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COMPUTER TECHNOLOGY IN POLICING IN ENGLAND AND WALES

By

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ABSTRACT

COMPUTER TECHNOLOGY AND POLICING
IN ENGLAND AND WALES

By

Kevin Patrick Bond

The purpose of the study was to determine whether, and how, police forces in England and Wales use computers. Many studies have examined the police role and organization, but very few have focused on the impact of computer technology.

Of the forty-three police forces in England and Wales a 65 percent sample responded to a mailed survey (N=28). Secondary sources supplemented the survey data. Police computer use and implemtation is examined within the framework of eight research questions.

The study indicates that all police forces use computers. Computer application areas are presently directed towards management needs. Applications are predicted to expand from 40 percent to 60 percent of potential available by 1983, with the greatest development in non-routine areas. Outside bodies, mainly the Home Office, greatly influence police computer development.

Computer implementation has had considerable impact on police organization and police leadership is committed to further computer development.

Dedicated to my Wife,

Susan Bond

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The support and friendship of faculty and student collegues contributed greatly to this study. I would also like to thank Professor Kent Colton of Brigham Young University for his assistance and the International

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CHAPTER I

THE PROBLEM

Introduction

The present study examines the role of the computer as it relates to policing in England and Wales. The computer is at the core of a technological development that has captured the imagination of twentieth century man. From the achievment of the space industries to the use of micro-wave technology in fast food delivery, man lives in anticipation of further rapid technological development. Yet, such anticipation also carries certain reservations based on the incomprehension of what is in fact taking place in technological development. This situation can be likened to the transition of agricultural society to industrial society with the development and adaptation of the steam engine, itself a technological change which took well over a century to achieve. Yet, the technological revolution, of which the computer is the core and a driving force, began a mere three to four decades ago in the post-war re-construction after the Second Worl War.

The impact of the technological revolution has left no aspect of society unaffected; the farmer milks his cows by machine, the homemaker shops in the computerized supermarket, children play computer games at school and learn to programme computers, and cemeteries maintain records of burial plots on micro-film. The significance of recent technological change was recognised by Valery Giscard d'Estange -- the President of the French Republic, who wrote:

> The applications of the computer have developed to such an extent that the economic and social organization of our society and our way of life may well be transformed as a result. Our society therefore should be in a position to both foster this development and to control it so that is can be made to servce the cause of democracy and human growth.[1]

Thus, since the police are in the vanguard of social development -- preserving and protecting social rights and freedoms -- it is reasonable to expect the police to be in the forefront of technological use since such development will affect the "economic and social organization of our society". The present study asks: "Do the police in England and Wales use computers, if so what for and what are the anticipated and unanticipated consequences of such use?"

The police in England and Wales are the subject of this study and not the police of Britain, which comprizes England, Wales, Scotland and Northern Ireland.

Scotland and Northern Ireland have different historical and legal traditions which make comparisons with England and Wales inapposite. For example, in Scotland the police present all cases to the Procurator Fiscal for a decision as to prosecution; an office not present in England and Wales. Similarly, in Northern Ireland there exists a legislative body, separate from the British Parliament, responsible for internal affairs in the province of Northern Ireland.

The present study will examine the developing role of computers in police forces in England and Wales. It is helpful to the remainder of the study to define the major terms with which we will deal; "technology," "police," and "computer".

The term tekhne, a Greek word, means art, craft, or skill. Technology is defined in the Oxford English Dictionary as; 1) "the application of science", or 2) "practical or industrial arts". Expanding on this definition, Manning points out that:

> . . . technology in recent years has accumulated diverse definitions in social research. "Technology" cannot in fact be considered in the abstract, because all technology is used by various personnel who bring meaning and understanding to technology and because it is always employed within the context of on-going social organization or social structure which constrains its use to socially sanctioned purposes.[2]

In the present study technology will be considered in the context of policing as a social organization.

Police derives from politia, a Latin word, meaning policy. Police is defined in the Oxford Dictionary as, "a civil force responsible for maintaining civil order." Thus, the police are responsible for the enforcement of policy set by the legislature -- the politicus. Specifically, this study concerns police use of computer technology. A computer is defined by the Oxford Dictionary as, "an automatic electronic apparatus for making calculations or controlling operations that are expressable in numerical or logical terms".

The importance of computer based information technology to policing has been stated thus:

> There is no way to over-estimate the importance of communications to the operations of a police agency. In fact, the use of radio communications was the greatest advancement in law enforcement in the first half of this century. In the second half of this century, law enforcement has been completely altered by the development of computer sciences. Computers and automated information systems are now a vital part of police communications and will increase in importance even more in the future.[3]

Purpose

There is little indication that the impact of crime will lesson in the foreseeable future to the extent that police in England and Wales will have spare capacity. Indeed, it is probable that crime will continue to increase, despite arguements by some authors, such as Wilson, that age cohorts -- the aging of the population --

will result in a gradual reduction in crime.[4] The rate of increase in crime year by year is not known in advance, informed guesses can be made, but they are simply that -- guesses. Consequently, police administrators have to plan their organizational development on the basis that demands on their time will increase. Demands on police would decrease if there is large scale decriminalization on the basis of the expungment of many statutory crimes, or there is a thorough re-examination of the role of the police resulting in a considerable narrowing of the police role. Either possibility is somewhat remote.

Yet, given the nearly certain increase in work load, it is almost also certain that the manpower available to police administrators will suffer a relative decline. The President"s Commission on Manpower had this to say on this point in relation to the United States:

> Although increases in police staffing are probably fully justified in many growing less affluent communities, the limited correlations among police staffing, crime rates, and police performance suggest that, in other communities, improvements in deployment and utilization of existing resources, combined with more active citizen involvment and support, may be as important in improving overall police performance as additional increments of police manpower.[5]

These comments given almost a decade and a half ago, probably have greater relevance today in connection with policing in both the United States and England and Wales

where inflation is creating a continuing problem in modern industrial society.

One consequence of such factors is that police administrators are looking to computer based technology as a means of increasing the work capacity of their police forces. The computer is being utilized to streamline the information gathering process of police forces. Traditional police administration methods, relying on a complicated set of written reports submitted through a hierarchic bureaucracy, are no longer adequate. As Manning comments:

> The police above all are information dependent; they are dependent on police calls for crime relevant information; on witnesses to solve crimes; on informants to provide cases; and on each other to process, collate and synthasize what is known in one unit for the others.[6]

The computer is seen, by many police administrators and managers, as a tool which can "collate and synthasize" the assortment of information which finds its way into the police organization.

If previous trends are accurate it would seem reasonable to expect that the police would be major users of computer based information technology. The difficulty in assessing this assumption is that there is very little information about police computer utilization. The police, as an institution, are a closed society within the greater social system. For example, Manning makes

the point that the police function on at least two levels. The first level, the public level, is where they do their best to meet public expectations -- where they appear as "an endangered crime fighter who battles heroically against the ever-threatening chaos of crime".[7] The second level of activity is where police actions are cloaked in a veil of secrecy -- to prevent public assessment of their actions. This is not to say that the police are different to many other important organizations in society, but they do occupy a very prominent position in the public eye. So, whilst it is of great interest to examine the use of computers by the police it is exceedingly difficult to obtain accurate and reliable data of such use.

The importance of such information goes beyond academic concerns to the heart of the efficiency of the police job itself. Policing is a multi-billion dollar industry, and in view of the scarcity of public funds and the acute competition between public agencies for those funds available, it would seem incumbent on the police not to re-invent the wheel but rather to exchange ideas and technical information concerning developments and their success or failure regarding computer usage. The first part of such an exchange of information is the accumulation of a reliable data base listing present computer applications and lines of development.

The import of such a data base goes beyond the realm of English and Welsh computer developments and includes the issue of applications and hardware and has transferability to other countries, such as the United States or other Westerm democratic countries.

For these reasons, it is important to look at developments in England and Wales not simply as isolated events, but as part of a larger trend of computer development in policing. Similarly, to make sense of what is happening in England and Wales it is helpful to take a wider perspective of computer development and use. Therefore, developments in the United States, which are believed to be in the forefront of law enforcement computer applications, research, and development are examined in the present study. In the United States, as in England and Wales, there is a relative scarcity of information concerning such law enforcement computer developments. That which is available is of varied quality and scattered widely in source. Police centred research is a relatively recent development; empirical research concerning the police is even more recent and yet to be fully developed. Consequently, this paucity of information concerning both policing and police use of modern information technology will be expanding upon in the present research. Furthermore, an attempt to identify reference points based on traditional police organization

and to indicate general areas of development rather than give specific prescriptive directions will also be undertaken.

Computer technology occupies a very obviously important position in the development of policing, its impact on police administration is not known, nor is its real impact on the front end of policing -- the street cop's job. The central concerns of the problem being studied are with, 1) which computers are being used and, 2) for what applications are these computers employed in British and Welsh police forces.

Research Questions

This study is exploratory in nature, with little previous research on which to rely, therefore general research questions are utlized rather than detailed hypothesis. The research questions guiding this study are listed below, along with a brief summary of the rationale underlying each question.

These questions, and the results of the study itself, can be divided into two major sections:

A. Police Use of Computers; this consists of a review of computer use, its development -- past, present, and future.

B. Police Computer Implementation; through an examination of problems encountered an assessment will be made of computer implementation and its impact on the police organization.

In order to put the results of this study into wider perspective the study has been constructed to closely replicate Colton's 1971 and 1973 studies of computer utilization in a sample of police agencies in the United States.[8] The findings of this study can be assessed against Colton's, promising a preliminary assessment of police computer use in both the United States and England and Wales. There is, of course, an important qualification which has to be made to such a comparative assessment. The time difference in gathering information is such that what we see is the state-of-the-art in the United States in the early 1970's, and the state-of-the-art in England and Wales in 1980, and nothing more. It is possible however, despite such limitations, to reach some preliminary conclusions as to areas of development in both countries.

The research questions studies are:

A. The Police Use of Computers:

1. Is there a uniformity in hardware used by police forces?

This question will examine the computer hardware* used by police forces. There are relatively few police forces in England and Wales when compared to the United States. In view of this, an attempt will be made to see

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*Terms marked with an asterisk may be found in the glossary.

whether forces utilize similar hardware or whether there is variation in hardware utilization.

2. What are the applications of computer technology currently used in police forces in England and Wales?

This question seeks to discover into what applications police forces are directing their computer efforts and whether these forces have similar application fields. If there is a uniformity in terms of computer applications, this might be interpreted as a general indicator of operational and management priority. Indeed, from such information it might be possible to identify whether management or operational areas of responsibility were considered of immediate priority and/or long-term priority.

3. Has the employment of computers created new, quantitative or numerical based pressures to use such information to justify decisions?

Police work is subject to frequent questioning at many levels, not the least of which is political and fiscal. This question seeks to identify whether or not the ready access to numerical information, as evidenced in the use of computer technology, has led to a tendency to support decisions or arguments with quantitative information in situations which were previously decided on some other basis.

B. Police Computer Implementation:

1. How important to the operation of the police are computers?

This question is an attempt to assess the use and importance of computers in police operations and management. The study seeks to identify the levels of management directly responsible for computer operations and the perceived impact of computer utilization on levels of influence within the police departmental hierarchy.

2. Where in the police forces does the stimulation and support for technological computer development originate?

This question seeks to locate the source of new ideas and the drive towards computer innovation in police organizations in England and Wales. As Warner observed:

> Despite the valuable work done to date, many aspects of the diffusion of innovations remain virgin research territory. Both conceptual work and empirical research call for attention and promise rewards in the form of enhanced theoretical understanding of dynamic social phenomena and of useful new knowledge.[9]

This question also seeks to identify whether police forces receive stimulation and support from agencies outside the force itself and whether such support has been instrumental in actual computer development. Indeed, Perry and Kraemer recently pointed out that in regard to the United States, "Federal financial assistance, innovation attributes and local government needs may be better

predictors of diffusion of computer application than interaction between adopters and nonadopters."[10] Thus, the role of the Home Office and local government authorities will be examined in this study in relation to computer developments in police forces in England and Wales.

3. What problems have been experienced in adapting to computer innovation?

The results of this question will indicate some of the major problem areas resulting from computer development and computer use. It is felt that the identification of problem areas will provide some indicators as to organizational ability to adapt to new computer technology. This question will also indicate whether the problems experienced in applying computers to police work are equipment related or personnel related.

4. What impact has the application of computing had on the administration of policing?

This question is an attempt to assess the impact of change on the police organization. From such an assessment of administrative change some feelings may be gained for the impact on the operational end of policing.

5. What benefits have police forces gained from the use of computer information technology?

This question seeks to examine whether police forces have achieved measurable benefits from their expenditures on computerization. For this study

information will be collected concerning the expectations of forces and the realization of these expectations. The study will also seek to assess whether the capital investment in computerization has been worthwhile, as measured from the police point of view.

Overview

In the next chapter a review of the literature is presented. Because little research has been directed at the specific issue under consideration in this thesis (police use of computers), the review ranges across a number of topics pertaining to the study. These include the development of policing in England and Wales, the organization of policing, computer development and police involvement with computers, and current police organizational trends.

In Chapter III the study design is elaborated. In addition to the description of methodology used, a number of research issues relating to the study are discussed. An outline of the criteria by which comparisons between policing in England and Wales and the United States are made is also presented.

In Chapter IV an analysis of the results is presented. In Chapter V conclusions, recommendations and proposals for future research are offered.

FOOTNOTES -- CHAPTER I

[1]Simon Nora and Alan Minc, The Computerization of Society, (Cambridge, Massachusets: Massachusets Institute of Technology Press, 1980), p. xvii.

[2]Peter K. Manning, "Crime and Technology, The Role of Scientific Research and Technology in Crime Control", The National Science Foundation, May, 1979. p. 17.

[3]Los Angeles Police Department, Communications Division Memorandum, 1978.

[4]James Q. Wilson, Thinking about Crime, (New York: Basic Books Inc., 1970), pp. 15-20.

[5]Law Enforcement Assistance Administration, The National Manpower Survey of the Criminal Justice System, Volume One, (Washington D.C.: U.S. Government Printing Office, 1978), p. 2.

[6]Manning, "Crime and Technology", p. 5.

[7]Peter K. Manning, Police Work: The Social Organization of Policing, (Cambridge, Massachusets: Massachusets Institute of Technology Press, 1977), p. 13.

[8]Kent W. Colton, "Police and Computers: Use Acceptance, and Impact of Automation", The Municipal Yearbook, (Washington D.C.: The International City Management Association, 1972) and "Computers and the Police: Police Departments and the New Information Technology", The Municipal Yearbook, (Washington D.C.: The International City Management Association, 1974.).

[9]K.E. Warner, "The Need for some Innovative Concepts of Innovation: An Examination of Research on the Diffusion of Innovations", Policy Sciences, 5,(1974), 433 - 451, p. 449.

[10]James L. Perry and Kenneth L. Kraemer, "Innovation Attributes, Police Intervention and the Diffusion of Computer Applications among Local Governments", Policy Sciences, 9 (1978), 178 - 205, p. 198.

CHAPTER II

REVIEW OF THE LITERATURE

In this chapter the literature pertaining to this study is reviewed in the context of five related topics. The topics are; the development of policing in England and Wales; the organization of policing; computer development in society; police involvement with computers; and current police organizational trends.

This chapter describes the environment of policing in England and Wales and compensates for the paucity of material relating to police use of computers by illustrating how the need for computers has arisen.

The Development of Policing in England and Wales

> Although the (Jacobite) rebellion of 1745 had been crushed, a feeling of anxiety and insecurity persisted. Deep apprehension was felt in many quarters that a renewed attack against the established institutions was still a possibility calling for constant vigilance. The position was further aggravated by the existence in London of a vast and unruly mob, always ready to take advantage of any incident to create disorder and endanger public safety. The strength of the nation was being undermined by widespread alcoholism which also engendered a general relaxation of manner.[11]

Clearly, at the turn of the eighteenth century London was facing many problems, not least of which was perceived to be the threat of the mob. The centre for national and international trade, London offered relative political and social freedom, made more acute by the recent terror of the French Revolution. The influence of the French Revolution, together with the knowledge of worsening poverty, whereby seven to eight percent of the population were on welfare and even more in the streets begging,[12] led to a feeling by the political leaders of England that they were under a severe threat.

The control of crime, at the turn of the century had effectively passed from the hands of the magistrates, watchmen, and constables and lay in a policy of severe punishment. During the later part of the eighteenth century the number of hanging offences were in the region of 300 with frequent public executions, running nationally as high as 100 per year.[13] An exciting spectacle a public execution; the prisoner being drawn through the streets on his way to Tyburn Hill. Pringle recounts one such spectacle, in December 1742 Thomas Pounce was sentenced "to be hanged but cut down before he is dead, his privies cut off, his bowels taken out, and then to be quartered, which quarters to be put up where His Majesty shall appoint."[14]

Despite intense distrust of an organized police, a distrust based on knowledge of the French system of police who were reputed to hold records on most citizens and extensively use informers, in 1829 Sir Robert Peel won Parliamentary support for the Metropolitan Police Bill. The creation of a civilian professional police force was a major landmark in English legal history; established along military lines, but with the responsibilities and duties of any other citizen:

> The police in their different grades are no doubt officers appointed by law for the purpose of arresting criminals, but they possess for this purpose no powers that are not also possessed by private persons . . . in a word, with a few exceptions, he may be described as a person paid to perform as a matter of duty acts, which if he so minded, he might have done voluntarily.[15]

In its early days, the new force's main job was to suppress the mob, win public support and the creation of a disciplined force. Established as a civilian body, the Metropolitan Police were managed on military lines, particularly in terms of discipline and rank. There is probably no other way the force could have then been made effective, for to walk a beat in parts of London, unarmed save for a truncheon, staff, and rattle (for a number of years cutlasses were carried at night until these were dispensed with), was to depend on either extreme courage or tight discipline. In the first eight years, 5,000 members of the force had to be

dismissed and 6,000 resigned. After four years only fifteen percent of the 3,400 original recruits were left.[16]

Police personnel became more disciplined and the military's involvment in public disorder situations declined substantially following the success of the police in controlling the 1848 Chartist march in London.* The 'new' policing spread rapidly throughout England and Wales to the extent that Critchley refers to the period 1853 - 1888 as the 'Consolidation of the Nineteenth centrury Police System!'[18]

In 1901, Melville Lee provided a balanced assessment of the development and impact of police through the nineteenth century:

> It is of course impossible to estimate with any degree of accuracy to what extent the diminuition of crime and this increased security of recent years are due to the exertions of our modern constabularies . . . There is no doubt that the spread of education and the labours of religious and philanthropic bodies have done much to civilize the masses; it is certain also that an improved prison system and a reformed penal code have reacted beneficially on the criminal classes; but if we believe in the teachings of history we shall put our trust in no combination of influences directed toward the maintenance of peace that does not at least include a good preventive police force.[19]

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*Major riots occured in 1855 over Sunday closing laws, in 1868 over the political reform movement, and in 1886-87 as a result of political meetings in Trafalger Square. Between 1869 and 1910 troops were called out in Britain twenty-four times and opended fire twice.[17]

The early developments of policing in England and Wales have been emphasised in view of the importance placed on continuity and tradition in policing. It is against this backdrop that the stage for twentieth century developments in policing, culminating in the present technological revolution, was set.

