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MANPOWER PLANNING PROJECT  
PHASE I  
FINAL REPORT

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U. S. DEPARTMENT OF JUSTICE  
LAW ENFORCEMENT ASSISTANCE ADMINISTRATION

CATEGORICAL GRANT  
PROGRESS REPORT

GRANTEE Sam Houston State University Texas Criminal Justice Center Huntsville, Texas 77341	LEAA GRANT NO. 78-MU-AX-0034	DATE OF REPORT	REPORT NO.
IMPLEMENTING SUBGRANTEE  N/A	TYPE OF REPORT <input type="checkbox"/> REGULAR <input type="checkbox"/> SPECIAL REQUEST <input checked="" type="checkbox"/> FINAL REPORT		
SHORT TITLE OF PROJECT Criminal Justice Manpower Planning Model	GRANT AMOUNT		
REPORT IS SUBMITTED FOR THE PERIOD August 31, 1978 THROUGH March 31, 1980			
SIGNATURE OF PROJECT DIRECTOR <i>Victor G. Strecher</i>	TYPED NAME & TITLE OF PROJECT DIRECTOR Victor G. Strecher Dean and Director		

COMMENCE REPORT HERE (Add continuation pages as required.)

This is the final report for the U.S. Department of Justice, Law Enforcement Assistance Administration Grant, #78-MU-AX-0034 entitled Criminal Justice Manpower Planning Model. This final report will include the narrative which immediately follows this introduction, and the following appendices:

- A. System User's Manual
- B. Data Base Thesaurus
- C. Request for Proposal for Software
- D. Print Out of all Data Bases
- E. Copy of all Code Books and Code Forms
- F. Copy of all Data Bases on Tape with Accompanying Documentation
- G. Evaluation
- H. Evaluation Form
- I. Evaluation Agenda

This project began in August of 1978 based on the premise that if information needed for decision making in criminal justice manpower planning is made available to criminal justice decision makers using a quickly accessible method which allows specific recall of needed information at a cost efficient level, encompassing all types and levels of information applicable to manpower planning in criminal justice, then, better decisions will be forthcoming.

NCJRS

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NOTE: No further monies or other benefits may be paid out under this program unless this report is completed and filed as required by existing law and regulations (FMC 74-7; Omnibus Crime Control Act of 1976).

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ACQUISITIONS

## INSTRUCTIONS FOR COMPLETING LEAA CATEGORICAL GRANT PROGRESS REPORTS

Grantees are required to submit Progress Reports on project activities and accomplishments. It is expected that reports will include data appropriate to this stage of project development and in sufficient detail to provide a clear idea and summary of work and accomplishments to date. The following should be observed in preparation and submission of progress reports:

- a. Due Date. Reports are due 30 days after the close of each calendar quarter. The final report is due 90 days following the close of the grant period or any extension thereof.
- b. Submission. Grantees shall submit to the LEAA project monitor an original and one copy of quarterly progress reports and an original and three copies of final progress reports.
- c. Form and Execution. Grantees should use LEAA Form 4587/1 (Rev. 2-77) as a face sheet. If continuation pages are needed, plain bond paper is to be used. It should be noted that the report is to be signed by the person designated as project director on the grant application or any duly designated successor.
- d. Reporting Requirements. The reporting requirements noted in this section are designed to provide LEAA with sufficient information to monitor grant implementation and goal achievement. To support effective monitoring progress reports must be keyed to the grant implementation plan provided in Part IV of the grant application. Specifically, the report should:
  1. Indicate the status of each goal which was due for completion during a previous report quarter but carried over due to implementation or other problems.
  2. State the status of each goal which was scheduled to be achieved during the report period.
  3. State the corrective action planned to resolve implementation problems and state the effect of these problems on the remaining schedule for achieving the project remaining goals.
  4. If appropriate, identify changes which are needed in the implementation plan specified in Parts III and IV of the grant application to overcome problems. Changes which alter plans and/or goals set forth in Part III or IV of the application require prior LEAA approval and the issuance of a Grant Adjustment Notice.
  5. State what technical assistance LEAA might provide during the coming quarter to help resolve implementation problems. If technical assistance has been provided to resolve implementation problems, state the problems (or tasks) addressed and the results (or impact) of the assistance provided.
  6. Based on the performance measures set forth in the grant application (implementation plan), indicate in quantitative terms the results (of the project) achieved both during the reporting period and cumulative-to-date. Explanatory and qualifying statements will be helpful here, especially if project objectives have changed.
- e. Special Requirements. Special reporting requirements or instructions may be prescribed for categorical projects in certain program or experimental areas to better assess impact and comparative effectiveness of the overall categorical grant program. These will be communicated to affected grantees by LEAA.

Unless the rapidly growing body of knowledge about criminal justice human resource planning is made readily available to agencies, we can expect only slow system improvement. Efforts today to systematically assemble and organize the data available into a coherent information base have been sporadic and narrowly focused. As one observer put it, "we have a lot of data but lack knowledge." This is one way of expressing the distinctions between a data "haypile" and a conceptually organized body of information.

During Phase I, project personnel have come to realize the truth of the statement "good decisions are based on good information." Having reviewed the literature related to management in general and the decision making process in criminal justice specifically, two previously held assumptions were verified.

