operating and systems maintenance functions which are required to ensure proper system performance. These functions are outlined below.

1. Computer Operations

Computer operations staff are responsible for the ongoing production activities which are associated with the centralized computer facilities. These

activities include:

- monitoring main computer console
- mounting tapes
- mounting disc packs
- changing paper on the line printers
- calling in system support staff in the event of a problem

2. System Hardware and Software Support

Highly skilled staff must be available on short notice to respond to problems with the computer hardware and software. Often, this type of support can be purchased on a contract basis from the supplier of the equipment. In any event, this type of support is absolutely crucial in order to insure a smoothly run operating environment.

3. Application Maintenance

A staff of systems analysts and programmers must be available to correct problems with the application programs after implementation and to respond to requests for changes from field users.

4. Data Base Administration

In view of the potentially large number of files, data elements and coding schemes, it is important that changes are coordinated and controlled centrally.

5. User Training

The training of users must be viewed as an ongoing

function. New staff must be educated; existing staff must be kept informed of system changes.

6. Data Processing Staff Training

Similarly, the training of computer operators, systems analysts and programmers must be accepted as an ongoing requirement in order to properly maintain and operate the systems.

F. TIPS Development Plan

In the previous sections of this chapter, we have identified the steps involved in a major information systems development project. In this concluding section, we intend to outline the resource implications in terms of time, people, and computer hardware required to successfully complete the development of a system by using TIPS as an example. The estimates are only "ball park" calculations. They are presented to illustrate the magnitude of the system development task. They are not intended to pre-define a precise plan of action.

The estimates have been developed based on a number of underlying assumptions about the type and size of police departments which could become involved in such a project, and the basic development strategy. These assumptions include:

- municipal level department.

- population served is between 250,000 and 500,000.

- the number of calls-for-service is in the range of 100,000 to 200,000 per year.

- total staff complement is between 500 and 1,000.

- the annual operating budget is between ten and twenty million dollars

- systems development tasks will be performed mainly by internal departmental staff (supplemented by some consulting assistance).

- the necessary skilled staff will be hired.

- computer hardware will be purchased by the department.

- computer operations and systems support functions will be managed internally.

- the TIPS components, as presented in Chapter IV, reflect user requirements in the department.

Based on these broadly-defined assumptions, we have developed a five-phase, multi-year development plan, as represented in Figure V-2. The phases outlined span almost seven years.

During the first year, all effort is focused on the Feasibility Study. At the end of this period, a major decision has been made concerning the development of information systems, and the appropriate plans for this development have been formulated.

During the second year of the proposed plan, most of the tasks associated with the Set-Up phase have been completed; the first sub-phase of System Construction has been initiated; and the first sub-phase of the Facility Selection phase is well under way.

The major highlights of the third year of the plan include:

- initiation of computer operation.

- acquisition of first part of system hardware.

- completion of the Set-Up phase.

- completion of the first sub-phase of System Construction.

- initiation of production involving first sub-phase components of TIPS.

- initiation of second sub-phase of System Construction.

During the fourth year, construction of the second sub-phase components is completed, and the construction of the third sub-phase components of TIPS is initiated.

Highlights of the fifth year of the plan include:

- completion of the third sub-phase components of TIPS.

- initiation of the construction of the fourth sub-phase component of TIPS (Computer-Assisted Dispatch).

- initiation of the selection of the appropriate hardware for the Computer-Assisted Dispatch component.

During the sixth year of the plan, the Computer-Assisted Dispatch component of TIPS is rendered operational. In addition, the last sub-phase of System Construction is initiated.

During the last year of the plan, the last set of TIPS components are rendered operational.

Table V-1 contains a listing of estimates of staffing requirements for each development phase and sub-phase. These are summarized below.

1. Feasibility Study

The first year is devoted entirely to the steps involved in the Feasibility Study. We estimate that three full-time systems analysts are required to complete this phase. At least one of these analysts should be fully aware of police operations and procedures. Two of the analysts should have a suitable background in data processing and systems design. Conceivably, these analysts will have to be hired.

2. Set-Up

The Set-Up phase involves the creation of job descriptions, the acquisition of the necessary staff, and the development of system standards, documentation standards, a user training program and technical staff training policies and procedures. We estimate that this phase will require one analyst for 18 months.