The first four decades of the twentieth century was the creation of a police service in England and Wales. From a situation in 1911 when there were fifty forces with fewer than fifty men, together with many larger forces, to 1972 when there were forty-three forces in total, the smallest having no fewer than 850 officers, this development is illustrative of the many remarkable changes that have affected policing in the present century.

The introduction of automobiles into law enforcement had an enormous effect on police development. Not only did the police gain rapid mobility, but they also experienced a new police/public relationship, with production line techniques creating a new mass public activity fraught with new national problems.

Police strikes in 1918 and 1919 resulted in police reforms establishing national representative machinery for police officers and the beginings of a national police service organized into seperate police forces.

Standardization of pay and conditions of service for all police forces also resulted. Such standardization was, and still is, ensured by Her Majesty's Inspectors of Constabulary; a body of retired ex-chief officers established in 1856 who act as an inspectional arm of the Home Office.

The General Strike of 1926 illustrated to what degree the police had unified and remained loyal to their oaths to maintain the peace. Little in the way of discontent was heard from the officers and large contingents of police were sent to badly affected areas of the strike; to Derbyshire, Nottinghamshire, and to the West Riding of Yorkshire where no real problems from such joint operations were experienced.

The police remained a loyal and effective force throughout the severe economic problems of the 1930's to provide a social cement to hold society together when external and internal forces were working to pull it apart. Thus, the development of policing in a little over 100 years saw a move from a position of social alienation and indiscipline to social integration, national uniformity and the occupation of a position of intense national pride. Gorer in exploring the status of the British police officer illustrates this national pride by indicating:

> Increasingly during the past century, the English policeman has been for his fellow citizens not only an object of respect but also a model of the ideal male character, self-controlled, possessing more strength than he ever has to call into use except in the gravest emergency, fair and impartial, serving the abstractions of Peace and Justice rather than any sectional advantage or personal allegiance.[20]

As a result of these developments and the increase in public esteem the police in England and Wales had developed to a postion whereby, following the destruction of 1939-45, they could take a real part in the post-war reconstruction, which tremendously affected police organization.

Police Organization in England and Wales

In 1939 there were 183 police forces in England and Wales; the number has since dropped to 43 with no force having fewer than 850 officers. Further amalgamations can take place, either voluntarily or under the direction of the Home Secretary, in the interests of effeciency. Table 2.1. illustrates the impact of these amalgamations; the size of three forces are given as illustrations; a large force -- the West Midlands Police, a medium sized force -- the Devon and Cornwall Constabulary, and a small force -- Northamptonshire Police. It is seen that even the small force consists of an authorised establishment of 950 officers and is a sizable organization policing a

considerable population.

TABLE 2.1.--Police Establishment and Strength in England and Wales, 1978.

	Authorised Establishment	Total Strength
Outside London	90,057	86,261
Metropolitan Police	27,601	22,814

Individual Forces: Some Sample Strengths and Establishments.

	Authorised Establishment	Total Strength	Population Served
Devon & Cornwall (Combined County)	2,673	2,673	1,361,000
West Midlands (Metropolitan County)	6,500	5,979	2,730,000
Northamptonshire	950	901	514,000

Source: Great Britain, Her Majesty's Stationary Office, Report of Her Majesty's Chief Inspector of Constabulary, 1978, Appendix One.

Table 2.1. further indicates the total number of police officers serving in forces in England and Wales and the population served, a population of considerable density when it is considered that the area of England

and Wales is smaller than that of the state of Michigan. From this table some appreciation for the size of police forces in England and Wales is gained.

The Police Act of 1946 gave the Home Secretary authority to complete the amalgamation of forces where it appeared to be in the interests of efficiency. Any amalgamation would be however, preceded by a local inquiry, and the order making the scheme would be subject to Parliament's approval. This Act marked the begining of a series of amalgamations that continued through the 1950's up to and including the 1964 Police Act which was the result of a Royal Commission established to consider:

1. the constitution and functions of local police authorities;

2. the status and accountability of members of police forces including chief officers of police;

3. the relationship of the police with the public and the means of ensuring that complaints by the public against the police are effectively dealt with; and

4. the broad principles which should govern the remuneration of the constable, having regard to the nature and extent of police duties and responsibilities and the need to attract and retain an adequate number of recruits with the proper qualifications.[21]

The report of the Royal Commission displayed a strong support for:

> . . . the logic of the case for nationalizing the police as constitutionally preferable to a system of local forces in that the Home Secretary would be accountable to Parliament for the activities of the police in the same way that other Ministers are accountable for the public services for which they are responsible; and as operationally preferable; in permitting a greater economy and efficiency in the deployment of ideas, men, and resources.[22]

However, despite the strong support for nationalizing the police a compromise solution was adopted whereby the Home Secretary is one component of a tri-part arrangement for managing law enforcement in England and Wales; the other two principle components being the local government authority and the chief officer of the particular police force. The Police Act 1964 established the respective areas of responsibility and power of the Home Secretary, local authority and the chief officer. The Home Secretary is given a new duty to take initiatives to promote the efficiency of the police, and powers to discharge this duty. These powers are of two kinds:

1. those directed towards promoting the efficiency of individual forces. Under this heading the Home Secretary can call for reports from chief constables, approve the appointment of senior officers and compel the retirement of an inefficient chief constable, and set up a local inquiry into the policing of an area;

2. those directed towards promoting the efficient policing of a wider area by developing co-operation between forces , providing common service arrangements, and amalgamating police areas.

In addition to the idea of control over the highest command postions, there is also financial control; 60 percent of the costs of policing have been, for a long time, met by the central government, subject to the efficiency of the individual force.

The local authority's main functions under the provisions of the Police Act are the maintenance of an adequate and efficient police force, properly housed and equipped, and the appointment , and if necessary, the removal of the chief constable. The police authority is composed of two-thirds locally elected councillors and one-third magistrates. Quite beyond its formal powers, the police authority retains its long established influence over the morale and efficiency of the force.

The chief constable is explicitly in command and control of the force with powers of appointment, discipline, and promotion over the subordinate ranks. Though the approval of both the Home Secretary and the local police authority is required for the appointment of deputy and assistance chief constables, once appointed they are under the command of, and responsible soley to, the chief constable.

The Police Act swept away completely or partially sixty-one Acts of Parliament, pertaining to jurisdiciton

boundaries, and organization, dating back to 1801.[23] The Act also gave statutory recognition to many agencies which had been developed under local or central initiatives in previous decades. These included many common service arrangements*, such as the national Police College for command training, district training colleges for initial training, forensic science laboratories, wireless depots, and the central negociating machinery for pay and conditions of service.

The jurisdiction of a constable is no longer restricted to his own locality. The Police Act provides that he was to have the power and priviledges of a constable throughout England and Wales. Chief Officers may also enter into collaboration agreements with other police jurisidictions whereby they can set-up joint operations such as traffic or crime squads. The Act also authorised the establishment of the Research and Planning Branch of the Home Office to co-ordinate and conduct research into scientific and modern management techniques likely to affect the police service.

The impact of the Police Act 1964 has been

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*Common service arrangements consist of an agreement between forces to contribute on a pro rata basis for the number of officers in their force a fixed sum to fund services too expensive for one force to efficiently provide.

profound. Critchley comments that "Another milestone in police history, comparable in magnitude to the events of 1919 and 1920 had been passed."[24] There exists a standardization for the operation of local police forces within a national police service. The police in England and Wales are still a hierarchic organization, managed on authority granted though rank and subject to a strict discipline code over which a chief officer presides.

Table 2.2.-- Rank Structure in the British Police

England and Wales Outside London	City of London	Metropolitan Police
Chief Constable	Commissioner	Commissioner
Dep.Ch.Constable	Dep.Commissioner	Dep.Commissioner
	Asst.Commissioner	Dep.Asst. Commissioner
Asst.Ch.Constable.	Commander	Commander
Chief Superintendent	Ch.Superintendent	Ch.Superintendent
Superintendent	Superintendent	Superintendent
Chief Inspector	Ch.Inspector	Ch.Inspector
Inspector	Inspector	Inspector
Sergeant	Sergeant	Sergeant
Constable	Constable	Constable

Table 2.2. illustrates the rank structure in the British Police. It is seen from this table that there is a general uniformity in rank, from the chief officer at the head of the organization to the police constable at the bottom. In the London Metropolitan Police and the City of London Police there are different titles given to the very senior ranking officers.this is simply a result of the historical development of these forces, being directly responsible for the policing of the nation's capital city. From Chief Superintendent down there is a general uniformity . Such uniformity in rank also applies generally in terms of manpower span of control. The manpower span of control of a Chief Superintendent serves as an example of this; by agreement of the Home Office and the Superintendent's Association (the representative body for superintendents) a general maximum of 500 officer is considered suitable for span of control.

From this description of the development and organization of policing in England and Wales the evolution of policing is briefly sketched. There has been little attempt to describe what the duties of the police are to be in modern times, the only recent attempt was that of the Royal Commission:

First, the police have a duty to maintain law and order and to protect persons and property.

Secondly, they have a duty to prevent crime.

Thirdly, they are responsible for the detection of criminals and, in the course of the interrogation of suspected persons, they have a part to play in the early stages if the judicial process, acting under judicial restraint.

Fourthly, the police in England and Wales (but not in Scotland) themselves conduct many prosecutions for the less serious offences.

Fifthly, the police in England and Wales (but not in Scotland) have the responsibility of deciding whether or not to prosecute persons suspected of criminal offences.

Sixthly, the police have the duty of controlling road traffic and advising local authorities on traffic questions.

Seventhly, the police carry out certain duties on behalf of Government departments -- for example, they conduct inquiries into applications made be persons who wish to be granted British nationality.

Eighthly, they have by long tradition a duty to befriend anyone who needs their help, and they may at times be called upon to cope with minor or major emergencies.[25]

Critchley comments that the police have gained one futher task since the publication of the report of the Royal Commission, the ninth duty, "To go out to the public and foster good community relations, particularly with young and coloured people whose support cannot be taken for granted."[26]

It is against this background of development and in order to meet the demands and responsibilities of these duties that computerization must be viewed.

Computer Development

> It would be difficult to overstate the magnitude of change that will take place in the lives of all of us, in human history, as a result of the information revolution that has so unobtrusively taken place in our day. Information, its communications and use, is the web of society; the basis for all understanding, organization, and effort.[27]

The history of data processing has been associated with technical innovations; with the succession of one generation of equipment after the other, with little attention given to the modification of the user's relation to it.

In the fifties computers were complex and difficult to handle. They used entire transistors* and were bulky (often filling entire rooms). These early machines often broke down and were difficult to handle, they were accessible only in machine language* and later in assemblers*. In order to conduct a dialogue with these machines required a data technician trained in the use of particular computer languages. On top of this different materials were incompatible* meaning that one program could not be transfered from one machine to another.

These early developments which, when compared to later advances, could be likened to prehistory, ended

in 1965 with the generation of IBM 360 computers. The third generation of computers were then with us. The first integrated circuits* replaced transistors which allowed significant improvment in the performance/price ratio while at the same time decreasing the size of the machines and increasing their reliability. Along with third generation computers, newer and faster equipment has been introduced for storage and handling of input and output. One important development with this new generation of computers is that they are compatible* making it possible for the user to switch from one machine to another without rewriting all the programs -- provided machines from the same manufacturer are used.

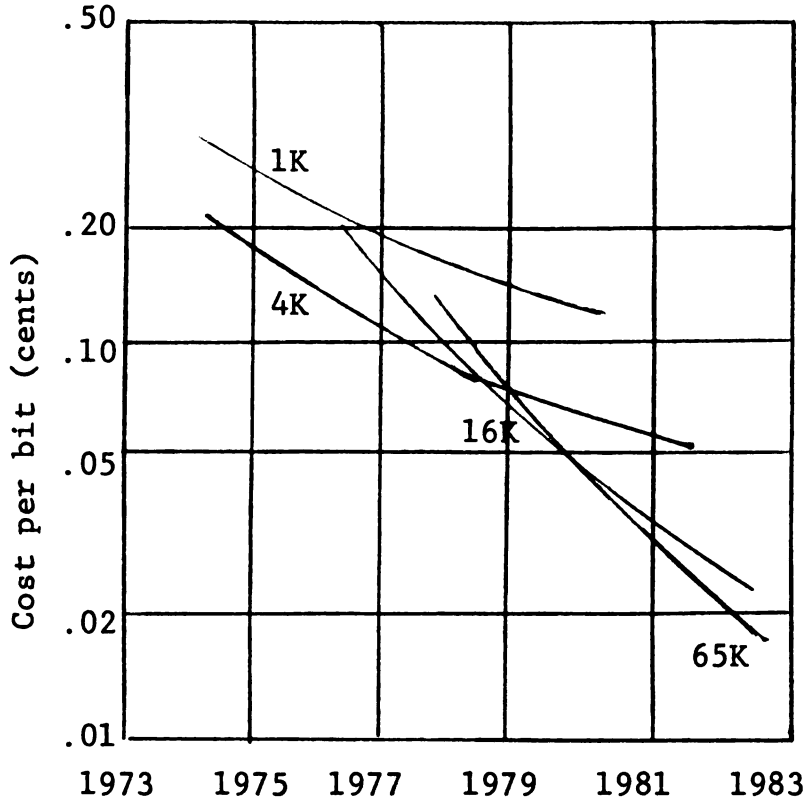
Programming languages have also become easier. "COBOL," "FORTRAM," and "PLI" are languages which require a relatively short period of initiation. The development of a new generation of compatible computers with easily accessible languages allowed users to escape from traditional data processing operations (payroll, money orders, invoice control) and devote efforts to analysing other tasks. Furthermore, a computer user ethic developed through an increaing familarity with the machines. Users became aware of both advantages and disadvantages of machines and have become increasingly

able to select and control the applications to which they are put.

There remained however, a number of technical restrictions. Sequential access* prevented the user from obtaining what he wanted directly. Furthermore, as batch processing* was still the rule the user had to take time to punch cards and enter them into the machine. Data processing was, at this time, reserved for the minority of businesses. For example, in France 250 businesses had 80 percent of the total number of computers in service in 1970.[28]

The development of electronic components is the one technical advance with the greatest consequences for computer developments and use. The remarkable miniaturization process and the extremely low cost involved are, as Minc puts it, "Pratically equivilant to a change in nature."[29] A microprocessor* only a few millimeters wide now contains the same processing capability as a computer which ten or fifteen years ago took up an entire room. This size reduction to a large extent accounts for the cost reduction for computer memory which is illustrated in Figure 2.1. This figure clearly indicates the decline in the cost of computer memory, a decline which in large part accounts for the rapid development in processing capacity and has made computers accessable in large numbers at a

Figure 2.1.-- Decline in the Cost of Computer Memory.



Cost per bit of computer memory has declined and should continue as is shown here for successive generations of random-access memory circuits capable of handling from 1024(1K) to 65,356(65K) bits of memory. Increasing complexity of successive circuits is primarily responsible for cost reductions, but less complex circuits also continue to decline in cost. (Source: R.N.Noyce 1977. © Copyright 1977 by Scientific American Inc.)

relatively cheap cost. Between 1975 and 1980 the cost curve has progressively declined, underlining the ability of computer manufacturers to market machines which are powerful and yet reasonably priced.

It is now possible to manufacture a small, powerful and inexpensive computer readily accessible for the average user through the reduction in cost in the central units* of standard computers. Manufacturers are now able to concentrate their efforts on increasing the accessability and simplification of computer languages. There is no longer a fight between computer manufacturers for a scrap of business here and there; there is widespread business to be enjoyed by all. Processing power is available for distribution over several points of the system. Real time* access to processing capabilities has produced access between terminals and processing centres* and the seemingly natural boundary between hardware and software* has begun to fade away. It is now possible to incorporate part of the basic software into the components themselves. Thus, computer manufacturers can 'lock-in' their customers by making it difficult and costly to change suppliers.

Restrictions inherent in previous generations of computers are also breaking down. Data available

only sequentially can now be obtained directly with the use of special procedures. Data banks* form an important part of this process. Instant satellite communications together with international time differences allow businesses to proceed twenty-four hours a day.

Data handling systems* are becomming more flexible. The computer manages its own operations with increasing effectiveness, optimizing work sequences and organizing in the best possible way the processing, data aquisition and printing times.

These advances are linked together in the marketing strategies of each of the manufacturers. Each new step taken by an industrialist forces all of the others to follow or to drop out of the game. There is as a result, a strong policy to force customers to remain faithful to their supplier. Producers of computers are offering their customers increasingly elaborate services, such as data banks and systems architectures.*[31]

Minicomputers and microcomputers have further reduced the size of machines; putting powerful data processing facilities within the reach of millions instead of only hundreds. Thus, we are in the 'Third Wave" of civilization as Toffler depicts historical development -- following agrarian and industrial civilization.[32] We are moving, according to Toffler,

towards a complete social dependence on computers.

Police Involvment in Computers

In 1967 a Home Office commission reported, "We think that the Home Office should give the highest priority to an examination of ways in which computer technology might be applied to police work."[33] At the same time, in the United States the following was observed:

> Only token progress has been made in introducing technology into the police world. Some police departments, mainly the largest ones, have taken solid steps alone or in collaboration with nearby forces toward applying advances in science and technology to law enforcement. They have done so in spite of costliness of equipment. Laudably, these large forces that have installed information storage and retrival and communications systems have invited smaller forces to draw on the larger department's facilities once the systems become operative.[34]

Just one year earlier, Los Angeles Police Chief Thomas Reddin reported to the National Symposium on Science and Criminal Justice that "Research should be a program of discovery and design, not merely patching the dike. . . This national knowledge explosion has so far left law enforcement untouched."[35] These comments reflect a concern that police agencies in both the United States and in England and Wales were not taking advantage of computer services; a concern that police were allowing themselves to be left behind in the

adoption of modern computer based technolgy.

