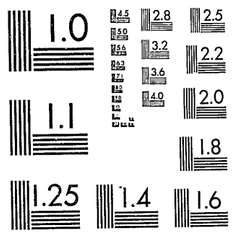

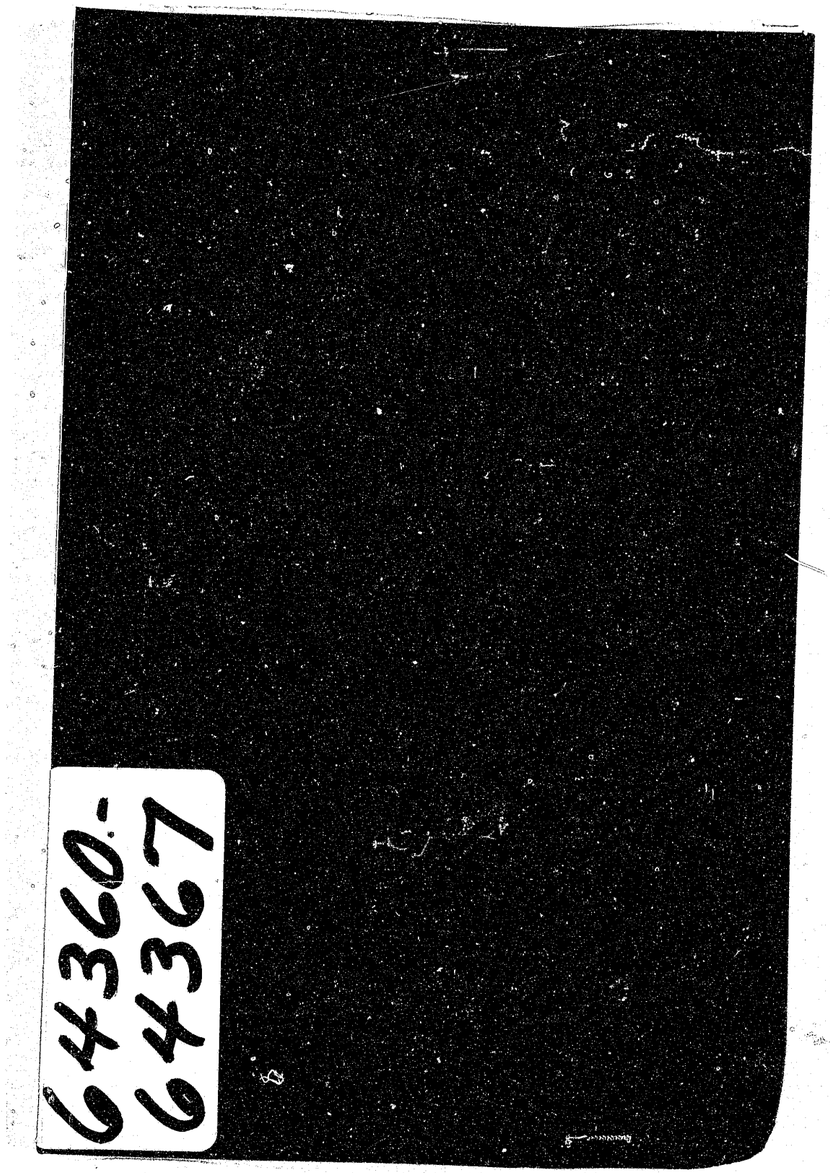

Management Information Systems in the Drug Field

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Computer Software

Bridge to Information Utilization

Clyde B. McCoy, Ph.D., Anne C. McCoy, M.Ed., and James E. Rivers, M.A.

INTRODUCTION

Commercial computers made their appearance only a quarter of a century ago, yet their impact on our society has been as dramatic and pervasive as any tools or machines of the technological revolution. Moon landings and space exploration were dramatic events made possible by computers but probably more important in terms of their impact on society is the involvement of computers in the daily activities of individuals. The routine activities of daily life such as telephone communications, receipt and payment of bills, credit purchasing, grocery buying, etc., increasingly involve computers. Developments on the horizon such as computer terminals integrated with home television sets are part of a continuing trend in computer applications which makes it imperative that every individual's education include some knowledge of computers.