3. System Construction

The System Construction phase is the most time-consuming and expensive of all the phases involved in the proposed plan. We estimate that almost eighty per cent of the total development staff resources totalling 254 man-months will be consumed in the design, programming, testing and implementation of the 19 different components of TIPS. The System Construction phase will span more than five years. In order to facilitate the process of building the TIPS components, we have identified five major sub-phases during the System Construction phase. Table V-2 contains a listing of the TIPS components and the proposed priorities for development. The sub-phases are outlined below.

(a) Sub-phase 1 - Field Reporting

We believe that the seven TIPS components listed under sub-phase 1 are Table V-2 support the basic field reporting requirements in a police department and therefore, must be considered as top priority. We estimate that 90 man-months of design, programming

and implementation effort spead over 18 months are required. These seven components, associated files and the on-line processing capabilities provide the structural foundation for the whole system. Therefore, we propose that 30 of the 90 man-months of expertise be purchased on a contract basis. Most of the detailed design and development work during this part of the System Construction phase is focused on the basic file structure and the on-line processing features of the system.

(b) Sub-phase 2 - Personnel and Activity Reporting

The five TIPS components listed under sub-phase 2 in Table V-2 support the operational management requirements for personnel information, the scheduling of officers, activity reporting and the operational control of follow-up cases. We estimate that 36 man-months of development effort spread over a 12-month period are required to build these file components.

(c) Sub-phase 3 - Management Reporting

The three TIPS components including Resource Allocation, Budget Control and Management Reporting as listed in Table V-2 are targeted primarily to middle and senior management reporting needs in a police department. The components developed in the previous two sub-phases provide most of the files which are used by these components to generate the necessary management level reporting. We estimate that 36 man-months spread over a 12-month period are required to complete the development of these components.

(d) Sub-phase 4 - Computer-Assisted Dispatch

Computer-Assisted Dispatch is the most complex component defined within the TIPS framework. The operating environment in the communications section of a police department dictates that the CAD component must provide:

- both on-line and real-time processing capabilities.
- elaborate back-up procedures in the event of a system failure.
- parallel/switchable computer hardware facilities.
- on-line recovery facilities.

In view of these complexities, we believe that the development of the CAD component of TIPS should be fourth on the list of priorities as specified in Table V-2. We estimate that 60 man-months of effort, spanning a 12-month period, are required to construct the CAD component. Thirty-six man-months of external data processing expertise of the 60 man-months should be purchased on a contract basis.

(e) Sub-phase 5 - Vehicle Maintenance, Stores and Registration

The last sub-phase of System Construction involves the development of the Vehicle Maintenance, Stores and Registration component of TIPS, as outlined in Table V-2. We estimate that 32 man-months, spanning an

8-month period, are required to complete the development of these components.

4. Facility Selection

The Facility Selection phase is broken into two sub-phases. The first sub-phase involves the selection and installation of computer hardware designed to meet the processing requirements of all TIPS except the Computer-Assisted Dispatch. We estimate that 12 man-months, spanning a one-year period, are required to complete this sub-phase. The second sub-phase involves the selection and installation of computer hardware required for the Computer-Assisted Dispatch component. This should require 8 man-months spread over an 8-month period.

5. Operations and Systems Maintenance

The last phase involves the ongoing computer operations and systems maintenance functions. This phase, in the over-all plan, is initiated at the beginning of the third year. During the first year of operations, the computer facilities should be managed and run for the benefit of system development staff involved with the programming and testing of the first sub-phase components of TIPS.

Table V-3 contains estimates of internal staff requirements for each year in the plan. During the first year, there are three systems analysts. At the

beginning of the second year, a manager of the Data Processing section is appointed and a secretary added, increasing the total staff complement to five. The manager should have over-all responsibility for the development and operations of information systems, and report directly to the senior officer responsible for administration. During the third year, three programmer/analysts, an operations supervisor and a computer operator are hired, increasing the total complement to ten staff. Over the first three years, the data processing staff should be involved in development activities only. At the beginning of the fourth year, four additional computer operators are hired to provide production services on a 24-hours-per-day, seven-days-per-week basis. At this point, the full complement of staff exists within the Data Processing section. As the various components of the system become operational, the system maintenance functions are assigned to the existing systems analysts and programmer/analysts.

Beyond the development time-frame outlined in this summary TIPS development plan, we believe that there will always be a signigicant requirement for trained analysts and programmers. Invariably, systems undergo change. Users will want existing reports to be modified or replaced. There must be experienced and skilled staff available to respond to these types of changes demanded by the various users of the system.