The application of computers and advanced communications systems to policing in England and Wales really began in 1958 with the establishment of a body entitled the Home Office and Metropolitan Police Joint Automatic Data Processing Unit. This unit was initiated to conduct inquiries into the possible use of automatic data processing for the work of the Home Office, the Metropolitan Police and the Receiver's Officer (the finance department of the Metropolitan Police). The studies undertaken by this unit resulted, in the placing of an order, towards the end of 1962 for a computer intended primarily for payroll purposes which was brought into operation in December 1963. This computer unit still handles pay, pensions, and a number of statistically based operations for the Metropolitan Police, among others.

In 1963, as a result of the Royal Commission on the Police, a new Research and Planning Branch of the Home Office was established. This research arm was one of the responsibilities of a new Chief Inspecter of Constabulary. On creation, the research branch consisted of four chief superintendents and four scientists and seven senior police officers with full supporting staff under the direction of one of the Inspectors of Constabulary.

This branch quickly became involved in examining ways of better utilizaiton of the limited resources available for enforcing both traffic and criminal law. Using operational research techniques it was quickly realised that in order to provide good quality information in the specialized area of telecommunciations and electronics a small expert committee was established in 1966 to provide long-term advice to both the Home Office and the police.

In 1969, the Police Research and Planning Branch was reshaped to serve a wider purpose; it was transformed into a new organization with three sections, a scientific development branch, a police research branch, and a management and planning group. Within this new organiztion for research and development a Police National Computer Unit was established in 1970 to plan and subsequently operate a central computer with access terminals in each police force. The reshaping of the Police Research and Planning Branch and the decision to develop a Police National Computer Unit reflected the interest in police and Home Office circles to move from the routine administrative application of computers into the routine operational application area. Police administrators had the benefit of the computer shown to then and were now ready to

co-operate and utilze computers for front-line operational purposes.

The Police National Computer (P.N.C.) became operational on a real-time basis in 1974 providing access by all forces to information concerning stolen and found motor vehicles together with a file of vehicle owners. In 1978, the P.N.C. records were expanded to include criminal histories and information concerning missing persons. Table 2.3. illustrates recent growth in use of the P.N.C. From this table we can see that the P.N.C. has very quickly become an important operational tool of officers in the field as each year witnesses a very large growth in computer use. The P.N.C. has established itself as an indispensable operational tool The index of vehicle owners achieved a transaction rate about 70 percent higher than in 1977. The reasons for such a large incease in enquiries was that during the year the central government's Driver and Vehicle Licensing Centre finished transfering vehicle records to the P.N.C. making available to the police a file of 21.5 million vehicle records.

The need to co-ordinate national and international police activities resulted in the creation of a joint committee to assess and support forces introducing computer aided systems together with a joint committee reviewing research and development

programmes in the different branches of the Home Office.

Table 2.3.-- Police National Computer Use.

Year	Number of Enquiries
1976	12 million
1977	18 million
1978	33 million

Source: Reports of Her Majesty's Chief Inspector of Constabulary (London: Her Majesty's Stationary Office, 1976, 1977, and 1978.)

Internationally, a good deal of research and development information is exchanged. One working party of the European Economic Community, on which the Police Department of the Home Office and the Association of Chief Police Officers are represented, exchanges information and views about police equipment (including computers), communications, and forensic science.

Individual forces became involved in computerization in the mid-1960's, with the main use being a time-shared* payroll, budgetary and pension use on local authority machines. Towards the late 1960's and early 1970's research and development moved towards in-house computers utilzed for computer-

aided dispatch and command and control functions. Essentially, these computers were being used to speed-up message flow within the police organization. Later developments, in recent years, have been towards in-house mini-computers and a few micro-computers, to manipulate information and produce management information which can be used in the allocation of police resources. The Home Office Directorate of Communications is presently developing "stand-alone" resource availability systems. This system will incorporate microprocesser based vehicle terminals which will inform a central computer of the location and availability status of each police vehicle.

In the United States the first real-time computer used by police was installed in the St.Louis Police Department in the mid-1960's. Since then, considerable growth has occured in the use of information technology by the police, indeed, there was a widespread shared-time use of city and county machines for batch-processing jobs such as payroll and pensions. The Federal Bureau of Investigation is responsible for the National Criminal Information Centre (N.C.I.C.) in Washington D.C. which began operations in 1968, one month after Michigan began operating their statewide Law Enforcement Information Network (L.E.I.N.). There now exists in every state a criminal record information file with access to the States Secretary of State's computer held vehicle owners

index and register of driver's licences. Each state computer system can interogate any other state's information network through the National Law Enforcement Telecommunications System (N.L.E.T.S.). The United States computerized criminal record system is as shown in Figure 2.2. (taking Michigan as the state example).

Figure 2.2.--L.E.I.N. and Interfaced Systems.

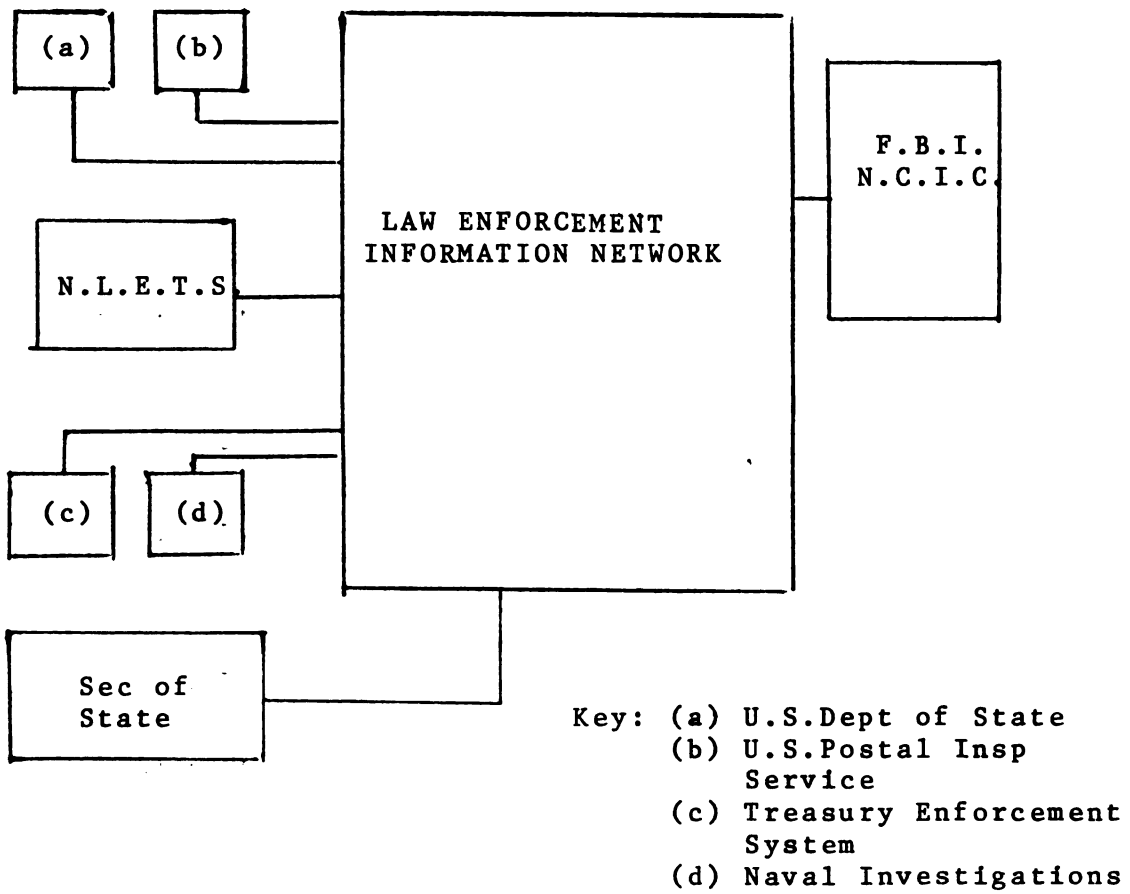


Figure 2.2. illustrates, in the case of policing in the United States, that there exists a similar computer data base to the P.N.C. in England and Wales. Police agencies have access to computer files storing information on vehicle owners, stolen vehicles and criminal histories. Access to such data bases are through a state computer (in this case Michigan's L.E.I.N.) and then to the State Secretary of State for driver's licence information and vehicles owner's information. Out of state information is passed from one computer (L.E.I.N.) to the F.B.I.'s N.C.I.C. or through N.L.E.T.S. to another state based data store. It is seen from this figure that users other than police departments have such access, the United States Postal Inspection Service has access, as do other Federal enforcement organizations.

Muir makes the point that:

> The peculiar characteristics of police departments in the United States is that they are local and very different from one another. An observer of a single police department must constantly check against a tendency to overgeneralize.[36]

As Muir points out, it is not possibe to generalize from developments in one police department to others. Thus, whilst some departments, such as Kansas City, Missouri, rightly enjor high reputations as leaders in the field of computer utilization, other, equally large, departments hardly use computers at all. Due to the great number of police agencies, approximately 17,500, employing in

excess of 600,000 officers, there exists a considerable diversity in the use of computers, based in large part on differing needs. There is no central research and development organization in the United States to disseminate information to police agenices concerning computer development, although the National Institute on Law Enforcement was envisaged to fulfill such a role.

In many cases the transfer of computer oriented information depends on either:

1. The police department publishing its results and case history through an organization such as the National Criminal Justice Information Service in Washington D.C.; or

2. Major computer manufacturing companies disseminate information in the form of subtle sales phamphlets; as I.B.M. have done for the ALERT II of Kansas City, Missouri and the Washington Area Law Enforcement System for Washington D.C. Police Department.[37]

The Law Enforcement Assistance Administration has attempted to keep abreast of police computer development conducting its first survey of criminal justice information systems in 1970. In 1975 a further survey was conducted incorporating listings for state level jurisdictions and 638 agencies in 549 jurisdictions surveyed. This later publication lists approximately 3.19 percent of the 17,500 or so law enforcement agencies in the United States[38] Generally though, data concerning particular computer applications and development in the United States is somewhat limited.

Colton's work examining the implementation of computers into police work in 1971 and 1973 is important in its attempt to examine the applications to which police are putting their computers.[39] A closer examination of this work will follow in Chapters III and IV.

Present and Future Organization Trends

In 1978 Colton brought together a series of case histories of individual United States police department experiences with computers.[40] In assessing the factors influencing implementation of computer technology, Colton divided these factors into two categories:

1. Conditions related to the Nature and Environment of the Innovation:
   a) A clear and realistic understanding at the outset of the project of the policy issues involved.
   b) A perceived need for change among those influenced by the innovation -- both police administrators and officers in the street.
   c) Effective timing and system design so as to meet user needs and resist the temptation to oversell and therefore build impossible expectations.
   d) The proper selection of priorities in implementing computer technology.

2. Factors related to the Project Management of Innovation:
   a) Establishment of a clear set of performance guidelines at the begining of a project.
   b) A long-term time framework and perspective.
   c) Emphasis on human-computer interactions.
   d) Effective training, education, and information dissemination.

e) Continuity of personnel.
f) Involvement and quality of top level leadership.
g) Involvement of other police personnel.
h) Caliber of computer systems and technical staff.
i) Unbiased evaluation.

These comments of Colton, though directed mainly at law enforcement in the United States, have relevance also in respect to implementing innovation in England and Wales. We will see in Chapter IV that in response to a mailed survey respondents indicated similar considerations to those enumerated by Colton as being required before embarking on a computerization of police functions.

Mohr makes an important distinction between invention and innovation, "Invention implies bringing something new into being, innovation implies bringing something new into use."[41] In this study, we are generally examining the process of innovation, though at times the distinction is fine in that the organizational impact is akin to invention itself -- new arrangements have to be made. In Chapter IV we will examine some of the effects of such new organizational impact, where we find the creation of data processing units and new areas of responsibility and influence being created in traditional managerial hierarchies. Mohr further points to organizational size as an important factor in implementing innovation:

1. Small departments reach an early limit of programming because of a limitation in the number of different activities into which one person's time may be fragmented;

2. Small departments have difficulty attracting specialized personnel;

3. Small departments have little slack in funds obtained from local sources, thereby depending heavily on single purpose grants for innovation;

4. Small departments innovate largely in programme areas for which grant funds are readily available.[42]

Thus, Mohr points out that "Large organization size as facilitator of innovation more than as a motivator of innovation".[43] We will see from the analysis of the data gathered in this study that large police forces have acted as catalysts of change; being the first to adopt computers for administrative and operational applications and disseminating their information and successes to smaller forces.

It is not possible to consider the process of innovation without looking at the diffusion of innovation. Warner comments:

> The diffusion of innovation is only one stage -- the final one -- in the process of technological change. It is an important one, however, because it is the stage which represents the transition between the old and the new economic equilibria.[44]

In one recent study of the diffusion of innovation by Bingham the question was posed, "Are cities that innovate located in close proximity to other innovation

adopting cities?"[45] Bingham found that though patterns did appear to exist, these were innovation specific and little evidence was found that certain cities are particularly innovative or non-innovative. This point, raised by these authors, concerning innovation, will be addressed in the concluding chapter of this study.

In the United States law enforcement is the subject of considerable debate. In a time of limited finance strong arguements are being made for fewer and larger police areas in order to capitalize on economies of scale. The context of police organizational structures might be expected to change with technological change:

> Integrated technology may be hypothesized to cause an organization to move towards the impersonal control end of the line control dimension . . . But as workflow integration reaches the production line or automated stages, where large numbers of tasks are interdependent, more control is needed than can be exercised by the line of command alone. Udy (1965) summarizes this in his proposition, "The more complex the technology . . . the greater the emphasis on administration."[46]

There would certainly appear little evidence of declining administrative emphasis so far in any law enforcement organization in either England and Wales or the United States, leading one to suspect increasing administrative emphasis. Goldstein emphasises the role of the police administrator who "Remains a central figure in the process of change, for it is upon him and through him that both the internal and external forces

of change exert their pressure."[47] The importance of police administration cannot be understated and in this study many of the variables analysed directly concern the role of the administrator in relation to computerization.

These developments in organizational structure and behaviour should be viewed in the context of the increasing professionalism of policing. Police professionalism is referred to by many writers and though it means many things to many people there is agreement as to the fact that something called 'professionalism' is affecting the police. This professionalism frequently consists of simply self-identification by police officers. Police officers label themselves professional simply due to an approach to their role from an independent position with a desire to act as self-evaluators of their behaviour. James has recently discussed the question of police professionalism by stating:

> . . . the relationship between technological sophistication and legality represents the basis of a model of professional policing which can be identified in the policy decisions of many chief and senior officers. I shall call this model 'managerial professionalism'. Yet, this is a model which is in sharp conflict with that to which lower ranks are committed, and which will be called 'practical professionalism'.[48]

At the base of this dichotomy suggested by James is the question of managerial control of lower level discretion

in decision-making. In the same article, James refers to the dichotomous relationship as "Professionalism is an imagery of legality which shields the highly questionable characteristics of operational policing."[49]

Professionalism has been considered by many other authors. Cain considers the professional trend to result from the centralism of capital; a result of the growth in government reflected in greater police unity, whereby they are increasingly defining their own role.[50] Cain's arguement has been taken further by Manning[51] who discusses the police's manipulation of appearances in order to appear successful when in fact they are not -- if control of crime is the yardstick by which success is measured. Manning's arguement is a continuation of Goffman's in the late 1950's[52] which pointed to the problem of really finding the truth of the police role as, indeed, frequently the police as an organization lose track of it themselves. This is a point emphasized by Punch[53] where he states the difficulties experienced not only in getting police co-operation in research, but then differentiating between the traditional craft of policing -- part of what Bordua called the "Police Estate"[54] -- and the new police culture of front-line policing.

What is the direction of police development now? This is an important issue being addressed in this

study. Do the styles of policing ennunciated by Wilson[55] -- Watchman, Service, and Legalistic -- suffice today? Is Banton correct in looking at policing as being either peace keeping or law enforcement[56] or is there a new ingredient introduced by the advent of modern computer technology? These and other matters will be addressed through an examination of computer applications and implementation in policing in England and Wales.

Summary

There is little literature specifically relating to police computer technology. This chapter has attempted to draw together the different threads of police and computer development and introduce some of the general ideas resulting from innovation literature. Further, a short discussion of general police literature illustrates the concerns felt by some authors as to police development in the future; the impact of professionalism, of which technology is an important ingredient.

We have seen in this chapter that some considerable differences exist between police organization in England and Wales and the United States. We have seen that over a period of time police forces in England and Wales have

amalgamated to reach a situation where policing is extremely concentrated and centralised in comparison to policing in the United States. We have seen that the Home Office play an important role in overseeing police administration and management.

Computer development has been traced in this chapter and we see that the computer has proved itself to be more efficient in tackling the routine jobs and has experienced remarkable growth and widespread acceptance. We have also seen that police forces in both England and Wales and the United States have used computers in their organization; the purpose of this study being to examine the applications to which these computers have been put and the impact of such computers.

That police forces have adopted computers is not seen as being a surprise in view of the information dependency of police forces and their needs to handle large volumes of information. We have discussed in this chapter the effect of presenting a good image by police to the public and the connection of professionalism with such an image.

Having examined police and computer development we are in a positon to examine the effect of computer technology on policing in England and Wales. In the remainder of this study an attempt will be made to develop a methodology to examine the present state

of development in policing in England and Wales in relation to computer applications and organizational impact of such computerization.

FOOTNOTES -- CHAPTER II

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CHAPTER III

DESIGN OF THE STUDY

Introduction

The review of the literature on the subject of police computer technology uncovered considerable material on the general history and development of policing, together with academic and professional speculation concerning current organizational trends. However, very little literature exists concerning the narrower issue of police computer use and development. This study is designed as an exploratory investigation of police computer technology.

The few existing studies of police computer technological development have based their analyses on some form of survey instrument. In the United States mailed survey instruments have formed the core of research exercises. Such surveys have sometimes, as in the case of Colton's work,[57] been supplemented by telephone follow-up and verification of a number of attitude variables.

In Britain the only known work in this field is the collation of police applications in the

computer field by the Association of Chief Police Officers:

> The primary aim is to meet the needs of the officer who is concerned with the consideration or development of computer applications within his force. The contents should enable him to locate similar applications or equipment easily so that he can discuss the possibilities of picking them up for his own use or learn from the experience of their designers and users.[58]

Thus, the immediate problem faced in conducting the present study is the lack of previous work in this specific field, either in Britain or the United States.

Manning comments on the problems facing the would be researcher of police work.[59] Gaining access to police institutions, Manning comments, presents the researcher with the need to be seen as acceptable to the police institution. The researcher in attempting to examine police organization and operations is often perceived as a threat and accordingly, in adopting a defensive posture, police departments decline co-operation.