First, a major portion of the current effort was spent in identifying the informational aspects which form the basic foundation of a criminal justice manpower planning model. It was determined that a wealth of information exists relevant to all areas of criminal justice decision making and this information may be divided into the categories of literal and numeric.

The second assumption held was that the idea of a planning model has no simple functional analog. The idea of planning in criminal justice is not unidimensional in nature given the complexity of the system itself. With the multiplicity of levels in the system and with the numerous external sources of influence, the idea of a planning model had to be something more than a paper chart which ostensibly would allow planning. From this assumption came the corollary that any planning model could not provide specific answers, but should provide a communication network which linked the planner to information rich in variety and utility. The confirmation of these basic assumptions provided direction in the achievement of specific accomplishments.

An initial analysis of the data needs for manpower planning in criminal justice resulted in three major conceptual realizations.

- \* The identification of those functional areas of manpower planning across the criminal justice components of courts, law enforcement, corrections and academics. The product of this identification is a taxonomy which reflects those basic areas of manpower planning activities which any planning system must address.
- \* The recognition that diverse kinds of information are required in order to make appropriate decisions. Specifically, this includes demographic, bibliographic and legal information, and extant agency data.
- \* Given the great diversity in kinds, location, and amount of data, it was recognized that a system would be needed which allows the end user via his personal conceptualization of data needs as related to his occupational environment, to quickly identify and locate that information which would assist him in making informed manpower planning decisions. In addition to the planner's personal conceptualization of data needs, there is the additional need for the system to be able to provide him with appropriate planning approaches based on criteria indigenous to his agency.

As a result of these realizations it became obvious that current methods for information disseminating within the criminal justice sector were insufficient both technically and in information depth. The challenge therefore was to identify technologies currently available, and, where necessary, modify them to meet the specific demands for criminal justice manpower planning.

Obviously the science of manpower planning is not new in the sense that persons concerned with such have been writing in the area for years. A thorough study of the development of manpower planning led to the observation that there exist discrete units of activity along a temporally oriented line or process. Although several such classifications could be developed, this project has found that the "functional activities" shown in Figure 1 provide what is believed at this point in the conceptual evolution to be an inclusive framework for data organization.

Given the functional areas of manpower planning, the project also is designed to address manpower planning in the major sub-systems of criminal justice. Thus, the functional areas are matrixed with Law Enforcement, Corrections, Courts, and Academics.

#### FIGURE 1

##### BASIC TAXONOMY

- I. RECRUITMENT
  - A. Manpower Sources
    - 1. Schools
    - 2. Military
    - 3. Other employed
  - B. Methods of Recruitment
    - 1. Internal search
      - a. rank
      - b. testing
    - 2. External search
      - a. schools
      - b. military
      - c. other employed
      - d. use of current employees
    - 3. Use of media
  - C. Constraints on Recruiting Sources
    - 1. Organizational image
    - 2. Attractiveness of job
    - 3. Internal organizational policies
    - 4. Governmental influences
  - D. Minority Recruitment
    - 1. Governmental influence
    - 2. Community considerations
    - 3. Procedural aspects

## II. SELECTION

- A. Theory of Selection
  - 1. Elements of successful predictors
  - 2. Reliability and validity
  - 3. Criteria of job relatedness
  - 4. Governmental considerations
- B. Components of Selection
  - 1. Initial screening
  - 2. Testing
    - a. psychological
    - b. performance
  - 3. Interview
  - 4. Background investigation
  - 5. Physical exam
  - 6. Final employment decision
  - 7. Use of a probation period

## III. PLACEMENT

- A. Theory of Placement
- B. Organizational Policies
  - 1. Orientation
  - 2. Assignment and review
  - 3. Termination

## IV. EDUCATION AND TRAINING

- A. Needs
- B. Formal Methods
  - 1. Pre-service
  - 2. In-service
  - 3. On the job
  - 4. Off the job

## V. CAREER DEVELOPMENT

- A. Evaluation
  - 1. Theory/rationale
  - 2. Structure
- B. Minority Considerations
  - 1. Legal
  - 2. Structural
- C. Motivational
  - 1. Theory/rationale
  - 2. Methods
  - 3. Assessment
  - 4. Organizational response
  - 5. Critical issues
    - a. turnover
    - b. absenteeism
  - 6. Communicating to employees
- D. Discipline

VI. WAGE AND SALARY CONCERNS

- A. Reward Criteria
  - 1. Performance
  - 2. Effort
  - 3. Seniority
  - 4. Skills
  - 5. Job difficulty
- B. Types of Reward
  - 1. Incentive plans
  - 2. Monetary motivation
- C. Pay and Motivation
  - 1. Pay structure
  - 2. Increase formulas
  - 3. External pressures

VII. FRINGE BENEFITS AND SERVICES

- A. Fringe Benefits
  - 1. Legal requirements
  - 2. Types of benefits
    - a. medical insurance
    - b. other insurance
    - c. retirement plans
    - d. economic programs
    - e. recreational programs
    - f. facilitative services
      - (1) social
      - (2) counseling
- B. Differential Access
- C. Quasi-benefits
  - 1. Use of official car
  - 2. Provision of equipment