The cost of system development and operations involve a $3 million expenditure for the seven year period of the proposed plan. Table V-4 contains a more detailed breakdown of these costs. The development

costs are divided into four categories. These include:

- Hardware; the total hardware costs are estimated to be $750,000. The first hardware installation, scheduled for the third year, is estimated to cost about $500,000. Table V-5 contains estimates of the various major hardware components. This basic configuration should be capable of supporting the needs of all TIPS components, except for Computer-Assisted Dispatch. The second hardware installation, scheduled for the sixth year, to support the CAD component, is estimated to cost about $250,000.

- Space Modifications; the estimates of $100,000 and $50,000 during the third and sixth year relate directly to the need to make major modifications (e.g., air conditioning, raised floor, electrical power, communications, etc.) to the existing space, in order to accommodate the proposed computer hardware.

- External Staff; the estimated cost of hiring specialists on a contract basis of sub-phases one and four of the System Construction Phase are $110,000 and $120,000 respectively.

- Internal Staff; the yearly estimates of internal staff costs are based on the estimated internal staff requirements listed in Table V-1 for each phase of the development.

The estimated total cost of development is $1,725,000 spread over the seven-year period.

Similarly, Table V-4 provides a three-way breakdown of operating cost estimates. These include:

- Staff; the estimates of staff operating costs are based on the portion of total staff costs not allocated to development. During the first two years, all internal staff costs are deemed to be developmental.

- System Maintenance; these estimates relate to the cost of systems hardware and software maintenance. The computer hardware supplier should provide a maintenance package which costs about 10 per cent of the original purchase price per year.

- Other; the estimates under this cost category relate to the cost of supplies, professional training of data processing staff, professional conferences, travel and other miscellaneous expenses.

The total operating expenses from the third to seventh years are estimated to be $1,200,000. The ongoing operating costs beyond the time-frame of this proposed plan should be almost $400,000 per year. Based on an operating budget of $20 million for all functions in a police department, this estimate of Data Processing costs represents two per cent of the total.

G. How Do You Begin?

This volume, and particularly this final chapter, has focused on the "How to...?" questions of MIS development. But like any other development program that must respect the need for major differences in approaches between different police forces, it falls far short of providing a "packaged solution" to MIS development. The TIPS framework developed in this volume, and refined in Volume V, is designed as an illustration of MIS development. Many variations on this theme are both possible and advisable for individual police forces.

We have identified a development process that is comprehensive. It is a major program for a police force. This leaves the practical question of: How do you begin a program which will extend over seven years and require significant financial resources? Although each police force will answer the question differently, we can outline a number of general requirements.

First, the police force must make a major commitment to change through its MIS program. It must recognize the far-reaching implications to its organization and its style of handling its business. MIS implies a greater use of science and technology in police functions. The use of this technology must be controlled by police managers, within the controlled environment of a detailed Master Plan.

Second, most police departments will probably have to make some use of external resources such as

consultants to initiate their MIS programs. Consultants can be put to best use in drawing up the Master Plan (feasibility study). By using consultants in this activity, the police force is receiving the best possible return on the wide range of experiences that the consultants have gained - in both police and other environments.

Third, the MIS design should be modular and capable of implementation, piecemeal over an extended time horizon. Success in development the first modules will build experience for subsequent work. Failure in early work will leave an opportunity for "mid-course" corrections through either adjusting the project team or resources allocated to the program.

GLOSSARY OF TECHNICAL TERMS

ADMINISTRATION OF CRIMINAL JUSTICE (System of Criminal Justice): The inter-organizational relationships that exist between law enforcement prosecution, adjudication, probation, corrections, and parole.

AUTOMATIC DATA PROCESSING (ADP): Denotes both electronic data processing (EDP) and electric accounting machinery (EAM).

BATCH INFORMATION PROCESSING: The function of providing data within some reasonable time, but not simultaneously with operations. This type of processing is frequently accomplished in an off-line mode. Off-line pertains to operating devices not under the direct control of the central processing unit. Batch processing can also operate in an on-line mode.

CATHODE RAY TUBE (CRT): A CRT is a visual display terminal used for inquiry into the memory of a computer system. The terminal consists of a keyboard, a signal generator-interpreter, a buffer, and a visual display screen similar to a television screen.

CENTRAL PROCESSING UNIT (CPU): The component of the computer that contains the main storage, arithmetic unit, and special registers. It is synonymous with Central Processor.