Police departments in the United States have been the subject of specialized academic examination for a longer period than in England and Wales and have learnt to participate in the academic exercise. In England and Wales there is a very limited amount of police research, that which has been conducted is largely of a historical nature. Consequently, both the Home Office and individual police forces tend to be

reluctant to provide access to the would-be researcher. Punch refers to the "Watchdogs of the Home Office"[60] in connection with the unwillingness of the Home Office to permit research projects in connection with police forces in England and Wales; underlining the reluctance to participate in academic research projects.

This study was fortunate in being able to rely on co-operation offered by police officers to a fellow police officer. This approach has problems in that the values of one police officer, the researcher, are being applied to a study of his own organization. The potential invalidities associated with this value consensus however, are partly countered in this study through the replication of Colton's work[61] together with the comparative approach.

No data was supplied for this study without the express authority of the chief constable of each force. Some chief officers did refuse to supply information, some did not respond tothe request, but the majority did co-operate. The request for information was accompanied with an outline of the intention behind the study together with an offer to supply participating forces with a summary of the results.

The intention in this study is to look at the use of computers by police forces in England and Wales

and to gain some preliminary indications as to the impact of technological developments on police organizations.

Data Base

Data used in this study were gathered from three primary sources:

1. The population of police forces in England and Wales. In total there are forty-three forces in England and Wales comprizing some 109,075 officers, policing 49,120,000 persons in a geographic area of 37,362,810 acres (1978 figures).

2. The Association of Chief Police Officers' publication "The Police Use of Computers". This work lists police applications of computers on a force to force basis for Britain. The latest edition was compiled in 1978/79 and published in September 1979. Information for this publication is gathered by the secretariat of the Association from the details submitted by each force. This publication is intended for internal police force use to disseminate information concerning computer applications.

3. Colton's survey results published originally in 1972 and 1974 for the International City Management Association. This study presented information representative of police computer use by departments in the United States responsible for policing areas, the population of which exceeded 100,000 people. There is a time span of six years between Colton's second survey and this study. The period between 1974 and 1980 witnessed a rapid expansion in computer development and there is good reason to believe that police use of computers in the United States would also have expanded. There is, despite the problem of time lag, reasonable grounds for making comparisons between Colton's work and this study. A large number of applications discussed in Chapter IV for police forces in England and Wales mainly involving routine administrative functions, were first put into use in the late 1960's and early 1970's. Similarly, there is no reason to suggest that expansion in computer applications in the United States after 1974 would involve applications very different to those found by

Colton; indeed Colton pointed out in 1974 and in his 1978 work that expansion in applicaitons had been considerably slower that expected. The police departments surveyed by Colton would appear to have been the trendsetting, innovatice agencies who are responsible for disseminating innovative ideas to other agencies. It is on this basis that comparisons are made in order to allow a preliminary discussion of police computer technology in the United States and England and Wales.

Data Collection Methods

The major data collection method employed in this study was a two part mailed survey which was sent to the population of police forces in England and Wales (N=43):

1. Part A of the survey was for completion by the chief officer of police or a nominated command officer. This part of the survey was mainly concerned with the attitudes of command personnel to computerization and how, if at all, it has affected decision-making in police organizations.

2. Part B of the survey was for completing by the person within the police force in command of the computer operation. From Part B information concerning hardware and software applications is generated. Specifically, information concerning routine and non-routine computer applications is produced together with indications as to dissemination within the police forces through education classes on the applicaitons. This part of the survey also provides information concerning sources of support for computer operations; support and initiate to computerize from inside and outside the police organization. Information concerning funding for computer operations and problems, past and present, is gleaned from this part of the survey instrument.

Taken together, Parts A and B provide a description of police computer use, plus indications of attitude and power/decision centres. The great

majority of the questions asked on both parts of the survey were closed-end questions, with provision for open-ended answers where necessary. In the case of a number of the questions respondents were asked to indicate by rank their three most important applications or choices, and on other questions provision was made for choosing more than one variable. For the purposes of this study, the surveys provided 288 variables for analysis.

The two other primary sources of information were:

1. The Association of Chief Police Officers (A.C.P.O.). The survey forming the first primary source of information was submitted to the technical committee of the Association by one of the forces surveyed and approved. The publication "The Police Use of Computers" was obtained through police sources in Britain.

2. Professor Kent Colton offered copies of his survey instrument and his published findings. The International City Management Association agreed to the use of their data for comparative purposes.

Through this combination of data collection methods the results presented in Chapter IV were produced.

Responses to Survey

The response table, Table 3.1., illustrates the responses received. From the response table it is seen that a greater number of the larger forces responed to the survey; between 100 percent of forces policing

populations over one million to 75 percent of those policing populations over two million persons. In the smaller forces response rates remained close to 50 percent.

TABLE 3.1.-- Summary of Responses to Survey.

Classification	Population Surveyed	Response Rate	% of Population
Total all forces	43	28	65
Population Group:			
Less than ½ mill	6	3	50
Over ½ mill	21	11	52
1-1½ mill	9	8	88
1½-2 mill	3	3	100
Over 2 mill	4	3	75
Geographic Region:*			
North	9	6	66
South	11	7	63
East	6	5	83
West	4	3	75
Central	9	4	44
Wales	4	3	75

*The regional grouping is based on an approximation of the responding forces geographic location; it is not an official categorization.

The overall return from the mailed survey was 65 percent of the population surveyed. This return is respectable in the light of the traditional reluctance of police forces in England and Wales to co-operate

with academic research. It is interesting that the response was particularly good from the larger forces. We could speculate on the reasons for this differential return rate. Despite limitations we do know from a combination of data sources -- survey, A.C.P.O., and accumulated personnal knowledge -- that the larger forces are the major users of computers and accordingly are the most likely to have an organized computer department able to respond to the survey. It is further known that many of the smaller forces are in the process of evaluating the computer operations of the larger forces prior to embarking on their own projects. The information gleaned from the geographic region of forces does not contribute to this reasoning in that each region comprises forces of most population groups.

The particularly low return rate from forces in the central region (low in comparison with other regions) can be partially explained in that three of the forces not completing survey questionnaires did reply by letter indicating that they were unable to complete the survey because they were subject to particular operational pressures and not able to spend the time demanded in responding. One other force from the central region indicated by letter that it was not their policy to complete survey questionnaires.

Research Questions

In Chapter I mention was made that research questions were utilized in this study rather than specific hypothesis. The research is exploratory, the intent is in large measure to describe police computer use in England and Wales, rather than have hypotheses to test. The eight research questions are listed below, together with a general indication of the variables tested:

A. Police Use of Computers:

1. Is there a uniformity in hardware used by police forces?

This question tested variables relating to computer hardware gathered from the first two primary sources of data; the mailed survey and the A.C.P.O. data.

2. What are the applications of computer technology currently used in police forces in England and Wales.

This research question tested variables relating to the applications that respondents were using their computers for. Data relating to these variables was gathered from the mailed survey and verified from the A.C.P.O. information. From the mailed survey, further variables are tested relating to the ranked order of importance of three applications for each respondent.

3. Has the employment of computers created new, quantitative or numerical based pressures to use such information to justify decisions?

This question tests variables based on responses received from the two part mailed survey. The variables tested relate to pressures exerted on decision-making;

whether there is a pressure to use quantitative information, if so , whether this is a good thing.

B. Police Computer Implementation:

1. How important to the operation of the police are computers?

This question is based on data gathered from the two part mailed survey. The variables tested relate to the level of management directly responsible for computer operations and the effect on levels of influence within management.

2. Where in the police forces does the stimulation and support for technological development originate?

The data for this question was gathered from the mailed survey and relates to research variables testing the source of initial proposals for computers and the source of original interest. Other variables tested include the source of recommendations for new computer use, indications of which forces receive financial aid from the Home Office, and the impact of such aid on the decision to use a computer.

3. What problems have been experienced in adapting to computer innovations?

The data for this research question is gathered from the mailed survey. The variables tested relate to the major problems experienced in computer innovation.

4. What impact has the application of computing had on the administration of policing?

This research question tested variables relating to the participation of operational police officers in computer projects and the impact of the computer on routine administrative tasks. Data for this question was gathered from the first primary source; the mailed survey.

5. What benefits have police forces gained from the use of computer information technology?

The variables tested in this question provide data concerning the costs of computerization and the benefits resulting. Also tested are variables relating to the feelings of satisfaction with computer operations. Data was gathered for this question from the mailed survey.

In dealing with these research questions major emphasis will be placed on the responses to the survey questionnaire indicating 'felt' impact by participants in the participating forces.

Limitations of Study Design

The mailed survey method generally has the advantage of anonymity, which mitigates against dishonesty among the respondents. However, there are disadvantages associated with the use of mailed surveys. In this case the survey questionnaires were not anonymous which can lead respondents to be careful about committing themselves, and their department, to specific positions. The other disadvantages include the tendency to generalize about computer use; if the person completing the survey considers a question does not specifically apply, he can either leave it open or simply make a generalization. Consequently, many of the variables suggest tendencies rather than specifics.

Inaccuracies can also arise in completing survey

questionnaires through imperfect recall or by faulty averaging. In addition, survey questions are frequently not absolutely clear, thereby making respondent interpretations necessary and introducing the possibility that the questions may mean different things to different people.

In interpreting existing published information the researcher is limited by the evidence found by other researchers. The impact of history on such evidence may make comparisons invalid. Further, the initial reseach agenda of other researchers are generally not available thereby leaving the later researcher cold as to the value criteria and judgemental effects.

Many of the weaknesses discussed have been offset by using the methodology described in this Chapter. Using the mailed survey as the major source of information and replicating Colton's work allows many of the weaknesses to be overcome.

Analysis

The data gathered in this study is generally ordinal and nominal, with some interval data. Analysis will be confined to summing and averaging together with frequency distributions and percentages.

The results obtained through such an analysis of the data drawn from the responses and secondary

sources will be used to describe computer development and draw comparisons with work previously completed. Given the restricted sample size and the sampling method, more sophisticated analysis would be inappropriate.

Summary

The methodology adopted in this study has been outlined, together with some of the limitations to the study. The response rate achieved provides sufficient data to allow a description of police computer use.

Chapter IV provides an analysis of the data provided by the respondents to this study.

FOOTNOTES -- CHAPTER III

[57]Colton, "Police and Computers", 1972 and 1974.

[58]Association of Chief Police Officers, The Police Use of Computers, (London: Association of Chief Police Officers, 1979).

[59]Peter K. Manning, "The Reseacher: An Alien in the Police World", in The Ambivalent Force, 2nd ed., eds. Arthur Niederhoffer and Abraham Blumberg, (Hinsdale, Illinois: Dryden Press, 1976), pp. 103-121.

[60]Punch, Policing the Inner City, p. 4.

[61]Colton, "Police and Computers", 1972 and 1974.

CHAPTER IV

ANALYSIS OF THE DATA

In this chapter an analysis of the data gathered for this study is presented. The presentation and analysis of data is made within the framework of the research questions introduced in the first chapter.

The present study indicates that all the respondents (N=28) reported using computers. Further, review of the A.C.P.O. publication "The Police Use of Computers" indicated that the remaining forces (N=15) were also using computers for management and operational purposes. Therefore, it is clear that police use of computers is general and this study will examine the responses received from the survey and secondary data sources.

The research questions which follow are considered within two broad areas; 1) Police Use of Computers and 2) Police Computer Implementation.

Police Use of Computers

In this section three research questions will be analysed:

1) Is there a uniformity in hardware used by police forces?
2) What are the applications of computer technology currently used in police forces in England and Wales?
3) Has the employment of computers created new, numerical or quantitative based pressures to use such information to justify decisions?

The analysis of these questions will be primarily based on the data gathered through the survey questionnaire, however where appropriate this information will be checked against information obtained from the A.C.P.O. publication "The Police Use of Computers".

Uniformity in Hardware Used.

There are relatively few police forces in England and Wales; forty-three in total. We find from the responses in Table 3.1., together with the information supplied through A.C.P.O. that all police forces in England and Wales use computers. The information gathered in the present study further indicates that there is no general uniformity in computer hardware presently used. For general information processing and routine management operations we find from the A.C.P.O. publication that both International Business Machines 300 series (360 and 370's) and International Computer Laboratory 1900 series (1904 particularly) were widely used. Table 4.1. indicates the hardware most widely used. This table indicates only the major suppliers of computer equipment.

Information supplied by respondents to the survey, together with A.C.P.O. data, indicates that many forces make use of more than one computer. Indeed, of the twenty-eight respondents to the survey, twenty-four had access to and used more than one computer. Such multiple computer use is through either in-house or time-shared facilities.

TABLE 4.1.-- Police Computer Hardware Use (N=28)

Hardware	Sample Using	Forces Using A.C.P.O.	Sample as % of Forces per A.C.P.O.
I.B.M.	10	17	59
I.C.L.	15	23	65
Honeywell	4	5	80
Digital Systems	4	7	57
Ferranti	2	4	50

As was mentioned in Chapter II, police reorganization in 1972 ensured that police and local government boundaries are generally the same. There are however, manay situations where one force area covers more than one local authority. For example, the West Midlands Police area is the same as the West Midlands Metropolitan Council area. Within the West Midlands Metropolitan Council area there are

district local authorities (a second layer of local government). The implication of this organization is seen from an examination of computerization within the West Midlands Police.

The core of the operational computer system of the West Midlands Police is a dual Ferranti Argus 700S system, each having 224K words in main store memory, two 2 megabyte fixed head disks, two 64 megabyte moving head disks, one magnetic tapedrive, line printer, cassette tape and communications multiplexor. In addition to this in-house system the force has access to the West Midlands County Council I.C.L. 1904S machine for both batch and terminal work involving payroll and pensions. Coventry District Council (one of the constituent parts of the Metropolitan Council) make available to the police their I.C.L. 4/72 machine for processing the force's crime statistics. Walsall Magistrates Court uses an A.B.S.MULTIBUS computer to prepare ducumentation and listing of cases for court.[62] The variation in computer use in the West Midlands Police highlights the jurisdictional overlap and, hence, the multiple availability or computer resources in a single jurisdiction. As most of the forces in England and Wales have similar jurisdictional arrangements it is not unlikely that this pattern would be repeated in other police areas.

Though Table 4.1. does not indicate a general pattern in computer hardware use, the study by A.C.P.O. reports that forces are adopting in-house machines for real-time use and are moving towards a greater uniformity. For example, the Ferranti Argus machines employed in four forces are used for command and control applications. Original development and field-trial work was performed on a Ferranti Argus machine under Police Scientific Development Branch auspices and the system is now being implemented in a number of forces.[63]

There is also a rapid development taking place regarding the use of micro-computers. Micro-computers are gaining greater processing ability rapidly since employing 16 bit chips in their micro-processors which given them the capacity once only held by large main-frame machines. This increase in processing power is being linked to integrated computer systems and forming the basis of present developments.

Of the respondents to the survey, thirteen indicated that they were using micro-computers. Interestingly, of these forces using micro-computer nine were forces policing populations above one million persons and therefore larger forces in terms of manpower. This finding gives some support for the notion of the trend setting role previously mentioned,

whereby, Mohr points to "Large organization size as a facilitator of innovation".[64] Mohr's suggestion is that large organizations have greater spare capacity to innovate whereas the smaller organization is generally fully committed to ongoing tasks and lacking in the spare capacity necessary to innovate. The role of the larger police force in England and Wales in acting as a facilitator of innovation is suggested from the findings of this study.

English and Welsh Police Computer Applications.

The survey respondents were asked to indicate where they were using computers for each of twenty-four application areas. These twenty-four application areas were replicated from those used by Colton in order that comparisons could be made later in this study. The respondents were also asked whether they intended to implement a particular application within a three year time period (1983). The twenty-four application areas were then grouped into eight areas according to their commonalities as shown in Figure 4.1.

The computer use for police patrol and inquiry allows the street officer to make rapid, real-time inquiries to identify people or property on the wanted or missing indices, and against the stolen property index. Generally, these inquiries are made through

FIGURE 4.1.-- Computer Application Areas.

Application Areas	Computer Applications
Police Patrol and Inquiry	Warrant file Stolen property file Vehicle registration file
Traffic	Traffic accident file Traffic citation file Parking violation file
Police Administration	Personnel records Budget analysis and forecasting Inventory control file Vehicle fleet maintenance Payroll preparation
Crime Statistical Files	Criminal offence file Criminal arrest file Juvenile criminal activity file
Resource Allocation	Police patrol allocation and distribution Police service analysis
Criminal Investigation	Automated field interogation reports Modus operandi file Automated fingerprint file
Command and Control	Computer-aided dispatching Geographic location file Communications switching
Miscellaneous Operations	Intelligence compilation file Jail arrests

Source: Kent W. Colton: Police Computer Technology, (Lexington :D.C.Heath and Company, 1978), p. 28.

an officer at divisional station via radio communication. Experimental work is now proceding to allow officers to make their own inquiry through cathode-ray-tube terminals in their patrol cars.

Traffic application areas include automated records of traffic accidents generally used for force statistical purposes and submitted to the Home Office for the Chief Inspector of Constabulary's annual report. They also include information concerning traffic violations and parking offences which can be used to bring-in revenues to the local authority.

The application of computer use to police administration closely corresponds to computer use in other government and business areas. Such applications as personnel records, payroll and pension accounts, budget analysis and forecasting systems, inventory control files and fleet maintenance records fall within this application area. This application area also includes applications of varying degrees of sophistication, including such functions as payroll and budget analysis and forecasting.

Computer use of crime statistical files includes information on the number and type of criminal offences, details of arrests in actual numbers and arrest specific information such as race, age, and occupation of victim and offender. Juvenile offences are also included under

this heading. This information is used to compile force annual reports and the Chief Inspector of Constabulary's annual report which is the official record of the Home Office.

Resource allocation information can be used to analyse police service and provide for the allocation of resources to certain tasks or divisions within the force area.

The application relating to criminal investigation processes provides officers with supporting information for the investigation of offences and towards the solution of crime. Such information could include details of modus operandi and crime patterns.

The command and control application areas provide for the automation of 'command and control' of units in the field allowing for a more rapid response to calls for assistance. Such command and control systems usually require a geographic base file of the force area. 'Command and Control' is used synonymously with the term 'computer-aided dispatch'. The two terms mean the same, but in England and Wales the term 'command and control' is used (this term will be used in this study), whilst in the United States the term 'computer-aided dispatch' is employed. Communications switching consists of computer controlled message routing

between different departments and sections of the force's operational division.

Miscellaneous operations include files related to jail arrests to follow through the progress of the arrested person and intelligence files.

In analysing the results of the information gathered in the survey it should be noted that warrant files, vehicle registration files and certain aspects of criminal arrest files (criminal history records), are kept on the Police National Computer and are accessible, since 1974, by all forces through terminal access. Automated fingerprint applications are provided nationally by the Criminal Record Office at New Scotland Yard in London. This automated fingerprint file is currently in the developmental stage and is gradually being implemented. Thus, information presented with regard to computer applications should be examined with these additional sources of computerized information in mind.