VIII. HEALTH AND SAFETY

- A. Occupational Laws
- B. Safety Programs
  - 1. Causes of accidents
  - 2. Predicting the accident prone
  - 3. Preventive measures
- C. Health Programs
  - 1. Legally required
  - 2. Workman's compensation
  - 3. Alcoholism and drug abuse

IX. LABOR RELATIONS

- A. Historical Perspective
- B. Current Status
- C. Organizational Considerations
- D. Legal Aspects
- E. Labor Negotiations
  - 1. Preliminary considerations
  - 2. Preparation
  - 3. Negotiation process
  - 4. Administration of contract



- X. SYSTEMIC ISSUES
  - A. Policy Changes
  - B. Legislative Mandate Changes
  - C. Budget Priority Revisions
  - D. Geographic Responsibility Changes
- XI. RECORDS MANAGEMENT
  - A. Personnel Reports
  - B. Personnel Statistics
    - 1. Descriptive
    - 2. Inferential
  - C. Records Administration
    - 1. Creation of records
    - 2. Maintenance of records
    - 3. Disposition of records
  - D. Legal Considerations
  - E. The Computer in Manpower Operations
- XII. RESEARCH AND PLANNING
  - A. Types of Personnel Research
  - B. Sources of Information
  - C. Research Methods
  - D. Research Needs
  - E. Constructing Research Programs
  - F. Assessing Current Manpower Status
    - 1. Productivity
    - 2. Econometrics
    - 3. Task analysis
  - G. Assessing Future Manpower Status
    - 1. Supply
    - 2. Demand
  - H. Structuring the Organization's Response
- XIII. FUTURISTICS
  - A. Changes in the Environment
    - 1. Technical
    - 2. Social
    - 3. Political
    - 4. Economic
  - B. Trend Development
    - 1. Increasing government regulation
    - 2. Decline of merit
    - 3. Use of volunteers
    - 4. Search for rewarding jobs

This taxonomy was created as an initial aid to an analysis of the data types in the area of manpower planning. That analysis indicated that four distinct types of data exist and are necessary for adequate manpower planning input. The four types of data are discussed below.

Bibliographic. This information consists of books, journals, and government documents. This latter is exemplified by training manuals, special reports, position papers, research results, planning methods, specific models appropriate for specific agencies, etc.

Extant Agency. This data consists of those types of information found in any and all agencies but typically the knowledge about which is not known beyond the producing agency personnel. This is so, even given that much of this information may have generalizability to numerous other agency planners. For example, extant agency information may be composed of technical reports, training documents, evaluation strategies, personnel manuals, employee contracts, and agency specific numeric data.

Numeric. This information consists of data from the areas of employment and personnel, revenue and expenditure, descriptive demographic characteristics, and crime reports.

Legal. This data encompasses legal reference material required by the manpower planner in criminal justice. Such data would cover the major areas of administrative law, statutory law, and case law.

Given the diversity and the complexity of the data types necessary for manpower planning, it became evident that a systems approach was necessary in order for such data to be useful and readily available to the planner.

Phase one of the project resulted in the development of a manpower planning system designed to provide both operational and non-operational criminal justice agencies with a method of manpower planning which is both efficient and effective.

The project staff members are intuitively and empirically convinced that this system meets the following criteria:

- \* the system is needed by the end user population
- \* the system is user compatible

- \* the system is based on the most appropriate method of data dissemination
- \* the system, when completed, will be self-sufficient and cost efficient
- \* the system is reliable

Needed by the End User Population

Staff associated with the Manpower Planning Grant bring considerable years of field experience to bear on the problem of manpower planning in the criminal justice sector. This background, however, only served as a starting point in validating the data needs of those individuals/agencies involved in criminal justice manpower planning. A review of manpower planning, in the generic sense, resulted in the development of the previously mentioned taxonomy which specified those major substantive areas of manpower planning. This taxonomy was then compared to a typology produced by the University of South Florida and found to be compatible. In addition, a review of the recently published National Manpower Survey of the Criminal Justice System (Vol. 6, Criminal Justice Manpower Planning, page 7-8) indicated that the kinds of extant and demographic information we were including in the data base were critical for manpower planning.

Further indication of the need and support for both a system of this type and of the information it will contain was received from those persons/agencies who chose to participate by providing data for the data base. In addition, the need for this system and the data it now contains, and will contain, has received both interest and support from the two primary organizations representing law enforcement and corrections, the International Association of Chiefs of Police and the American Correctional Association. Another end user,

criminal justice education, is one not often conventionally recognized as a part of the manpower entering the field of criminal justice. The system produced by this grant will provide to the academic sector, via currently operating data base networks, access in a single source to data necessary for decision making and manpower planning research. The data base management system used by this project, Bibliographic Retrieval Services (BRS), has users in 8,000 existing information centers, the predominant number being located in institutions of higher learning.