Computers differ from many technological innovations in that their impact is not limited to specific activities, industries, or businesses. Certain fields such as business and science were quick to recognize and utilize their advantages. However, other fields such as social services and health care delivery agencies have been much slower. Although health research scientists have made marvelous use of computers, those agencies which deliver social and health care services have been reluctant to utilize the full capabilities of them.

An example is the field of drug abuse treatment and research. Drug abuse researchers have used computers extensively to investigate trends and relationships in the etiology of drug abuse. Treatment evaluation researchers are beginning to use computers more frequently to make comparisons and to assess the effectiveness and efficiency of treatment. But administrators of drug treatment programs who must make difficult resource allocation decisions and who must satisfy the increasing demands for public accountability have not taken advantage of computers with their ability to provide needed timely and accurate information.

Drug abuse treatment, like many other social and health care delivery services, has in recent years grown tremendously in the scope and complexity of its activities, in its dependence upon tax dollars for its operation and, consequently, in its need for information to improve efficiency, determine effectiveness, and account for expenditures. The scope of these information needs varies according to the scale and complexity of the organizations and client populations, but in most cases the data required to produce the needed information are of sufficient quantity and complexity to require the use of a computer. The requirement for computers is basically one of efficiency, but it also involves timeliness, a very important consideration when management and funding decisions are at issue. Further, the availability of computer services can often make the difference as to whether or not important functions are performed at all.

Why have social and health care service agencies been so slow to utilize computer capabilities? There are several possible answers including the bias against computer technology and quantified data by human-service workers who perceive these as antithetical to a humanistic perspective. This perspective has resulted in the failure to train human-service workers and administrators in computer utilization. These individuals, as do people in general, see computers as mysterious and frightening with a technical complexity dissuading many from attempting to learn even a little about them. Too often those who could benefit considerably from computer usage continue to reject computerization when the admission of ignorance followed by minimal time and effort to learn something about them could lead to greatly improved information, knowledge, decisionmaking power, and effective and efficient utilization of resources and cost-effectiveness.

The purpose of this paper is to demythologize computers for potential social and health care delivery users.[1] We will not focus upon the tremendous advances in recent years in computer hardware (the machines themselves), but rather upon computer software (the language and logic the machine uses). It is these latter advancements in particular which permit those people with minimal knowledge about computers and computer programing (the providing of instructions to computer machines) to conduct very sophisticated investigations and analyses and also to obtain timely information and reports.

This chapter begins with the observation that there is a great lag between the potential capabilities of the computer and its actual utilization in the health care and social service fields. It is assumed that this utility lag represents a knowledge gap which is rooted in the mystery which surrounds these miraculous machines which are presumed to be able to accomplish great feats at the push of a button. While it is true that these electronic wonders

[1] Those who have need to use a computer for any purpose regardless of how remotely involved with the actual detailed operation of the computer system.

have the capability of performing astounding tasks, it should always be kept in mind that human beings are required to do the thinking and to provide precise (programing) instructions to the machines. Without programed instructions, the electronic machines are incapable of performing. In this paper we impart a basic knowledge of how computers work, emphasizing the necessity of the human element in computer programing. We refer to all of these human instructions and programing as software in contrast to the hardware--all the electronic components, metal cabinets, levers, buttons, terminals, tape drives, magnetic tape, and other storage devices. In the most general terms, the appropriate combination of hardware and software is a computer system.

We emphasize software because it is the primary tool which has so greatly improved the user's ability to handle large quantities of data and to perform very complicated and varied tasks with speed, accuracy, and efficiency without extensive technical knowledge. In effect, software provides a bridge between the user of computers and the highly technical world of computer operation. Although "engineering" (programing knowledge, time, and expense) is required to construct the bridge, a knowledge of software is the simplest path to effective computer utilization in that it permits one to cross over the technical abyss. Such software bridges provide computer access to larger numbers of users than ever before.

SOFTWARE DEVELOPMENT

Although the hardware devices that could improve the efficiency and effectiveness of health and social service activities in the areas of policy formation, planning, budgeting, and service delivery, exist today (and have existed for some years), the necessary software development which would permit their utilization by these agencies still lags behind. Software development requires that the appropriate knowledge be applied to "program" the computers to perform the desired applications. Science and industry, possessing both the resources and competitive nature, have developed not only sophisticated and elaborate hardware but also large quantities of varied software to meet many of their desired applications. Much less a development of software has occurred for application to the health and social service areas presumably because of a lack of funds and the scarcity of knowledgeable and interested people.