The application areas discussed above can be further divided into structured and unstructured applications which are presented in Figure 4.2. Structured application areas are those which involve routine automation of information processing activities and relatively straightforward manipulation of prescribed

data. In many cases the computer is simply doing that which was previously performed by hand.

It is the unstructured application areas that turn the computer into a tool of the planner and a decision-making instrument where man machine interaction takes place. Thus, unstructured applications refer to those uses where the decision-maker manipulates the computer to produce information necessary to make decisions. Figure 4.2. illustrates that structured and unstructured applications are not necessarily sharply divided classifications but rather at different ends of a continuum. At the unstructured end of the continuum, man-machine interaction is acute. No method is absolute in this area, rather a process of trial and error has to be employed because of either the complexity of problems or the need for a tailor-made decision. The intervention of the human element is important here to complement the machine with judgement, insight and intuition. Several applications seem to fit between the two extremes; crime statistical files would seem to apply here, because although they are routine in collection and processing of data. But the data then becomes the basis for non-routine applications such as computer based command and control or resource allocation. It ought to be noted that many of the routine applications listed

FIGURE 4.2.-- Structured and Unstructured Police Computer Applications.

Structured -- Continuum -- Unstructured	
Police patrol and inquiry	
Traffic applications	
Miscellaneous operations	
	Command and control
	Criminal investigations
Crime Statistical files	
Police administration	Resource allocation

Source: Kent W. Colton, Police Computer Technology, (Lexington: D.C.Heath and Company, 1978), p. 30.

in the structured end of the continuum would also form the basis of unstructured applications; it is simply that their main thrust is presently in structured areas that causes them to be placed at that end of the continuum.

The information gathered through the mailed survey is presented in Table 4.2. Table 4.3. presents supplemental data taken from the information supplied by A.C.P.O. Taken together, the two tables indicate

TABLE 4.2.-- Actual, Potential, and Predicted Computer Application Areas: Sample Survey (N=28).

Application Area	Number of Applications	Number of Potential Applications	Applications as % of Potential	Predicted 1983	Predicted as % of Potential	% Change
Police Patrol	39	84	46	53	63	+17
Traffic	35	84	41	46	55	+14
Crime Statistical File	51	84	61	69	82	+21
Police Administration	53	140	38	82	59	+11
Resource Allocation	11	56	20	29	52	+32
Criminal Investigation	44	84	52	62	74	+22
Command and Control	25	84	30	66	78	+48
Miscellaneous Operation	9	56	16	22	39	+23
Total	267	672	40	429	64	+24

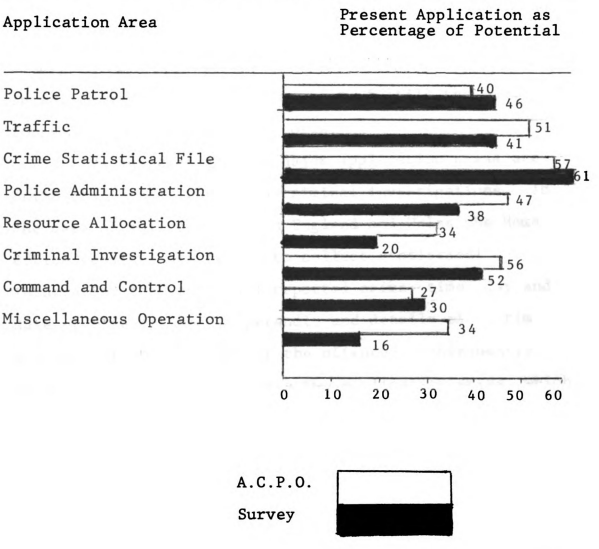
TABLE 4.3.--Actual, Potential, and Predicted Computer Application Areas : A.C.P.O. (N=28).

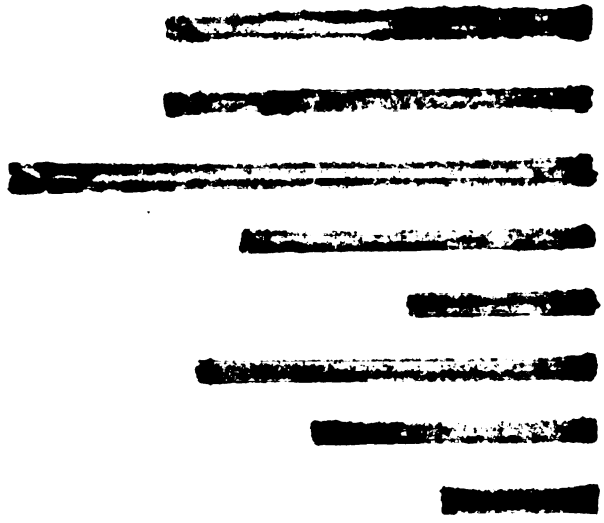
Application Area	Number of Applications	Number of Potential Applications	Applications as % of Potential	Predicted	Predicted as % of Potential	% Change
Police Patrol	34	84	40	40	48	+8
Traffic	43	84	51	64	76	+25
Crime Statistical File	48	84	57	62	74	+17
Police Administration	66	140	47	94	67	+20
Resource Allocation	19	56	34	42	75	+41
Criminal Investigation	47	84	56	62	74	+28
Command and Control	23	84	27	54	64	+37
Miscellaneous Operation	19	56	34	35	62	+28
Total	299	672	44	453	67	+23

the application areas of police computer use in England and Wales. Figure 4.3. compares the data given in both tables in respect of present applications as a percentage of the total potential applications. It is seen that there are differences between the two tables. These differences can be partly explained through the time differential in the gathering of the information. Data for the A.C.P.O. publication was gathered in the later part of 1978 and early 1979 for publication in September 1979. Information for the survey was gathered in March 1980.

Even allowing for the time differential there are some major differences between the two sets of results. The A.C.P.O. information indicates a greater interest in resource allocation than does the survey date by 14 percentage points. That is, eight more forces indicated to A.C.P.O. that they were using their computers for resource allocation than indicated in this survey. Similarly, ten more forces (18 percent of the potential) indicated miscellaneous operation use to A.C.P.O. than did in the survey. Such differences in response comming approximately twelve months apart to requests for similar information are interesting. No adequate explaination is immediately available as further research is called for to explain such a situation.

FIGURE 4.3.-- Computer Application Areas: Mailed Survey and A.C.P.O. Data Compared. (N=28)





If we look at the distribution of applications from the perspective of the structured/unstructured dichotomy we see a fairly consistent present emphasis on structured application areas. Police patrol, traffic, and police administration application areas are heavily emphasised. This is not particularly surprising given that these application areas include most of the routine data gathering operations which have long been included in police management requirements to fulfill the need for Home Office and force reports.

We see that the two major application areas are crime statistical files and criminal investigations. In the case of police forces in England and Wales the Home Office requires all forces to collect statistical information concerning all reported crime; time, day and date of offence, modus operandi, and details of victim and any person arrested for the offence. Consequently, much of this data is in these two application areas, which are included in the unstructured part of the continuum, but in fact the data collection is routine and could easily be included at the structured end of the continuum. One very important point ought to be made. As was mentioned earlier, in discussing the structured/unstructured continuum, the allocation of application areas to one or other ends of the continuum, is somewhat

arbitrary. In truth, each application area contains elements of both structured and unstructured activities. Further, data collected for one application area is interconnected with data collected for others. Crime statistical files are indicated as falling between the two ends. In fact, there would be a constant movement of all application areas since the data collected in structured areas forms the base for unstructured applications.

It is interesting to note that the unstructured application areas (with the exception of criminal investigations which is subject to some qualification) do receive considerable attention. Many of the resource allocation applications are closely linked to command and control applications. Information on service calls gathered from command and control is vital for police service analysis. The geographic location file is essential to police patrol allocation and distribution.

Overall, police forces are presently only utilizing 40-44 percent of the potential computer applications. Potential computer applications consist of the number of computer applications in each application area multiplied by the number of responding forces. For example, the potential applications in the traffic area are three applications multiplied by the number of respondents -- twenty-eight -- which produces a potential

of eighty-four. Thus, the figure of 40-44 percent utilization of potential computer applications (survey and A.C.P.O. figures) indicates a considerable committment to computerization, but leaves room for growth.

We see from the two tables, Table 4.2. and 4.3., that respondents indicate an intention to expand overall computer applications by one third of the potential available over the next three years; from 40-44 percent to 64-67 percent. It must be said that such prediction are always subject to overstatement. Colton, for example, found in the United States that predictions of computer use were never fulfilled and have to be treated warily.

The Tables 4.2. and 4.3. indicate an intention to greatly expand both resource allocation and command and control application areas. It was seen in Chapter II that the Home Office Directorate of Communications and the Police Scientific Development Branch are actively involved in research and development in these fields. Further, respondents report an intended 32-41 percent increase in resource allocation applications and a 37-48 percent increase in command and control applications, both unstructured areas in terms of our continuum.

These indications of growth also begin to point to the impact of the Home Office on developments in

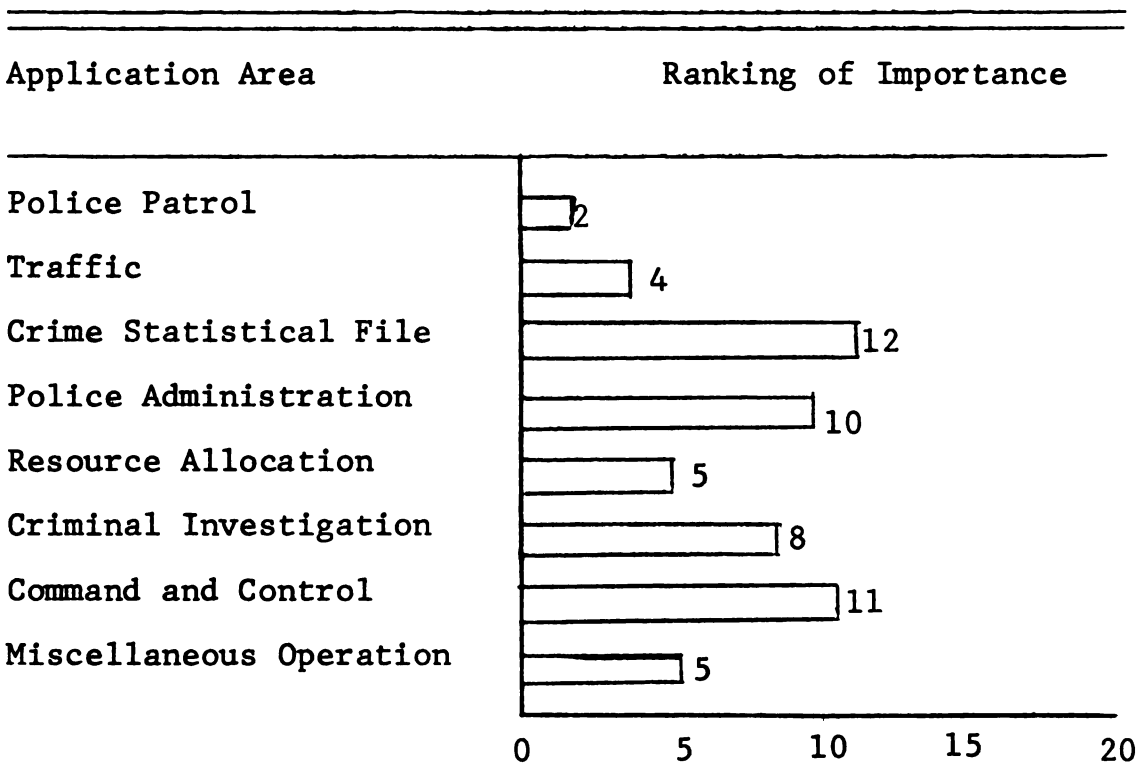
individual police forces. The impact of outside bodies, particularly the Home Office, will be considered in detail later in this chapter.

Tables 4.2. and 4.3. indicate considerable growth in computer applications across all application areas. The overall impression that we are left with is of a committment to growth (a committment subject to further consideration throughout this chapter) in terms of computer application. We can suggest from the information collected to this point that base-line data has been collected in the structured areas which will perhaps provide the platform for expansion in the unstructured application areas. Such a conclusion is consistent with one interpretation of the relationship between the structured and unstructured areas.

In addition to reporting all application areas used, respondents were asked to indicate the three most important applications for which their computers were used. Figure 4.4. presents the ranking of application areas based on the number of times forces selected particular applications as one of their three most important applications.

Figure 4.4. reflects to a great extent the information contained in Tables 4.2. and 4.3. Those areas of present application emphasis are frequently ranked as important; police administration and crime

FIGURE 4.4.-- Ranking of Computer Applications by Survey Respondents (N=28)



statistical files, and criminal investigation. Those areas where rapid growth is predicted, command and control and resource allocation, are also given considerable attention. Interestingly, police patrol and traffic do not receive the attention evident in Tables 4.2. and 4.3. We can take this as an indication of an acceptance of such applications as purely routine (structured). Most

consideration is given to those areas with the potential to contribute towards the unstructured applications. This can be seen as an indication of a computer ethic developing amongst management; a willingness to move forward into new computer application areas. Further, consideration of the issue of the development of a computer ethic among law enforcement administrators will be made later in this chapter.

New Quantitative or Numerical Based Pressures to Justify Decisions.

This research question is based on the political and financial sensitivity of police forces to outside opinions. The question seeks to identify whether or not the ready access to numerical information has given rise to a trend to support decisions with quantitative information derived from the computer.

Respondents were asked to indicate whether the employment of computers in their forces had created pressure to justify decisions on quantitative or numerical grounds. Table 4.4. indicates that the majority of respondents to this question did not consider such pressures to have been created. However, 46 percent of the respondents indicated that they were subject to at least occasional pressures to use numerically based information in situations which previously were decided

on previous experience. Respondents who answered this question in the affirmative were then asked whether they considered such numerical pressure to be too strong, too weak, or about right. The responses to this question are given in Table 4.5.

TABLE 4.4.-- Quantitative Pressures to Justify Decisions, (N=26).

Response	Number of Affirmative Responses	% of Total
Subject to Pressure	12	46
Not Subject to Pressure	14	54
Total	26	100

It can be seen from Table 4.5. that the majority of respondents who reported increased pressure to justify decisions on numerical grounds considered such pressures to be reasonable (about right). There is, of course, a social desirability to choose the category 'just right', to not appear subject to an undersirable pressure beyond one's control. This ought to be borne in mind in looking at this finding.

TABLE 4.5.-- Emphasis on Quantitative as Opposed to Qualitative Information, (N=12).

Response	Number of Respondents	% of Total
Too Much	2	17
About Right	8	66
Too Little	2	17
Total	12	100

The information gathered in this section lends some support to a developing picture of computer produced impact on police force management. It is interesting that given that we established early on in this chapter that all forces used computers to a greater or lesser extent, the majority of the respondents do not consider themselves subject to quantitative pressure. Particularly, in view of the predominance of statistically oriented computer applications. Police management can be expected to be subject to increasing quantitative pressure if computer applications develop as indicated earlier as an increased volume of statistically based information will form the base-line data for decisions.

Even given that future developments in computer applications would appear to be directed largely towards unstructured areas there is little cause to believe that numerical information will be any less important. Indeed, the emphasis upon quantitative information would probably increase as unstructured applications, though involving the manipulation of data, rely on an adequate and sound existing data base which would need to be extensive to account for the many variables manipulated in reaching operational decisions.

Police Computer Implementation

In this section the implementation of computers into the police world will be examined through an analysis of the responses to the mailed survey. It has already been seen that police forces in England and Wales have well established their computer use; employing an assortment of hardware to tackle an extensive range of applications. This section of the study examines how important are computer operations to forces within the bounds of five research questions:

1) How important to the operations of the police are computers?
2) Where in the police forces does the stimulation and support for technological development originate?
3) What problems have been experienced in adapting to innovation?

4) What impact has the application of computing had on the administration of policing?
5) What benefits have police forces gained from the use of computers?

The information in this section of the study is based on the respondents' replies to the mailed survey questionnaire and is primarily concerned with management attitudes. From these responses a consideration of the organizational impact of computerization will be undertaken.

The Importance of Computers.

This research area attempts to assess the importance of computers in police operations and management. The question seeks to identify the level of management directly responsible for computer operations and the impact of computerization on levels of influence within the police organization.

Respondents completing Part B of the mailed survey, the persons in command of data processing, were asked to which division of their force they directly reported. The responses to this question are presented in Table 4.6.

It can be seen from Table 4.6. that 76 percent of the responding forces' data processing managers (sworn or civilian) report directly to a command officer of chief or assistant chief officer rank. It is

TABLE 4.6.-- Direct Management Responsibility for Computer Operations, (N=26).

Person/Section Responsible	Number of Responses	% of Total
Chief Officer	4	15
Assistant Chief	16	61
Operations Division	2	8
Support Services	1	4
Administrative Division	3	12
Research & Planning	-	-
Total	26	100

interesting to note that in 15 percent of the forces the chief officer takes direct command responsibility for computer operations. This is of interest given the size of police organizations in England and Wales; the smallest force is 850 officers strong (plus non-sworn employees, the smallest force would employ in excess of 1000 persons) and the pressures on chief officers are intense. Chief officers are responsible for personnel, operational, and budgetary matters in his force. There are also considerable demands made for chief officers

attendence on interview boards for promotions, on conferences and as visiting speakers at the Police College. In view of such demand on chief officer's time it is surprising to see that four chief officers retain direct responsibility for computer operations.

Respondents were also asked to indicate what changes had taken place in the amount of control or influence exercised by different people or divisions within their police force as a result of putting the computer into use. The responses to this question are given in Table 4.7.

TABLE 4.7.--Changes in Centres of Influence

Centre of Influence	More Infl	No Change in Infl	Less Infl	Total[1]
Chief of Police	5	1	17	23
Assistant Chief	9	1	15	25
Divisional Commanders	5	3	16	24
Research & Planning	13	-	12	25
Data Processing Division	8	-	11	19
Patrol Officers	6	1	17	24

[1]N's not the same due to missing data

Table 4.7. illustrates the responses of assistant chief officer, or other senior administrator nominated by the chief officer of police, to the question 'Have changes taken place in the amount of control or influence exercised by different people or divisions in the police department as a result of putting the computer into use?' The responses indicate a 'felt' loss of influence or control (influence or control over the functioning of the police organization or over other peoples activities) across-the-board. For example, we may ask where has the influence moved; has it relocated? From the responses given in Table 4.7. no clear answer emerges. There has been a clearly felt loss of influence at senior management level and also at the level of the patrol officer. There is some doubt evident from Table 4.7. as to the position of research and planning and the data processing division; in both of these instances in excess of 40 percent of the respondents considered a gain in influence to have occured. This result would reflect the role these divisions perform in implementing computer applications into the police organization; a planning, installation, and operating function.