#### User Compatibility

Since the 1960's on-line systems have become less complex from the standpoint of the user and thus more available to end users in a wide variety of disciplines. The obvious result has been an increased number of end users entering the "searcher" environment. In addition, end user interface programs are being developed to aid end user searchers. For example, on-line catalog projects have been underway since 1978 at two large academic libraries. Dartmouth College and Rochester Institute of Technology. In both projects, the library patron (end user), not the trained librarian, will interact with a commercial dial-up on-line system via a specially designed user interface. It will be possible for the patron to ask complicated queries of a very sophisticated free-text searching system without any knowledge of so-called Boolean logic. Thus, the effectiveness of such end user interface is already being tested.

Finally, brief specialized training programs, simplified technical manuals as is the one produced by the Criminal Justice Center, and other user aids have been developed for most systems to aid novice and non-technical end users. These new programs have been the direct result of recent interest by end users in accessing on-line systems.

Evidence that criminal justice agencies are more than capable of employing this system by self-initiated remote terminal access is overwhelming. The era when a computer terminal was foreign to criminal justice personnel has long since passed. Computer terminals are now a common part of the management of police, court, and correctional agencies. The variety of uses of computers in such agencies is as broad as in any organizational complex in the United States.

First, computers are routinely being employed in agencies for operational information retrieval and transmittal. The National Crime Information Center must be accessed by a series of key computer codes. The accessing codes necessary to retrieve information from the Criminal Justice Manpower Data Bank are less complex than those for accessing NCIC information. In addition to operational use, criminal justice agencies are employing computers for sophisticated management information analysis. A visit to any of the Integrated Criminal Apprehension Program (ICAP) police departments will reveal the use of computer programs involving techniques far more sophisticated than that necessary to access and employ the manpower information data system. ICAP programs employ the generation of data by variable parameters, computation of measures of central tendency, deviations from central tendency, and computer graphics. Only the uninformed would suggest that agencies which can employ a system this sophisticated will be unable to access an information bank by entering keywords.

This project is employing a basic keyword system no different from that of over ninety financially successful data bases currently on-line with BRS, Lockheed Corporation, and Systems Development Corporation (SDC), the three major data base managers. The keyword systems are used daily around the country by thousands of undergraduate students. There is no mystique or complicated programming necessary to understand and use such systems. This is the case with the Criminal Justice Manpower Data Bank.

### Appropriateness of Method

For the past 15 years, access to large, bibliographic data bases through on-line rather than off-line or batch systems has been the recognized dissemination method for the following reasons: (1) there is no time delay in access to the data base information, (2) on-line allows the user to browse the file and (3) on-line is a highly cost-effective method of large data base manipulation. For example, it is a well known fact that many large government agencies have chosen on-line access through commercial vendors or their own systems to disseminate the information contained in their large bibliographic data base. Examples of these include National Library of Medicine's (NLM's) MEDLARS system and files, the National Technological Information Service (NTIS) data base from the Department of Commerce, LEGIS from the U.S. Congress, ERIC from National Institute for Education (NIE) and numerous other on-line files, especially from the Department of Energy and Health, Education and Welfare.

On-line systems and sophisticated free-text retrieval systems are particularly appropriate for searching data in the Criminal Justice Manpower Planning data base. Searching of textual material frequently requires a system that provides access to natural language terms in a specific context. Derivation of these natural language terms, i.e., synonym list building, for search profile development, is easily accommodated in a single interaction with the on-line system. In this regard on-line is particularly impressive when compared to manual or off-line searching. In addition, the planning and data needs of a specific type of agency requires an information retrieval method which will allow the agency to identify qualifying variables resulting in the recall of information specifically appropriate to that agency.

An on-line system access to the Criminal Justice Center data base permits a unique retrieval mechanism for different types of data in a way that cannot

be duplicated using printed tools or off-line systems. The user's query is very efficiently answered with a minimum of system interaction for even the most complicated questions with many searching parameters. It should be noted that the BRS search system permits concatenation of "merging" of diverse record types into a single inverted file for free-text searching.

Most importantly, on-line is an interactive process which allows the user to interrogate the file and develop and refine the search profile during the searching session. This type of dynamic interaction, which is what makes on-line in the final analysis most cost-effective and responsive to user needs, is of course, not possible in an off-line mode.

Therefore, on-line access to the Criminal Justice Manpower Planning Data Base will provide an information product available to all law enforcement agencies. Additionally, it will fill a present "information gap" by providing a valuable resource to existing on-line users from over 8,000 information centers in government, academia and commercial environments. .

Nevertheless, the staff of this project recognize that some criminal justice agencies may choose not to employ on-line searches. Therefore, concurrent with on-line capability, the Center will offer off-line services for user requested searches. Thus, for example, a correctional agency desiring a review of current correctional officer selection techniques and requirements could contact the Center by mail or telephone and request a search by Center staff.

#### Self-Sufficiency and Cost-Efficiency

One of the most important issues is the ability of this project to sustain itself after the cessation of federal funding.

First of all, it is important to again note that there are currently over ninety data bases similar to this one existing in the country. The experience

of other data bases is that users are willing to pay for this service which in turn allows self-sufficiency. Numerous experts in the field of information science have indicated to the project staff that approximately two years are required from initiation of a data base to self-sufficiency. The current, second phase funding will result in the provision of a total of some thirty months of support (August, 1978 to April, 1981) before self-sufficiency is necessary. This level of support has allowed the development of a unique data base and the innovative approach to incorporating four different types of information in the system.