CODE: It is either a system of symbols for representing data or instructions in a computer or a tabulating machine, or it is the translating of a program for the solution of a problem on a given computer into a sequence of machine

GLOSSARY (continued)

language or pseudo instructions and addresses acceptable to that computer.

COMPUTER (Digital): An electronic device capable of accepting information and performing prescribed processes to the information and supplying the required results in micro-seconds.

DATA: Facts used as a source for processing a series of actions or operations directed toward an end; the raw material for the function of information processing.

DATA COMMONALITY: The identification and use of the same data element by more than one person or organization.

DATA FOUNDATION OR DATA BASE: File or files of information existing in permanent or semi-permanent storage, excluding transitory or impermanent information to be operated upon by the system or contributing to the operation of the system.

DECISION MAKING: An organizational strategy for mounting a collective response to a problem situation.

DISK: A storage device on which information is recorded on a magnetizable surface. The disks rotate at a high speed, providing rapid (random) access to information.

DRUM: A high-speed, rapid(random) access storage device consisting of a rotating drum coated with a magnetic material upon which data are stored.

GLOSSARY (continued)

ELECTRONIC DATA PROCESSING (EDP): The kind of automatic handling of information which is done by the million-operations-a-second electronic computer.

HARDWARE: Hardware is all of the mechanical, electrical, magnetic, and electronic components forming the equipment portion of an information system.

INFORMATION: Knowledge derived through the analysis of data.

INPUT: The acquisition of data and placement into the system.

INQUIRY (I/O): A device, generally a typewriter keyboard, used to "talk" to the computer, usually to get quick answers to random questions. Also, it may accept new data, send it into the computer for processing, receive the results, and convert them into a usable form.

INTEGRATED INFORMATION SYSTEM: Developing and coordinating the individual elements of a system so as to form a compatible over-all system configuration.

INTERFACE: The intersection or common boundary of two or more logical or physical entities. In the context of this report, to interface two systems or effects is to integrate and coordinate the specific systems or effects such that the results can be combined to provide a unified solution.

MAGNETIC TAPE: A ribbon of tape impregnated or coated with a magnetic material upon which data may be stored as magnetically polarized spots or wave forms.

GLOSSARY (continued)

MODEL BUILDING: The abstract construction of an ideal state of affairs which usually acts as a guide for subsequent design, development, and implementation of the concept.

OPTICAL SCANNER: A computer input device that recognizes many characters and digits by optical scanning.

OUTPUT: To present the results of the processing or the status of any data stored in the system.

PAPER TAPE: A ribbon-like strip of paper, one inch or less in width, used as a means of recording data in the form of coded perforations.

PROCESSING (of either information or data): To manipulate data according to specified rules.

PROGRAM: A series of instructions which cause a data-processing system to process a specific application.

PUNCHED CARD: A punched card is a card of standard size and shape in which data are stored in the form of punched holes. The hole locations are arranged in 80 or 90 columns with a given pattern of holes in a column representing one alphanumeric character or one digit. The data is read by mechanical, electrical or photo-electrical sensing of the hole positions.

GLOSSARY (continued)

RAPID ACCESS (Random): Pertaining to the process of obtaining information from or placing information into storage where the time required for the access is independent of the information most recently obtained or placed in storage. This type of process is capable of operating at extremely fast speeds.

REAL-TIME, ON-LINE INFORMATION PROCESSING: Real-time means the processing of information in a sufficiently rapid manner so that the results are available in time to influence the process being monitored or controlled. It is sufficiently fast that there is virtually no passage of time between inquiry and result. On-line pertains to operating devices under the direct control of the central processing unit.

RETRIEVAL: The recovering of desired information or data from a collection of documents or other graphic records.

SIMULATION: This is an exercise which generally uses a computer as a score keeper while people make decisions concerning a mathematical model of the business world. The model consists of a group of cause-and-effect formulas that determine what happens when a decision is made by a human competitor.

SOFTWARE: Software includes design documentation, computer programs and their supporting description documentation for operational and support functions, operator methods and procedures handbooks, orientation materials, and system exercising and training materials.

GLOSSARY (continued)

SYSTEM: A set of components and their attributes interrelated by process or structure possessing a functional purpose and organizational unity. Depending on the context it may be either an organization or a set of informational relationships.

SYSTEMS ANALYSIS: A specialized method of subdividing an integrated complex into its more basic parts in order to examine each component's use and relationship to other components. This process requires ascertaining some relatable denominator as quantitative value.

SUBSYSTEM: A subdivision of a system; a system contained within a system.

END