In looking at the responses to this question it must be recognised that what is being expressed is the feeling of respondents who themselves occupy senior positions within the police organization; this can

colour the responses given.

On the strength of the findings revealed in this section a number of interesting questions surface. Where has the centre(s) of influence gone, if indeed there has been any movement? What is the nature of this loss of influence? Is there at issue a loss of discretion? When the responses to this question are weighed against some of the other results of the study -- the emphasis upon quantitative rather than intuitive based decision-making together with the majority of application areas being statistically based -- police organizations appear to be becomming tied to the need to justify their actions on the grounds of facts and figures. It is probably significant that neither command officers nor patrol officers (the two major areas of felt decline in influence) have direct personal access to the computers. Both command and patrol officers rely on an intermediary to perform the physical action of obtaining information from the computer which they in turn have to supply at the front-end and interprete at the back-end of the system. Both command officers and patrol officers are traditionally accustomed to having direct physical control of situations demanding their action. The change in circumstances could account for the felt loss of influence -- being both a felt loss of discretion and an alienation to the machine over which they have no personal

direct control. This interpretation of the reasons for the felt loss of influence is but one interpretation, others could be made. There is little doubt that further research is called for in this area.

Stimulation and Support for Technological Development.

The intention in this section is to locate the source of new ideas and the centre of support for computerization. In order to gain an insight itno this interesting area a number of questions on Part B of the questionnaire were asked. The responses to these questions will be dealt with first and then analysed in an attempt to draw some meaningful conclusions.

Table 4.8.gives the respondents' indications of where the initial proposal for the use of computers originated. We see from Table 4.8. that 70 percent of the proposals were reportedly made at senior command level. Interestingly, 15 percent of the initial proposals were made by external bodies to the force; the Home Office and local authorities.

TABLE 4.8. -- Source of Initial Proposal for the Use of Computers, (N=28).

Source	Number of Responses[1]	% of Total
Chief of Police	8	25
Assistant Chief	11	35
Data Processing Manager	2	6
Administration	6	19
Home Office	3	9
Local Authority	2	6
Total	32	100

[1]Respondents were asked to indicate more than one area if necessary.

Table 4.9. indicates what stimulated the initial interest in computerization. From this table it can again be seen that the Home Office (including the Police Scientific Development Branch) and local authorities were indicated to be the origin of 48 percent of information stimulating the interest in computerization. Outside influence in stimulating the interest of police

TABLE 4.9.--Stimulation of Interest in Computers.

Source	Number of Responses[1]	% of Total
Professional Meetings	8	17
Journal/Written Reports	4	8
Activity in Other Forces	13	27
Computer Salesmen	-	-
Outside Consultants	-	-
Police Scientific Development Branch	8	17
Home Office	6	12
Local Authority	9	19
Total	48	100

[1]Respondents were asked to indicate more than one area if necessary.

forces is very obviously important, but it must be weighed against the role of internal agents providing stimulation, namely the 52 percent reported. Interestingly, the respondents deny an important role to external people, indicating that all decisions are made as a result of

in-house deliberations. The denial of a role in stimulating interest in computers to computer salespersons and outside consultants ought to be seen in the light to the role of the Police Scientific Development Branch (P.S.D.B.) which acts as a consultant for the police service. The P.S.D.B. discuss new computer models with the computer companies and perform field tests of equipment and then report these findings to the individual forces. This clearinghouse role of the P.S.D.B. tends to insulate the individual forces from external consultants.

The role of the P.S.D.B., an agent of the Home Office, also reinforces the developing picture we have of the Home Office as an agency of considerable power in police circles -- controlling a considerable amount of technical information.

One question in the survey asked a follow-up question to those discussed above, namely who usually initiates recommendations for new computer uses. The responses to this question are given in Table 4.10. Such recommendations for new development are incorporated into the forces budget for approval by both local authority and Home Office.

It is seen from Table 4.10. that once computers have become established with the police force organizational framework new uses are generally a result of internal recommendations at either command or senior administrative

TABLE 4.10.-- Source of Recommendations for New Computer Uses, (N=28)

Source	Number of Responses[1]	% of Total
Chief of Police	10	22
Assistant Chief	10	22
Data Processing Manager	5	11
Research & Planning	6	14
Administration	4	9
Police Force Computer Committee	7	15
Consultant	-	-
Local Authority	3	7
Total	45	100

[1]Respondents were asked to indicate more than one area if necessary.

level. We must not lose sight though of the fact that 56 percent of the recommendations for new computer use came from outside the system. Of the new recommendations, 25 percent came from the research and planning and data processing departments. This finding adds to that reported

in Table 4.7. where it was indicated that the influence of both these departments increased when all other sections of the police organization were considered to have lost influence. The role of the Police Force Computer Group is also of interest accounting for 15 percent of new computer use recommendations. In this regard, the case of the West Midlands Police Computer Group serves as an illustrative example of some of the roles of computer groups. The West Midlands Police Computer Group consists of the computer manager and his staff of programmers, analysts, and operators, together with a police inspector with operational experience under the chairmanship of the deputy chief constable of the force.[65] This group has the responsibility for development, operation, and co-ordination of the development of computer applications within the force.

In the example given of the West Midlands Police Computer Group we see a strengthening of the role and influence of the data processing department, adding to the findings reported earlier in this chapter. We cannot generalize from this one example, but it is illustrative of a trend which warrants further enquiry.

Respondents were also asked to indicate specifically the effect of the Home Office, through the P.S.D.B., on computer development. This question was operationalized

in two parts: firstly, asking respondents to indicate the level of financial aid received from the Home Office for the use and development of computers and secondly, asking them for an evaluation of the impact of the Home Office aid on the decision to utilize a computer. Tables 4.11. and 4.12. indicate the responses to these questions.

TABLE 4.11. -- Forces receiving Financial Aid from the Home Office to aid in the Use and Development of Computers, (N=20)

Classification	Number of Responses	% of Total
Received Aid	6	30
No Aid	11	55
Planning to Apply	1	5
Applied, but refused	2	10
Total	20	100

Only twenty forces responded in Table 4.11. and only sixteen to Table 4.12. This low response rate could provide some indication of the political delicacy involved in discussing the source of financial aid and the impact of outside agencies on police computer development.

TABLE 4.12.-- Impact of Home Office Aid on Decision to Use Computer, (N=16)

Classification	Number of Responses	% of Total
No Computer without Aid	2	13
Computer Effort Smaller without Aid	5	31
Computer Use Same with/without Aid	9	56
Total	16	100

We see that in the case of 45 percent of the responding forces indicate in Table 4.11. that they looked to the Home Office for aid in the computerization and 30 percent of the respondents did receive aid. In Table 4.12. we see that the impact of Home Office aid was important to 44 percent of the respondents. The picture which emerges from both tables is supportive of the general picture of the importance of the Home Office in encouraging, supporting, and providing initial stimulation to individual forces computer efforts.

The responses given in Tables 4.9. through 4.12., taken together given some insight into the source of innovative ideas within the sample of English and Welsh police forces and, particularly the impact of outside bodies on decisions taken by forces to computerize. One important qualification ought to be made. Respondents were asked to indicate whether their force was part of, or likely to become a part of, a local authority information system. Respondents were unanimous in answering in the negative. Respondents were also unanimous in stating that control of police computer systems should rest soley in the hands of the individual police force. The one exception to this individual control is the Police National Computer, the control of which rests with a committee of police chiefs and representatives of the Home Office.

It is against these results that one can see the importance and influence of outside bodies. Local authorities have an impact owing to their control of between 40-50 percent of the operating revenue of forces and their close proximity to the force in terms of the same geographic area. The impact of the Home Office is due to both financial provisions, 50+ percent of the operating budget of individual forces is from central government, and through the role of the P.S.D.B.

It ought not to be forgotten that the office of the Chief Inspector of Constabulary is a Home Office appointment. The responsibility of this officer is to ensure uniformity of operating and administrative standards and therefore gives the Home Office further influence into the affairs of local forces.

We ought not to see the role of the Home Office as one of interference with the operation of individual forces, but rather as one of support and ensuring that the individual forces benefit and do not waste resources duplicating the efforts and experiments of other forces.

From the indications given of the role of chief officers and their command staff in advancing into new fields of computer applications one can readily see the transferability of ideas during meetings of the A.C.P.O. Indeed, the A.C.P.O. has its own computer committee as one of its standing committees, the function of which is to examine new developments in the computer field and ensure that all members are aware and in a position to take advantage of these developments -- very much a supplement to the role of the P.S.D.B. The role of the A.C.P.O. helps legitimise the activities of the P.S.D.B. by introducing a senior representative body into the assessment procedure which aids the transfer of information from the research and development stage into the operational arena. Therefore,

the role of the Home Office is supportive and is closely allied with other police bodies such as the A.C.P.O.

Problems Experienced in Adapting to Computer Innovation.

This research section is intended to pinpoint some of the stumbling blocks to computer innovation encountered by the sample agencies. Through an analysis of the problems experienced in implementing change into computer operations it ought to be possible to begin to assess the traditional police organization's capacity to adapt or resist the pressure of change.

Respondents were first asked to indicate in what areas of the computer operation have problems occured in the past, and/or present. Table 4.13. illustrates the responses to this question.

The primary problems facing the police reported in Table 4.13. in using computers are behavioural and not technical. Scheduling and priorities, that is determining what applications to implement and what the priorities and scheduling will be is presently a primary concern. The second area of concern to forces is that of recruitment. That is, ensuring that suitable people are employed in the data processing department. Management acceptance of computers is another problem

TABLE 4.13.-- Problems Hindering Computer Operation, (N=24).

Application Area	Problems			
	Past	% of Total	Present	% of Total
Scheduling & Priorities	1	3	4	19
Planning	2	7	2	9
Equipment:				
Performance	6	20	-	-
Reliability	5	17	4	19
Maintenance	-	-	-	-
Programs	3	10	1	5
Training	2	7	2	9
Recruitment	4	13	4	19
Integrating Computer with Force	1	3	1	5
Management Acceptance	4	13	2	9
Organization or Personnel Problem	2	7	1	5
Total[1]	30	100	21	100

[1]N's differ due to missing data

facing the sample of police forces. This could be interpreted as an unwillingness or inability of management to adjust to the new demands of the computer. The issue of management acceptance however, is somewhat confusing. On the one hand we have the data previously presented which points to a felt loss of influence by management (Table 4.7.). Yet, we also see data indicating that management at the very senior level are making decisions to develop computer applications. We can only make the tentative interpretation that the problems experienced with management are from middle management levels. We ought not to overstate this problem (or any of the problems discussed) as the actual numbers of forces indicating that it is a problem is small. However, it is interesting to note that in a study of a major police department in the United States, Wycoff and Kelling found management acceptance, at middle management levels, a major hurdle to the implementation of change.[66]

Equipment problems do not appear to be the major problem they were in the past. The major problems of the past related to equipment, both performance and reliability. Equipment reliability still ranks as an important problem, but generally the situation appears to have improved; as is indicated by the performance category in Table 4.13.

From the data produced in this section it is clear that computerization in police forces may have

resulted in considerable acceptance difficulties, hence the person related problems. There is a need, however, to take a series of measurements relating to computer integration within police forces in order to assess the continuing nature of these problems or their resolution. From the emphasis placed on personnel problems it may be that when these problems receed in importance computerization will become integrated within the total police organization. This is a matter for further research.

The remaining two research questions are concerned with the impact of computers on police forces and the presumed benefits resulting from such impact. The results and analysis of these two questions are closely related, being based, in large part, on much of the previous discussion.

Impact of Computers on the Administration of Policing.

This research section seeks to assess the impact of computers on police organizations. From such an assessment of administrative changes some feeling may be gained for the impact on the operational end of policing.

The data supplied by respondents regarding the presumed effect of computerization on centres of influence

has already been discussed and illustrated in Table 4.7. Respondents were now asked to indicate to what extent do operational officer participate in computer projects. These responses are given in Table 4.14.

TABLE 4.14. -- Participation by Operational Officers in Computer Projects, (N=26).

Participation	Number of Responses[1]	% of Total
No Participation	-	-
They Pose Problems	11	34
Act as Consultants	8	25
Staff Computer Project Related to their Operations	13	41
Total	32	100

[1]Respondents were asked to check more than one area if necessary.

Respondents were also asked to indicate whether computerization had eliminated the work of those doing routine and recording tasks. The responses to this question are given in Table 4.15.

TABLE 4.15.-- Effect of Computer on Routine and Recording Tasks, (N=24).

Effect	Number of Responses[1]	% of Total
No Significant Effect	3	10
Freed People to do Non-Clerical Work	6	20
Clerks still doing Routine tasks, now related to Data Processing	14	47
Hire additional Clerks to handle Data Processing	3	10
Eliminate jobs leading to redundancy	1	3
Allowed Existing Clerical Staff to absorb Extra Workload	3	10
Total	30	100

[1]Respondents were asked to check more than one area if necessary.

The responses given in the two tables illustrate organizational adjustment, or lack of it, at two levels in police forces. At the operational level, despite the indications given in Table 4.7. that operational officers have lost influence, we find in Table 4.14. that they are involved in computer projects in some capacity. It would seem reasonable to assume that the involvement of operational officers in computer projects would be invaluable if legitimacy is to be won amongst the rank and file officers in these departments. We do not know, however, to what degree such participation is taken as tokenism or as genuine meaningful participation.

Table 4.15 provides an interesting illustration of the failure, so far, of computers to free clerical staff from many of the routine functions. From this table we see that twenty-four forces responded. The information given by these respondents presents an outline of clerical staff being moved from one task to another whereby they service the computer. In some cases (three responses) additional staff have been hired to help service the computer.

Given that most police computer operations are related to routine functions of a largely statistical nature (Tables 4.2. and 4.3.) it is not surprising that clerical staff are increasingly being directed to serve the needs of the computer. One further

point ought to be made. The primary method of computer operations to serve routine operations is presently batch-processing (A.C.P.O. publication indicates this dependence which is slowly changing as forces move towards their own in-house computer operations), where statistical information is first translated to computer readable form by hand. Later, more recent developments, of optical scan forms and interactive-terminal access to data bases could lead to less clerical emphasis on this type of operation.

Despite such trends, the overall picture emerging from this section is of an involvement by both operational and administrative police officers with computer operations in their forces; and involvement which will grow as computer applications develop,

Benefits Gained from the Use of Computer Information Technology.

This section is intended to produce some indication of the perceived benefits acruing to police forces from the large capital investment and continuing financial costs of computerization. This section will analyse the results to a number of questions asked on the survey instrument.

In the first place, respondents were asked what financial costs were involved running their computer operation for the present fiscal year (April 1st 1979 --

March 31st 1980). This question sought to obtain some indications of the cost side of the cost/benefit ratio. Table 4.16 indicates the expenditures of forces on their computer operations for the current fiscal year.

TABLE 4.16.-- Data Processing Expenditures for Financial Year ending March 1980, (N=15)

Expenditure in 000's $ [1]	Number of Responses	% of Total
0 - 199	10	66
200 - 399	3	20
400 - 599	-	-
600 - 799	1	7
800 - 999	-	-
1000 +	1	7
Total	15	100

[1]Expenditures given in pounds sterling and converted to dollars at an exchange rate of 2.31 dollars to the pound sterling.

The actual range of costs given is between 4,620 dollars and 1,381,380 dollars. The large sums given relate to forces purchasing new computer systems. The very large figure at the one extreme of the range

relates to the purchase of a new criminal information system for a force with over 2,500 officers. The figures given must be treated with caution as some respondents indicated that their expenditures on computer operations were shared with the local authority and it was not possible to separate out only police costs. Other respondents declined to give such information, four respondents marking the section 'confidential'.

There is considerable expenditure taking place on police computer operations as seen in Table 4.16., what then of the benefits? Respondents were asked to indicate their major reasons for using computers, ranking them 1,2, or 3 in order of the perceived importance. Table 4.17 provides the results of these responses.

From the data given in Table 4.17 it is immediately obvious that the major emphasis in computerization is managerial -- to make internal operations more efficient and for better management information. Operational factors did not figure greatly amongst the reasons for computerization. This finding agrees with the information given in Tables 4.2. and 4.3. concerning current computer applications. It will be interesting to see whether operational factors become more important as new computer applications develop as they were projected, or whether the emphasis in new computer applications remains

TABLE 4.17.-- Major Reasons for Using Computers.

Reason	Rank Order					
	1.	% of Total	2.	% of Total	3.	% of Total
Management:						
Make Internal Operations Efficient	8	38	6	34	2	17
Monitor Performance	-	-	1	6	3	25
Better Management Information	9	43	4	24	4	33
Professionalism	-	-	-	-	-	-
Operational:						
Improve Apprehension	4	19	2	12	-	-
Improve Investigative Ability	-	-	4	24	3	25
Improve Surveillance Capacity	-	-	-	-	-	-
Total[1]	21	100	17	100	12	100

[1]N's differ owing to missing data.

predominently managerial.

In view of the traditional emphasis in policing in England and Wales on public service it is interesting to note that the emphasis is on management and not operations whereby the public service would be directly served. However, as the general emphasis of the present study was with organizational issues respondents could be expected to view the particular question within an overall organizational context.

Respondents were finally asked to indicate how accurate and useful they considered computers to their overall operation. Table 4.18 provides the responses to this question.

The results given in Table 4.18 indicate little dissatisfaction with either the accuracy or usefulness of information supplied by the computer operation. Interestingly, we might have expected some expression of dissatisfaction from the information supplied in Table 4.7. concerning influence, where we saw a felt loss if influence and control over the police organization. In view of these findings we begin to cast some doubt on the findings in Table 4.7. The findings in Table 4.7. are possibly an expression of adjustment to a new situation which deserves further research to examine how development takes place.

The information given by the respondents in Table 4.18 would appear to support that given in Tables 4.4. and 4.5. where quantitative pressure to justify decisions was discussed. Similar proportions of the respondents considered that the computer provides useful information (Table 4.18.) to respondents reporting at least occasional pressures to base decisions upon quantitative information.

TABLE 4.18.-- Accuracy and Usefulness of Computers to Police Forces, (N=26).

Statement	Response			Total[1]
	Yes	Sometimes	No	
Computer provides information that is useful	14	10	2	26
Confidence in accuracy of computer	21	5	-	26
Information provided fast enough for force needs	15	7	3	25

[1]N's differ due to missing data.

Table 4.18 does provide a general picture of usefulness to responding forces of their computer operations and an assessment of fast and accurate information which is useful to their management operation. We can conclude that the computer is useful to management and that the major application thrust is presently in this direction.