Data bases such as the Criminal Justice Manpower Planning Data Base are supported by several sources of income. As mentioned previously, user subscriber fees from a network of information centers across the country contribute to such support. Such fees will be collected by Bibliographic Retrieval Services on a contractual basis and passed through to our data base. More than 8,000 information centers now routinely access available on-line data bases. Subscriber fees from these centers may be expected to generate \$50,000-\$100,000 per year for the Criminal Justice Manpower Data Base.

Second, specialized searches are undertaken by such data bases with concomitant fees. In our instance, we could anticipate initially the greatest demand for such services would be in the police-labor contract area. Negotiating teams will undoubtedly request comparative searches along several demographic dimensions of comparable contract provisions from other jurisdictions. The value of such information to labor negotiation relative to the financial stakes involved for both unions and management make it obvious that jurisdictions and union organizations will be willing to pay generous fees to support a system that will provide such comparative information to them. Over the course of the project duration to date we have visited with representatives of both labor and



management. The response is uniform, "tell us the minute the system is ready to go."

While the system is fully intended for on-line user utilization, some organizations may opt for detailed information retrieval packages involving data base managerial support. For a competitive fee the staff of the Manpower Planning System would provide such a service, thereby generating additional financial support for the system.

Lest there be any misunderstanding, please note that this system is not merely a police-labor negotiation information base. However, it is obvious that from a financial perspective the immediate inclusion of labor contract information will contribute immensely to the ability of the program to become self-sufficient.

A third means to generate income is the sale of specialized publications. We anticipate many such publications emanating from this data base. The recent survey documents completed by the Police Executive Research Forum regarding police organization administration and police collective bargaining are examples of the nature of such publications. Publications such as these can be routinely generated from this system. We do not intend to duplicate NCJRS publications, but rather publish materials relevant to manpower decision making which necessitate the inclusion of data from all four kinds of information included in the system.

If each criminal justice agency were required to purchase a terminal and access the data base individually, it would be impractical to consider on-line systems for occasional usage. We know, however, that 90-95% of both law enforcement agencies and state correctional agencies currently have and use the hardware necessary for accessing the system. An agency membership plan to support use of the system could be designed to provide many member agencies with access to the data base for less than \$100 per year.

With the implementation of a membership plan, individual agencies could indeed be occasional users at a low per-question charge. Low costs of occasional users is well documented in the literature and by commercial vendors' experiences with government files such as ERIC and NTIS on which there is a year-round, one-time usage. For example, one vendor reports that typical query of either file requires less than 10 minutes of on-line time for searching and display of records for an average total of \$3.50 per query.

The most economical method of a criminal justice agency's use of the system is through a group membership based on a fee paid to the data base managers and an hourly connect fee based on actual use. If as few as 10% of the some 25,000 criminal justice agencies joined the group, an average annual fee of \$100 per member would generate income of \$250,000 annually. Under such a plan, member agencies could pay an annual fee of about \$100 and pay for connect time at a rate of \$15-\$20 an hour. The occasional user who might access the system as few as 10-12 times a year would have an annual cost of less than \$200. The agency who used the system as many as 250-300 times a year would incur an annual cost of less than \$1,000. It is expected that such a cost schedule will be equally attractive to small, medium, and large agencies. Numerous studies in the information management field indicate that the costs of manual information searches on much less complex topics than criminal justice manpower are on the average, 5-10 times more expensive than this schedule.

These sources of income should more than provide for the data base to become self-sufficient. In fact, we anticipate a level of income sufficient to allow us to develop further innovations in information dissemination in the criminal justice human resource development field.

### Computer Reliability

The BRS IBM 370/155 computer is one of the largest and most modern computers in the IBM line and has an enviable on-line record. BRS provides full back-up with additional computers and has a full-time technical staff that provides "up time" well in excess of 99.5% of scheduled operations. The reliability of TELENET Communications is in excess of 99% as well. When outages do occur, they are typically of less than ten minute duration.

### Identification of Data Sources

As mentioned previously, the data types include both numeric and literal data. The sources of data encompass books, journals, monographs, governmental publications, uniform crime data, employment and expenditure data, research reports indicating methods of planning and parallel data needs for specific types of agencies, state summaries of specific legal areas, case citations, labor contracts and other agency specific data. Where possible, automated processes were used to identify and obtain data and the collection of agency specific data was routinized as much as possible. These processes have been evolutionary in nature and are now adaptable to the identification and collection of a variety of data. In concert with the projects at Michigan State University and the University of South Florida, it is anticipated that additional data needs will be identified with new forms of data presentation and agency specific criteria for data retrieval being required. As will be shown in the following section the system flexibility is such that it is receptive to new methods of information dissemination with little or no modification.

### System Design and Contract

Following World War II, the primary motivation in the computer based information science area came not from private industry but rather from the

military forces and more specifically the intelligence community, the purpose being the facilitation of information retrieval. There are two general divisions in the information science area: one being data base management systems (DBMS) and the other being Search and Retrieval Systems (SRS) or fact access by computer systems (FACS). Some of the characteristics of the DBMS are:

- \* Data relationships are pre-defined by definitions entered by the user.
- \* Data manipulation is a key component.
- \* Data manipulation, retrieval and up-date are accomplished by a computer language.
- \* Data entry and up-date are locally centered in the organization.