From this section we can say that respondents felt that the financial commitment to computerization was justified as measured in managerial and administrative terms. This finding is to be expected given the obvious reluctance of respondents to indicate that they were putting money into an operation which was not producing results. However, the finding supports the general tone of the information previously supplied -- a commitment to computerization which is producing considerable assistance in the management and administration of policing in England and Wales.

The final question on both parts of the survey asked what major recommendations respondents would make to a department that is considering computerization. Respondents to this question were unanimous in their replies, and they very closely follow the factors listed by Colton as influencing implementation of computers and discussed in Chapter II. The first condition respondents indicated was a clearly perceived need for change linked to

an understanding at the outset of the policy implications. These considerations closely relate to those mentioned by Colton regarding the nature and environment of innovation. Also mentioned by respondents was a need to establish priorities for development (also found by Colton).

Respondents further commented on the need to select personnel with the skills necessary to carry through computer development and implementation. It was indicated that personnel selected needed to have the support of senior management for the successful completion of implementing innovative developments. There was also a recognition by respondents that computerization was a long-term project and required a suitable time frame, including continuity, for development. Once again the respondents are echoing Colton.

The data presented in this analysis concerning computerization in England and Wales can now be compared with finding in the United States. We will compare computerization in law enforcement in England and Wales with that in the United States.

Police Computers in the United States

In Chapter I mention was made of the United States being in the forefront of computer application in the police field. This statement can now be assessed by looking at Colton's findings in comparison to the information so far presented concerning computerization in England and Wales.

This short comparison is based upon an examination of Colton surveys of both 1971 and 1973.[67] The immediate impression we get from Colton's study is of similarity in findings. For the purpose of comparison we will look at the general similarities in two parts. First, the computer applications utilized including who uses them and with what problems and second, the impact of such computerization on the operations of police departments in the United States.

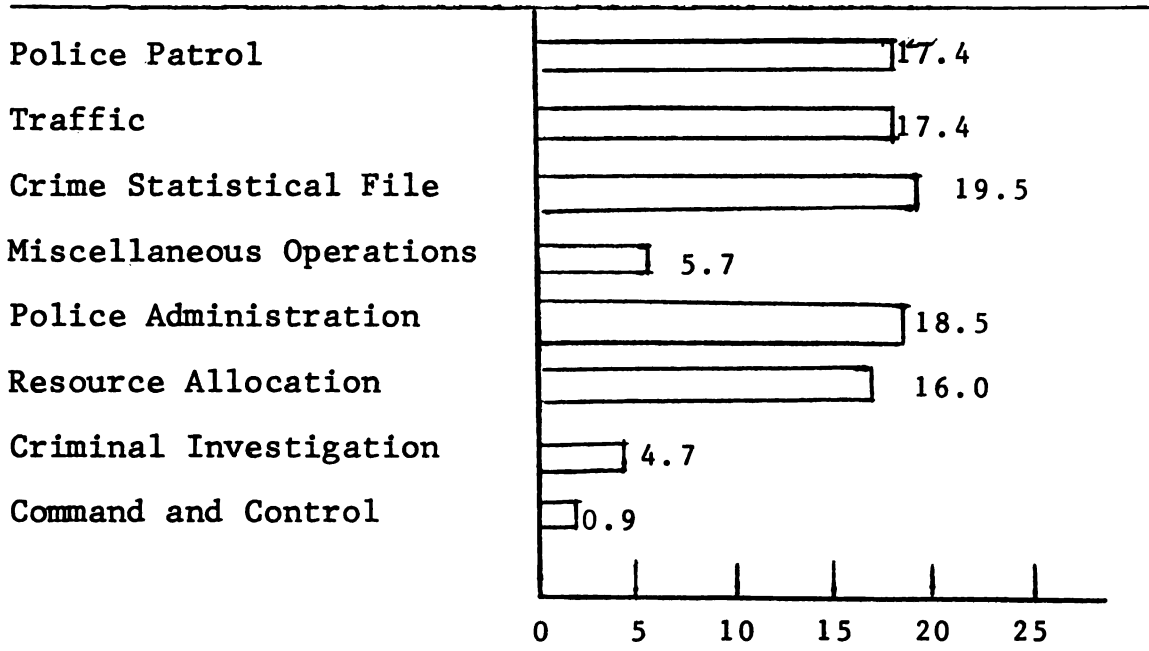
We ought to remember, as has been discussed in previous chapters, that the findings of Colton were collected in the early 1970's, six years before this study. However, an examination of the present computer projects being undertaken by a number of the larger police departments in the United States by the present author reveals that in substance the applications indicated by Colton are still predominant.

For example, the larger police departments are presently moving into a new range of larger systems, powered by more powerful machines in order to move into the non-routine area of computer applications, particularly in the area of resource allocation. Kansas City, Missouri, serves as an example of such a development. Kansas City is presently updating its computer system by renting a powerful I.B.M. computer and developing quite a sophisticated resource allocation model and integrating a command and control system into a management information system.[68] Similarly, the Los Angeles Police Department is this year (1980) introducing an advanced computer system incorporating command and control with resource allocation packages.[69] Dallas, Texas is an example of another major police department in the United States introducing similar developments.[70] So it is clear that whilst the major police departments in the United States are developing advanced computer systems, they are still based on the applications found by Colton in the 1970's.

Colton lists the major computer applications of United States police agencies as shown in Figure 4.5. From this figure we see that there was an emphasis placed on administrative applications. Police patrol, traffic, crime statistical files, and police administration were the major application areas. A somewhat similar picture to that given in Figure 4.3. earlier where the same areas

are of primary application importance. It ought to be mentioned that Colton's survey is based on a sample of cities of population 50,000 and over across the United States. The 1973 sample reported in Figure 4.5. consisted of an 80 percent return rate on 410 cities surveyed (N=326).

FIGURE 4.5.-- Status of Computer Use in Police Departments in the United States, 1974.



Source: International City Management Association, 1974.

The presentation of Colton's findings is not quite compatible with those presented in Figure 4.3. This is in part due to the applications in the present study being presented as a percentage of the potential applications. In Colton's study it is difficult to tell whether the total potential applications was used or rather whether the total number of actual applications was used. Nevertheless, it is possible to compare the two sets of results on the basis of the major thrust of application areas.

Colton's work indicates a greater development of resource allocation applications than seen in England and Wales. Whilst in the present study we see a greater emphasis placed on command and control than is evident in Colton's study.

The disparity can be partly explained by the concern in the United States about the ability to continue to recruit manpower faced with increasingly tight budgetary controls. In fact manpower has grown in the United States, but there is a constant threat of cutbacks entailing lay-offs. In England and Wales however, police forces have found it difficult throughout the 1970's to recruit an adequate number of officers to meet authorised establishments. In order to compensate for this shortage forces have looked at ways of increasing productivity and to this end command

(speeding the turn-round of officers at incidents) has received considerable attention.

We see from both Figures 4.3. and 4.5. that considerable emphasis is placed on the structured application areas in both England and Wales and the United States and on the accumulation of vast quantities of statistically based information. The one major difference between the two figures (4.3. and 4.5.) being in the criminal investigation area. In England and Wales this is a major application area even though as discussed earlier the information gathered in this area is largely structured and statistical. The reason why there should be such a difference between the two figures is not clear and would require consideration of what the information in the United States is used for. The consideration of this difference is a matter for further research.

Table 4.19. indicates the effect of computers on routine tasks in the United States. We see a similar picture to that presented in Table 4.15. In both cases we see an emphasis placed on administration. In both tables we see that the majority of the clerical staff are still doing routine tasks, but that they are now related to data processing; 47 percent in England and Wales and 57 percent in the United States. In the

TABLE 4.19.-- Effect of Computer on Routine Tasks, 1974.

Effect	Number of Responses	% of Total Responding (N=112)[1]
No Significant Effect	14	12.5
Freed People to do Non-Clerical Work	39	34.8
People still doing Routine tasks, now related to Data Processing	64	57.1
Hire Additional Clerks to handle Data Processing	34	30.4
Eliminate Jobs leading to Redundancy	0	0
Other	11	9.8
Total	162[2]	144.6[2]

Source: International City Management Association, 1974.

[1]Of 146 departments using computers, 112 responded to this question.

[2]Total greater than 112 and 100% since multiple responses were allowed.

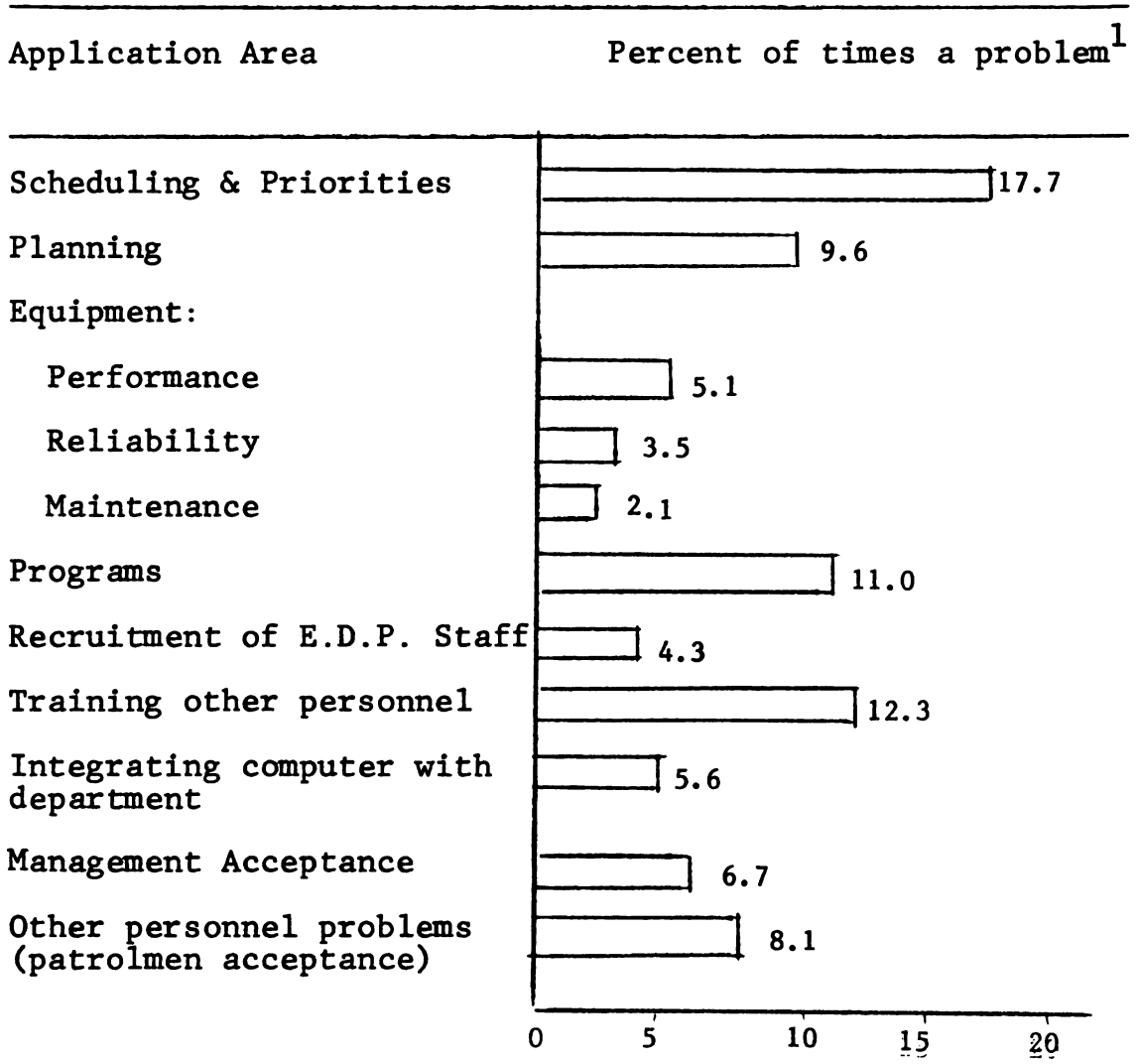
United States there would appear to be a greater tendency to hire additional staff to handle data processing -- 30.4 percent of the respondents in the United States hired additional staff whilst in England and Wales only 10 percent hired additional personnel. The implications of such a divergence can be that either in the United States police departments were at maximum capacity in coping with work whilst in England and Wales they were not, or that in England and Wales existing staff were able to tackle larger work loads whilst in the United States they were not. Such a difference would need further research before any conclusion could be advanced.

Colton found that all forces serving populations of 500,000 and over were using computer and for populations below this figure the type of city management was an important factor. In England and Wales we find that all force serve populations of over 400,000 (with the exception of the City of London where the residential population is 6000, but the daytime business population is approximtely 3 million), thus it is not surprising to find all forces in England and Wales using computers. However, we do find in both countries that the largest forces tend to be the trendsetters, in that they appear to have the spare capacity to place both financial and personnel resources in innovative areas.

In both countries the major problems experienced in adopting computers are people related. Table 4.13 gives the breakdown of problem areas for police forces in England and Wales. Figure 4.6. illustrates the findings of Colton in relation to police agenices in the United States. It is seen from both Table 4.13 and Figure 4.6. that the major problem area is in both the cases scheduling and priorities. It is interesting to note that police departments in the United States did not experience management acceptance as such a problem as forces in England and Wales did. One can assume from this difference that a computer ethic exists in police management in the United States ready to accept computers.

Similar problems would seem to exist in connection with the recruitment and training of personnel in relation to the operation of the computer. However, forces in England and Wales appear to suffer more from equipment reliability whilst not suffering from equipment performance and equipment maintenance to the extent that departments in the United States did in the early 1970's. However, the equipment based problems are probably more a reflection of the time difference in gathering the two sets of data. The computer hardware of the 1980's is undoubtably more reliable than equipment of the early 1970's.

FIGURE 4.6.-- Problems Hindering Computer Operations, 1974.



Source: International City Management Association, 1974

[1]Two application areas: facilities (9.9 percent) and training of E.D.P. staff (4.0 percent) have been ommitted in order to make this compatible with Table 4.13.

In both countries it is interesting to note the important role played by outside agencies -- the Home Office (Police Scientific Development Branch) and the Law Enforcement Assistance Administration -- who provide the much needed financial help in entering into the costly purchase of computer systems.

Table 4.20.indicates the way in which the Law Enforcement Assistance Administration has had an impact on the decision to computerize in the United States. Whilst in regard to England and Wales, Table 4.12. indicated that the majority of forces consider that their computer effort would be the same without the aid of the Home Office, Table 4.20 indicates that only 11.8 percent of the respondents in the United States who had received aid considered that their effort would have been the same without aid. It must be remembered that forces in England and Wales are generally a good deal larger than in the United States and have larger budgets which might allow them greater capacity to innovate without external aid. Further, a greater percentage of English forces as compared to departments in the United States did not receive aid (55 to 40 percent). Yet, in terms of the actual number of departments we are talking about, eleven forces in England and Wales and forty-eight in the United States did not receive aid; relatively small numbers.

TABLE 4.20.-- Influence of L.E.A.A. on Computer Use.

Received LEAA Funds	Number[1] Indicating A	% of Total	For those receiving funds has computer made a difference							
			Yes, no computer without help		Yes smaller use without		Uncertain		No, would be same	
			No.	% of A	No.	% of A	No.	% of A	No.	% of A
Yes	51	42.5	10	19.6	24	47.1	6.	11.6	6	11.8
No	48	40.0	-	-	-	-	-	-	-	-
No, but have or will apply	21	17.5	-	-	-	-	-	-	-	-
Total Responding	120	100.0								

[1]Category 'other', accounting for five responses (9.8 percent) has been omitted due to lack of explaination by author of what included in category.

Source: Kent W. Colton, "Police and Computers: Use, Acceptance, and Impact of Automation", The Municipal Yearbook, (Washington D.C.: International City Management Association, 1972).

In viewing the above comparisons between computer use in England and Wales and the United States caution must be exercised in view of the time gap between the two sets of data. Further, in both cases the information gathered is preliminary, there having been little previous work in this field. The two sets of data do provide a descriptive outline of computer applications and an assessment of impact on organization and operations which is very similar in both countries.

The larger departments in the United States are presently embarking on a re-development of their computer systems. Police departments in the United States were earlier into the computer field than forces in England and Wales (that is in terms of in-house dedicated computers) and as a result of this the majority of these computer systems are due for replacement, whilst in England and Wales the systems tend to be more modern and based largely on minicomputers. Kansas City provides a good example of such new development in the United States. The Kansas City ALERT II computer system presently in the developmental stage mentions as one of the major advantages of the new system:

> Use of the system enables the department to deploy its field forces more efficiently. Kansas City, for example, has four police officers assigned per square mile, compared with the national average of 7.3 officer for cities of comparable size. This is possible because ALERT II data resources help the patrol officer extend his area of effectiveness.71

Summary

The preceding analysis of the data collected in this study begins to describe the state-of-the-art in police computerization in England and Wales. We see that a range of computer hardware is being put into general applications whereby priority is being given to administrative based tasks. Operational functions are not being ignored in the computer based innovation, but are clearly secondary.

The impact of this computer development has been briefly sketched. We see that whilst there is general support for, and satisfaction with, the overall computer effort, respondents did indicate some symptoms of alienation in their 'felt' loss of influence through or to the computer.

We have also seen that there are similarities between computerization in the United States and in England and Wales. A number of trendsetting departments in the United States are developing advanced computer systems incorporating resource allocation and command

and control functions linked into management information networks. In the case of Kansas City, St.Louis, Dallas, Los Angeles and Cincinatti such systems are in the operational (or presently being installed) stage. In England and Wales however, developments into such integrated system architecture is planned for the comming three years.

The general picture that emerges from the data supplied by the respondents in England and Wales is of a commitment to computerization with a development in progress from structured statistical applications to unstructured integrated system architecture whereby the different application areas become integrated into data base which can be manipulated for planning and decision making.

FOOTNOTES -- CHAPTER IV

[62]West Midlands Police, Police Computer Group internal force publication, 1980.

[63]Report of Her Majesty's Chief Inspector of Constabulary, (London: Her Majesty's Stationary Office, 1976, 1977, and 1978).

[64]Lawrence B. Mohr, "Determinents of Innovation in Organizations", American Political Science Review, Vol 63, 1969, pp. 111-126, p. 112.

[65]West Midlands Police, Police Computer Group publication, 1980.

[66]Mary Anne Wycoff and George Kelling, The Dallas Experience; A Summary Report, (Washington D.C.: The Police Foundation, 1976), Ch 5.

[67]Colton,"Police and Computers", 1972 and 1974.

[68]Kansas City Police Department, "ALERT II", (New York: International Business Machines, 1979).