SRS systems on the other hand are not designed to manage information per se, but rather are designed to allow the user to retrieve specific areas of information from a large non-dynamic data base.

The important point is that initially these systems were designed for different purposes and for basically different data, the former data being primarily numeric in nature and the later being primarily literal in nature. Both of these approaches, however, fall under the general rubric of information science. The information scientists, both system builder and system user, have to address a range of retrieval requirements, from a single piece of information on a single topic, to all information on a variety of interrelated topics. There are three basic divisions of retrieval process, moving from less sophisticated to more sophisticated. These are best discriminated between by understanding the searching attributes for each division. In the first division, retrieval is based on a single attribute such as subject, title, or author as found in all card catalogue systems. It is obvious that there will be less specific recall

in this process, especially if you use only the subject attribute and author attributes. Precision is increased by the title search; however, you are still searching on only one attribute.

Following the single attribute level is the division where several attributes are used to identify information areas of interest. This is commonly referred to as the key word approach where retrieval of specific pieces of information is based on whether a document meets the criteria cumulatively imposed by the attributes of the keyword. For example, the keyword may be "police" or "law enforcement", resulting in recalling all documents in that conceptual division.

The final division is that of using controlled keywords which reflect the essence of a piece of information. These are terms found in the thesauri based on study of the topical matter of specific documents. The terms are assigned to a document because they describe the document's contents. The major role of the thesaurus is that it allows the user to identify related terms including those which are broader, narrower, synonymous, and used for. It is at this level of retrieval that the user can obtain extremely specific recall resulting in fewer false drops.

In modern on-line information systems test keywords, also known as controlled vocabulary, are assigned to searchable fields in each document. Conventionally these fields are divided into major and minor descriptors, and identifiers.

Descriptors are keywords which reflect the topical nature of the document and may include phrases. Identifiers are phrases, proper names, acronyms, etc which most often identify highly specific entities or subjects in the document. While the user may limit his search to the descriptor and/or identifier fields he also may perform "free-text" search, a process whereby all searchable fields

on each document are scanned for the inclusion of the keywords the searcher is using.

While the use of controlled keywords in searching for documents dealing with specific topical areas has provided for an intellectual approach to searching, the actual conventions used for presenting the keywords also allow greater specificity in recall.

#### INFORMATION SYSTEMS AND BOOLEAN LOGIC

The use of controlled keywords is a major advancement in information systems. The theoretical construct on which this process is based is Boolean logic.

Prior to the development of computer technology, information was traditionally classified via the Dewey decimal system. That system depended on a classification scheme involving the creation of artificial hierarchical classes of knowledge involving broad topical headings which subsumed increasingly narrower topics. For example, collective bargaining would be a sub-classification of labor relations which in turn would be a sub-classification of social sciences. Individuals wishing to find documents relating to a particular subject are required, under such a system, to work their way down through broad topics to narrower and narrower concerns. Such a system is replete with difficulties. Topics which relate to several fields of interest are difficult to classify and are often misclassified due to differing perceptions. Further, multiple topic documents must ultimately be assigned to one classification or another, resulting in information being missed by a searcher who chooses the wrong branch of exploration.

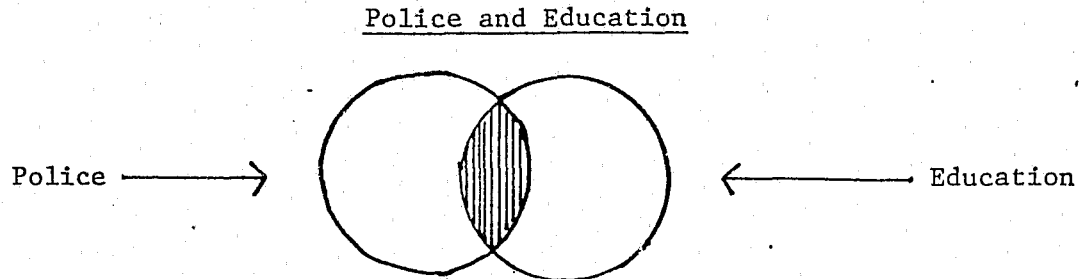
The capability to search by computer eliminates the need for such hierarchical classification. The Boolean system of classification is substituted for a

hierarchical system. A Boolean system involved the assignment of as many indexing terms to a particular document as are necessary to adequately describe its contents. Following the assignment of primary descriptors, usually between four and eight, other terms are assigned to the document which are related to those primary indexing descriptors. Such terms are classified as either a broader term (BT), narrower term (NT) or a related term (RT). The researcher accessing documents so classified simply specifies those descriptors in which he is interested, and the computer automatically searches all index terms assigned to every document in the system for those terms. In effect this system allows for far narrower classification than is possible under a hierarchical method. Very specific index terms can be assigned to a document that pertains to a relatively unique topical area, e.g., psychological testing for screening police applicants.

These systems operate by searching not only index terms assigned to documents, but also search the standard citation formats (author, title, publisher, year of publication) and abstracts of documents. These "fields" can be searched independently of simultaneously. Thus a researcher can designate specified years of publication (e.g., 1975 forward) a particular indexing term (e.g., police psychological testing) and if desired even a qualifying phrase which might appear in an abstract (e.g., "screening of applicants"). The computer will then search all documents and report only those meeting all three criteria. The basic design of the Criminal Justice Manpower Planning Center system will adhere to this approach.

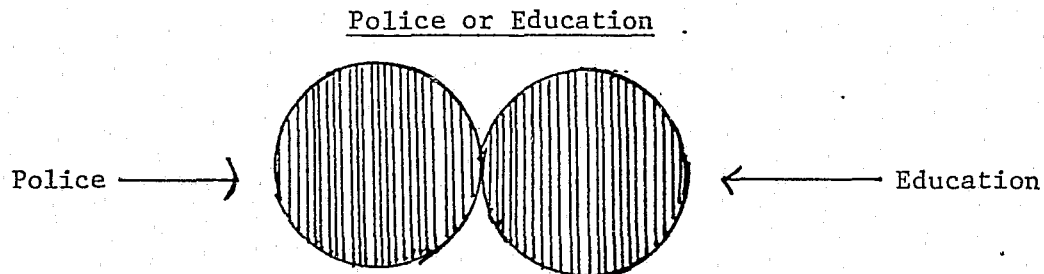
The actual input of search terms in modern information systems is perhaps one of the most attractive features in that the end user does not have to be aware of sophisticated terminology or processes. There are several conventional Boolean operators used. The most common ones are: "and", "or", "not", and "xor".

The conventional "and" restricts searchers to retrieve only documents containing terms which are coupled by the "and". For example, the search term "Police and Education" would be portrayed in a Venn diagram as follows:



Only those documents which contained both "police" and "education" would be retrieved.

The conventional operator "or" does not restrict the search in the same sense as did the previous example, rather it combines into one search term, two or more independent keywords. Using the previous example of "police education", the use of the operator "or" is portrayed in the following Venn diagram:



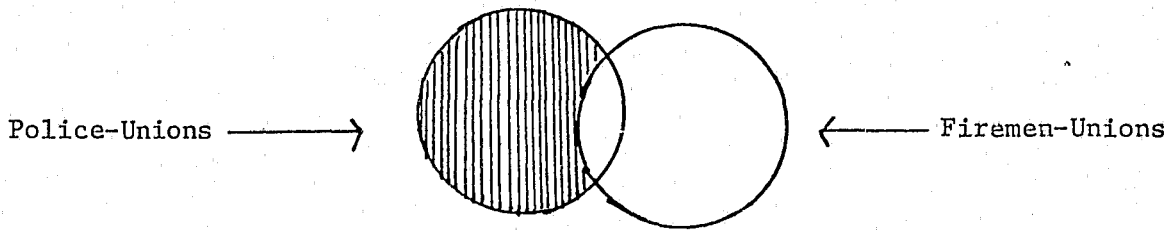
In this example, all documents containing either of the words "police" or "education" would be retrieved.

The conventional "not" excludes documents which contain the term referenced by the "not" operator. For example, the user may use the phrase:

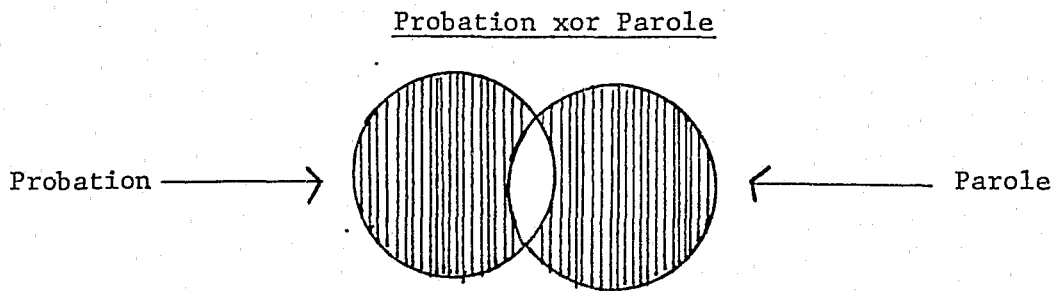
Police-Unions not Firemen-Unions

This formulation would retrieve all documents containing the description Police-Unions except those which also contain the description Firemen-Unions. A Venn diagram would look like this"





The final Boolean operator is "xor". While not used as much as the above operators, it is a logical possibility which is available. "Xor" requires the presence of either of two terms but not both. For example, the user may want documents written on probation alone or on parole alone, but not those written on probation and parole together. The search statement and illustrative Venn diagram would be as follows:



In addition to the Boolean operators, there are two other easily understood and easily used search aids. These are conventionally known as positional operators and are found in major informational data systems. These operators require not only that the term be found in the document(s) being searched, but further specify in what position they are to be found. For example, using the positional operator "same", the user is telling the computer to retrieve only those documents where the search terms are found in the same paragraph. Using the operator "with" specifies that the search terms must be in the same sentence. The final positional operator "adj" (abbreviation for adjacent) specifies that the search terms must be immediately adjacent to each other in the order given by the user (i.e., law adj enforcement).