[69]Los Angeles Police Department, Annual Report, (Los Angeles, California, 1979).

[70]Dallas Department of Public Safety, Annual Report, (Dallas, Texas, 1979).

[71]Kansas City Police Department, "ALERT II".

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

A summary of the research study and conclusions based on the findings are presented in this chapter. The chapter summary includes a discussion of the purpose of the study, the research method used, and the results of the data analysis. Some of the limitations of this study are also discussed, followed by conclusions and recommendations for future research.

Purpose

The intention of the present study has been to examine the role of the computer in relation to policing in England and Wales. There is growing acceptance that the police, as an institution, cannot continue to perform their role in the traditional manner which has changed very little in the 150 years that modern policing has existed. Such questioning of traditional methods has contributed to the development of computerized management and operational police applications.

It ought not to be forgotten that computer based

innovation is also a part of societal innovation; transfering industrial society into technological society. Thus, it is also against this general social back-cloth of change that the current study is presented.

Method

Police use of computers was assessed on the basis of a broad outline examining what computers are currently being used, and for what purposes. Within this outline specific research questions were stated within two general headings:

A. Police Use of Computers: this consisted of a review of computer use, its development, past, present, and future.

B. Police Computer Implementation: this consisted of an examination of problems encountered; an assessment was also made of computer implementation and its impact on the police organization.

Data for this survey was gathered from three sources:

1. A mailed survey of all police forces in England and Wales based on a two part questionnaire; one part for the completion of a senior command officer designated by the chief of police, the other part for the completion of the person in command of the forces' data processing division. To this request for information the response rate was 65 percent successful returns.

2. The Association of Chief Police Officers in Britain published work "The Police Use of Computers" in which hardware and applications used by police are outlined. The data was used to supplement and verify that collected through the mailed survey.

3. In order to give the study a wider perspective, a comparison of the results obtained through the two methods outlined above with a similar study made in the United States in the early 1970's was performed.

This data was used to address eight research questions.

Results

The first eight findings listed below relate specifically to the research questions used in the study. The remaining findings pertain to additional results of the research.

1. There is, at present, no overall uniformity in computer equipment used by police forces in England and Wales. In view of the fact that each local authority buys computer hardware independently, and one force might police an area of two or more local authorities, police forces use a wide range of hardware. There is a developing trend, in in-house computers, to use specific hardware and software packages for specific applications; command and control is such an application.

2. Applications processed through the sample of police computers have been categorized as either structured or unstructured. Structured applications, which predominate, have been outlined in this study as routine tasks previously performed by hand with a strong administrative and numerical emphasis. Unstructured applications are those involving the manipulation of data for decision-making purposes; such applications are presently in the minority, but quickly developing.

3. Computers have created perceptions of new pressures on police administrators to use quantitative or numerical based information in decision-making. Such pressures do not appear to be uniform, nor do they appear to be acute. These police administrators who feel themselves to be subject to these pressures generally consider the pressure to be 'about right' though a majority of administrators do not consider themselves subject to such pressure.

4. Computers are becomming very important to the operation of police forces. In the majority of forces sampled direct responsibility for computer operations is taken by a senior command officer, indeed in some forces directly by the chief of police himself. One result of this rapid innovation process and the importance afforded to it has been a 'felt' loss of influence by large segments of the police organization without corresponding gains in other sections. Planning and Research and Data Processing sections do appear to have benefited from the loss of influence in more traditional divisions of the police organization.

5. Most of the stimulation and support for technological development within individual police forces has come from senior command officers. In approximately 15 percent of the cases in this study initial stimulus and support came from outside agencies, the Home Office and local authorities. It was found that outside consultants and computer salesmen played no direct part in this stimulation, although the Police Scientific Development Branch of the Home Office may act as liason with consultants on behalf of individual police forces.

6. The major problems experienced by forces in computerization have been people-related. Making suitable arrangements for scheduling and prioritizing is the major problem area. Recruitment and training of suitable computer staff is also a major problem. Equipment problems are not major, but of the problems presented by equipment, software development plays the leading role.

7. The application of computers to police work has resulted in the establishment of computer project committees which are new channels for posing problems, a range of other ways in which operational officers participate in projects involving computers. So far, the computer has not released people from routine clerical jobs, in fact there has been a re-location of many clerical workers from one clerical job to another directed mainly at servicing the computer.

8. The results of the study pertaining to England and Wales are generally similar to findings in the United States. Variation in findings, where they exist, can be partly explained on the ground of different recruitment problems in respect of sworn officers.

In the United States, departments have faced the prospect of manpower limits and lay-offs. Though few limitations have actually occured and manpower has grown through the 1970's, police departments in the United States have looked at ways of allocating resources economically. In England and Wales, by contrast, the problem has been to recruit an adequate number of officers and the thrust has been to use computers for the command and control of officers in the field.

9. Considerable financial costs are involved in police computer operations. Most forces consider that the computer produces information that is useful, and accurate. Justification of computer operations is based first on administrative grounds; computers making for better management control. Operational benefit and justification of computer development is important, but second to management needs. The overall feeling is that computers provide fast, accurate information that is useful for management purposes. The application areas to which computers are directed reflect this management concern being largely administratively based.

10. The role of outside agencies in stimulating and supporting computer innovation is important in both the United States and Eangland and Wales, through the Law Enforcement Assistance Administration and the Home Office. In England and Wales the Home Office acts in a co-ordinating role to a degree not evident in the United States by the Law Enforcement Assistance Administration.

11. The large police agencies in England and Wales and in the United States would seem to act as centres for innovation and this would seem to account for much of the transmission of new ideas to smaller departments. The Home Office in England and Wales acts to prevent some of the distortions which result from size and slack in financial and personnel capacity by co-ordinating research and development. No such mediating arrangements exist in the United States for police departments.

12. The concept of professionalism would seem to play little conscious role in the decision to computerize in England and Wales. Though computers have become part of the modern professionals bag of tools and all forces in England and Wales possess them, or have access to them for use largely as an administrative/management tool.

Limitations of the Study

The study was limited by a number of factors. In the first place there was no previous work on police computer use in England and Wales to act as a data base to develop this line of enquiry. Secondly, information was gathered at a distance through a mailed survey. This resulted in an impersonal data gathering technique susceptible to generalization and lack of care on the part of the respondent. The comparisons made with research work in the United States were based on studies performed nearly a decade ago, there being no recent work available. Another limitation of this research was the small sample size. Though a 65 percent response rate was achieved, this still amounts to only twenty-eight (28) cases.

Conclusions

The conclusions drawn from the study are preliminary, based as they are on the limitations of both sample size and lack of previous foundation either theoretical or analytical.

From what has been seen in this study we find that computers are used by all police forces in England and Wales -- they are part of the police organization. Computers are important, particularly in police administration and management and will become more so

in relation to operational matters according to the predicted extension of computer application areas. There is probably no operational police officer who now functions without frequent recourse to the Police National Computer for information concerning stolen vehicles and wanted persons (similarly in the United States with the National Criminal Information Centre and related state systems).

The continuing nature of computer development is reflected in the large financial expenditures currently being undertaken to acquire computer systems and the predicted expansion of computer applications to 64-67 percent of the potential applications available.

The size of the police agency is not the sole important factor it once was in terms of computer development in England and Wales. The role of the co-ordinating agency -- the Home Office, together with new powerful, and cheap, microcomputer systems place considerable processing power and storage capacity within the range of all police agencies. Though, it must be noted that all police forces in England and Wales are large in comparison to police agencies in the United States. Software packages developed in one force for specific application areas are transferable and will enable forces to avoid experimenting with equipment and programs that have been tried and tested in other forces.

The close proximity of forces in England and Wales undoubtably aids the transfer of information concerning both existing and planned computer systems and helps avoid duplication of effort. The role of the Home Office at the centre of this close proximity of forces affords even greater co-ordination of effort and avoidance of unnecessary expense. Through the Police Scientific Development Branch the Home Office ensures all forces receive information concerning technological advances, the Police Scientific Development Branch operates an enquiry bureau for the use of individual forces and publishes a quarterly bulletin containing information on computer project undergoing research.

Though, of itself, professionalism does not appear to be a motivating factor to computerize, it would be naive to not realise the benefits the employment of computer systems affords police forces in meeting public expectations. Police forces are seen as being in the forefront of the technological revolution and to be using every modern weapon in the war on crime and are unconsciously manipulating an appearance of effectiveness in just the way Goffman and Manning have portrayed.[72] That computers are largely being used as electronic filing cabinets in administratively based

functions at the moment is not important. It is the appearance of an operational cutting-edge (an appearance in part true) to the computer which provides the professional image and public justification. In the terminology of James, police computerization is part of 'managerial professionalism' and has not yet had a profound effect on 'pratical professionalism'.[73]

Commitment to computerization is definate beyond that reported in this study. For example, management exercises at the national Police College at Bramshill House in England are to be based on computer simulations. Interestingly, Cain in discussing professionalism refers to the centralism of capital and the role of the Police College in training the police to be professional.[74] We see an interesting example of this in the Police College's computer based management training; the use of a simulated management problem to train senior police administrators in problems solving and decision-making.

Further evidence of a computer commitment is in the Greater London area where all traffic signals are computer controlled, also a massive computerization of information is being undertaken by the Metropolitan Police, eventually to have command and control at the front-end of the system and management information and intelligence systems at the back-end.

Computer developments so far, have been

non-threatening to the police or public. The applications to which the computers are being put are basically routine and oriented toward fulfilling statistical operations to assist administrative and management functions. These operations do not question the police role as 'crime fighters' and social disaster solver. Indeed, the computer operations are portrayed as assisting the police to meet these demands. Therefore, neither the public as consumers of the police service, nor the police officers within the police organization have been threatened by computerization. This development can be interpreted as natural being the creation of a computer ethic or mental state whereby a new technology becomes assimulated to the point where it becomes indispensable. If so, the question which arises is where do the police go from here now that a computer ethic is established (evident from the predicted expansion of computer operations) and that the public has acquired an acceptance of computers in everyday life?

For internal police functioning the computer is becomming a tool for limiting discretion at the operational end of policing. The accumulation of data banks containing operational information (stolen vehicles and wanted persons) together with constant education of operational police officers to use such data is

developing a computer ethic in the functioning of operational officers (evident from the figures for Police National Computer use). Such data banks, together with command and control and management information systems makes available to police administrators information upon which they can plan directed patrol strategies. This obviously gives police administrators considerable influence over operational matters, to a degree not previously available.

The role of automation in policing has received little attention. Will a number of the more mundane police functions become automated as dependence on computer develops? This has already happended to some extent; the use of one or two-way digital systems incorporating car-based terminals which either automatically inform computers of the location of vehicles or the officer driving presses a button to inform the computer of his operational status. Automation is treated with considerable care by administrators but it is an area of development and would be a subject for further study.

Privacy has also become an important issue with computer data banks containing considerable sensitive information about the personal life of many people. The police have a special duty to take care in the use of information and maintain their information in a

secure environment with restricted access. To this end the Home Office have published guidelines concerning the control of computer information.

Faced with pressures to adopt technology as soon as it is available, police have to take care to ensure that their close relationship with the public, and support by the public, is maintained and strengthened. Bittner has illustrated the duality of the police role by indicating that the police must remain available for social service whilst also being prepared and able to use force when this is required in a socially threatening situation.[75] The police must as a result retain this dual role in face of the committment to technology as evidenced in the use of computers.

Recommendations for Future Research

The primary research need with respect to the police use of computers is for evaluation of the impact of the computer on organizational behaviour. The organizational behaviour of the police affects their operational role and the relationship between police and public. Future research in this field must recognise that the police do not operate in a vacuum and that societal developments also affect the police as individuals and as a social institution.

The following areas require futher research within the overall framework of organizational behaviour:

1. The impact of computerization on the organizational influence of individuals and departments within the police organization, as well as their relationship to the organization and one another.

2. The role of insiders and outsiders in further computer development, the interaction of insiders of the police organization with organizational outsiders.

3. The relationship of the Home Office with senior police officers in relation to computer developments. What effect does the control of research and development by the Home Office, and thus the control of information, have on police organizational development?

4. An examination of the problems caused by computer development. Further work is required to examine whether similar problems keep occuring or whether organizational adaptation eliminates problem areas. Recruitment practices are of interest in the solution of problems and whether the traditional recruitment practices of the police are adequate for future development.

5. The involvment of operational police officers in computer development and their interaction with management officers concerning the allocation of priority areas for development.

6. Whether the present emphasis upon administration and management applications for computerization will continue, and if so with what effect on operational and management discretion. Will the pressure to use numerical information to justify decisions continue, increase, or decrease?

7. Will computerization bring an intensification of the administrative end of the control line as predicted by Pugh and Udy or will robotics -- the automation of functions presently performed by men -- find a place and displace many operational or management positions; and with what effect?

8. What will be the overall effect of this organizational development on the quality of police service delivery to the public. How do we measure improvement in police service or a deterioration in the service delivery?

These, and many other, questions are for future consideration. The present research has raised questions rather than provided any answers. There is a need for a good time series data base to afford more longitudinal analysis.

There is also a real need for more international and cross-national study. The problems of one police force are rarely unique. Similarly, the problems of one police service are rarely unique. Thus, the solution of problems in one police jurisdiction or in one country can have value to other jurisdictions or countries.

Computer developments employ advanced technological thinking to solve problems. There is a need for advanced social and management research to examine the problems created by technology, and indeed whether technology can solve the problems it is meant to solve.

FOOTNOTE -- CHAPTER V

[72]Goffman, The Presentation of Self in Everyday Life, and Manning, Police Work: The Social Organization of Policing.

[73]James, "Police-Black Relations".

[74]Cain, Society and the Policeman's Role.

[75]Egon Bittner, "Florence Nightingale in Pursuit of Willie Sutton", in The Potential for Reform of Criminal Justice, ed H.Jacob, (London: Sage, 1974).

GLOSSARY

GLOSSARY

Assembler: A computer program used to translate a program written in a symbolic programming language into a machine-language program. The purpose of the assembler instructions is to act as a mnemonic code for one or possibly several machine instructions.

Batch Processing: A technique by which items to be processed must be coded and collected into groups prior to processing

Central Processing Unit: That portion of the hardware of a computing system containing the control unit, arthimetic unit, and internal storage unit.

Circuit: A system of conductors and related electrical elements through which electrical currents flow.

COBOL: COmmon Business-Oriented Language. A higher-level programming language developed for programming business problems

Compatability: A term applied to computer systems implying that it is capable of handling both data and programs devised for some other type of computer system. Data processing advances and competition amongst manufactures lead to differences between one generation of hardware and software and the next. To maintain customer loyalty, manufacturers guarantee a certain compatability in its own hardware

Components: An element or unit that constitutes a part of a system. In the electronics industry, the term component designates an elementary part that can be interconnected and contains an electronic device such as a resistor, capacitor, electron tube, etc.

Computer: A calculating device which processes data represented by a combination of discrete data (in digital computers) or continuous data (in analog computers).

Data Bank: Acomprehensive,nonredundant, and structured set of data, reliable and coherently organized and readily accessible. Data is easily usable and must meet standards of confidentiality.

Data Base: A comprehensive data file containing information in a formate applicable to a user's needs and avaible when needed.

Data Processing Centre: An installation of computer equipment which provides computing services for users.

Digital Transmission: Transmission of signals which consist of data transmitted in succession. Each one of them can only assume a finite number of discontinuous values. Most often consisting of binary signals, data having been previously coded in the binary system.

Discrete Transistor: A transistor is an electronic device that makes use of the properties of semiconductors; through the use of externally connected electrodes it is possible to amplify an electric current. A "discrete transistor" in contrast to an "integrated circuit" is an electronic component containing only a singel transistorized device.

FORTRAN: FORmula TRANslation. A higher level programming language designed for programming scientific-type problems. The relatively advanced standardization of this language failitates portability of programs. It is in frequent use to produce software for the management of computer resources and the control of operations.

Integrated Citcuit: A microminiature electronic circuit produced on a single chip of silicon; grouping a set of elementary electronic devices such as, resistors, transistors, capacitors, etc. These grouped electronic components are interconnected according to a specific pattern.

Intelligent Terminal: An input/output device in which a number of computer processing characteristics are physically built into, or attached to , the terminal unit.

Machine Language: Basic language of a computer. Programs require no further interpretation by a computer. At the time of its execution, a program is always expressed in machine language.

Message Switching: A technique consisting of receiving a message at a connection point in a network, storing it until the appropriate output circuit is clear, and then retransmitting it.

Microcomputers: A computer consisting of a central processing unit, storage, and input/output circuitry. A microcomputer contains at least one microprocessor. It functions much the same way as a minicomputer.

Microprocessor: The control and processing portion of a minicomputer or microcomputer, which is usually built with Large Scale Integration circuitry on one chip.

Minicomputer: A small and relatively inexpensive digital computer. Since the end of the sixties, the minicomputer has developed considerably as a result of decreasing costs and the extreme miniaturization of their components, as well as the considerable development of software. They are now equiped with peripheral systems and with software enabling them to cover a much wider market. The highest performing models may now rival the most powerful computers.

Modem: A word formed from a contraction of MOdulator and DEModulator. Its function is to interface with data-processing devices and convert data to a form compatible for sending and receiving on transmission facilities.

Network: The interconnection of a number of points by data communications facilities. This concept covers a wide range, it includes not only the transmission lines, but also the hardware, located at the various interconnections and essentially charged with transmission functions, as well as the terminal stations.

PL/1: Programming Language/1. A general-purpose programming language specified for the IBM System/360 computer; however, it is now available on several machines.

Programming Language: A language used to prepare computer programs

Real Time: A system where transactions are processed as they occur.

Real-Time Networks: A real-time network consists of a terminal sub-system, a transmission network, and a processing sub-system, operating in such a manner as to enable a certain number of users to have access to it simultaneously, with each of their requests being fulfilled within a given time and at given intervals.

Robotics: All the research and techniques aimed at designing systems capable of replacing man in his motor, sensory, and intellectual functions, and operating either in a predetermined fashion or by a learning process.

Sequential Access: A method of retrival or arrangement of informtion in a memory requiring a search from the begining until the segment concerned or the data sought is located. Magnetic tapes are a specific example of this mode of access.

Shared-Time: A method of processing information in which several users perform independent work on the same computer. Time periods are assigned to each user.

Software: The computer programs, procedures, and documentation concerned with the operation of a computer system. Software is the name given to the programs that cause a computer to carry out a particular operation.

System Architecture: This term designates the structure of a more or less complex data-processing system, which may contain one or more central units, telecommunications installations, and terminal stations that may be interconnected, all within the geographically dispersed network.

Terminal: Input and/or output station connected to a computer by any data transmission and allowing the transmission and/or reception of messages.

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