Computerized information systems today have made tremendous strides with respect to end user compatibility. The necessity of having a trained intermediary to perform searches for the end user is quickly becoming a thing of the past. Automated library systems, based on the above model, are already being used in major libraries in the United States. The library patron is the one who sits down at the computer terminal, not the librarian.

#### SYSTEM SOPHISTICATION

In addition to the above technically sophisticated (but easy to use) search techniques and aids, there are additional capabilities and uses of the computer for communicating information.

The first of the special capabilities is computer communications. Each individual user who subscribes to an information system receives a unique identification number for the purpose of computer communications. These users who wish to communicate with each other via computer give their identification number to the individual agencies with whom they wish to establish a communications network. If one of the users in the network wants to contact another user in the network, it is a simple matter of identifying the user by identification number followed by the message. When the receiving user signs on, the system will ask if he wants messages printed. The user types "yes" and the message appears.

A second capability, related to the first, is data collection. Using the above message system, a survey questionnaire can be entered by the user conducting the survey and assigned to those network users to be included in the survey population. The survey need be no different in format than if it were on paper. The user can respond to each question via the computer terminal and the responses can be narrative, Likert scale, check boxes, etc. The advantages

of quick turn-around, immediate creditability for the surveyor, and increase in return rate are obvious. In addition, there is the capability to perform on-line analysis using standard statistical tools.

A third capability is that of off-line printing of search results. If the user has the appropriate hardware, the option of printing on-line is available. If the user does not have the hardware or if the search results are so extensive than on-line printing would be prohibitive, the results may be printed off-line at the data base location. The cost is much less expensive and results are usually mailed within 24 hours.

A fourth capability is the ability to limit information retrieval based on specific agency factors. For instance, if there are certain factors which will identify what agencies should engage in what type planning, the system will allow the agency user to use these factors as limiting criteria thereby only retrieving the planning method appropriate for that agency.

The state-of-the-art in information dissemination has largely been advanced through the application of advances in computer technology. We are now on the threshold of new, exciting, and extremely practical methods of communications, for individuals as well as between agencies and institutions. Making information available to a variety of users at various levels of sophistication is today a reality. While these systems have been primarily used by private industry and the academic community, usage is beginning to spill over into the public sector. In the very near future, lack of information and, more to the point, the lack of appropriate information, displayed in usable form will no longer be an excuse for uninformed decision making. Rather the consumers of information will have at their fingertips the most exhaustive and current information upon which to make planning decisions.

Currently there are three major data base management programs in the

country, operated respectively Bibliographic Retrieval Services, Lockheed, and Systems Development Corporation. These programs include both a standardized software package for entering and retrieving data, as well as a centralized computer data storage facility which is accessible by remote terminal. Most libraries are now connected to these three major programs via telenet links.

A primary effort for this project centered around the writing of technical specification and documentation specifying the system requirements for inputting, storing, and retrieving the information contained in the system. A request for proposal for the system software was sent to the three major vendors for this service. On 10-8-79, the contract was awarded to Bibliographic Retrieval Services (BRS). BRS provided the services of developing specialized software for the dissemination of demographic information and specialized recall of matched portions of the manpower planning data base, as well as the standard services of keyword access to literal documents.

#### Data Reduction

Due to the extremely large amount of information which was identified, it was necessary to employ several information encoders. For purposes of data entry these individuals coded the data in a format consistent with the requirements of the BRS software system. Code books and code sheets were developed for each specific kind of data (bibliographic, extant, legal, demographic, etc). The data was entered locally, using the University Dec-20 system which also allows on-line data editing. The data was then transferred to magnetic tape and shipped to BRS for loading on their system.

### Testing and Evaluation

The testing and evaluation of the Manpower Planning System was a two stage process. The first stage involved in-house system testing by project staff in the areas of system design, technical completeness and reliability, and included testing of the user's manual. The latter is an on-going evolutionary process whereby the user's manual will be continually modified based upon staff and user input. The second stage of testing will also be on-going and will be accomplished using a select group of both operational and non-operational agencies. This on-going evaluation includes a formal evaluation of the system by the agencies including both subjective and objective components. Information is solicited by evaluation questionnaire and used for the purposes of determining how well the system meets the user's needs and to ascertain any changes which might need to be made in both the system and user's manual.

In conclusion, the project staff have accomplished the objectives of this project and the resultant products are a nationally available on-line information system, including a user's manual and data base thesaurus, and a test data base which includes over 450 demographic variables for jurisdictions of 25,000 and above, extant agency information in the form of collective bargaining agreements, similar renumeration information for non-collective bargaining jurisdictions, legal references in the area of public employee bargaining for all fifty states, and over 1,000 bibliographic citations in the areas of public employee collective bargaining generally and law enforcement collective bargaining specifically.

The up-coming funding period will see the completion of the data base in all areas of manpower planning in criminal justice, the publications of documents in the area of manpower planning in criminal justice and the implementation of income generating methods to insure the continued viability and expansion of the project beyond the termination of federal funding.

**END**