Since computers do not operate at all without software, much of it is developed and provided by the manufacturers and vendors of computer hardware. Typically a bundled package of hardware-software is sold together as a complete computer system; this type of software generally is a systems package. Practically all computer systems come with such software as the operating system (although some users modify the manufacturer/vendor-developed system or develop their own operating system).

Unfortunately, hardware manufacturers/vendors, in their eagerness to sell expensive hardware, have often taken advantage of the buyers and users of their computers (particularly government agencies) by misleading them as to what the computers can do. They have failed to inform the users that the hardware-operating software will not perform many desired tasks and specific user applications without a great deal of instruction (programing) by very knowledgeable and experienced people. Indeed, programing or software has today become considerably more expensive than hardware.

To appreciate the nature of software, we now elaborate on how software is developed and the components that are required before desired information can be extracted from the computer.

As indicated above, the manufacturer/vendor typically supplies the operating system (or executive-monitor) which permits and controls all other operations; it is the general framework within which all other programs operate. Since the computer system requires input/output devices (ways to get information into and out of the computer) so that one can communicate with it, the operating system also provides programed machine commands to control the activities of these input/output devices.

Computers follow human instructions but they can only "read" and "understand" machine language which is composed of special types of symbols (binary code). An elaborate system of software programs has been developed for the purpose of translating other types of more easily coded programing (source) languages (such as COBOL, FORTRAN, and RPG) into the machine language. These software translators are known as program compilers and they too are usually provided by the manufacturer/vendor.

Other important software generally provided along with the hardware permits the programer to detect and eliminate programing coding errors as well as to ascertain whether the program actually did what was intended. Most applications performed by the computer are initiated through programers--people knowledgeable in the standardized programing languages.

Another general type of software structure is classified as utility programs. These are of several varieties and are used as "finishing tools" to assist the programer or operator in sorting files and presenting data files[2] in different ways for processing. Most large computer operations employ a variety of utility programs to facilitate data conversion, transfer, file construction, etc.

Because there are general functions common to many computer systems, it has been possible to develop much standardized software. The research and development expenses for new software are typically high and the developer wishes to recover, at minimum,

[2]Any set of organized data where each specific piece of information has a known location on some machine-readable form such as punched card, magnetic tape, or other storage device

these R. & D. costs. Therefore the software developed is usually broadly applicable to make it attractive to as many users as possible. By distributing the software as widely as possible, the developer maximizes the chances that costs will be recovered and that the users will obtain software at affordable prices.

Software written for wide distribution to multiple users is known as a software package--a specific computer program (or set of programs) designed to perform one or more well-defined functions which the developer designed with several potential users in mind. The package is made available in "canned" form with associated documentation and maintenance and is offered either free or at a fixed price.

The usually modest price of such standardized software should be weighed carefully against the not insignificant probability that it will have to be modified to meet the user's specific needs. Any required modification to the standardized software necessitates that programers be knowledgeable about both (1) the standardized software program to be modified and (2) the specific application desired. The services of such knowledgeable programers can represent considerable expense to the user. This expense is particularly great when a special computer program application must be written for a single user who must bear all the modification costs.

There are a large variety of software packages on the market today but all of them can be classified into two basic categories: systems packages and application packages.

Systems packages are programs or sets of programs that make it possible to use a computer more conveniently or operate it more efficiently. Examples are the operating systems, assemblers, compilers, input/output control routines, translators, and debugging aids mentioned previously. Systems software is still largely the domain of the computer manufacturers but independent suppliers are entering the market at an ever-increasing rate and achieving some noteworthy successes. Although only about 25 percent of the currently available software packages fall into the systems category, these systems packages account for more than 50 percent of total revenues.

Application packages are programs or sets of programs that perform specific data-processing or computational tasks. After getting off to a comparatively slow start, both the computer makers and independent suppliers are now extremely active in the development of packages to handle a broad range of business applications. Payroll packages are by far the fastest selling type to date, but packages for accounts receivable, accounts payable, general ledger, inventory control, production scheduling, and other common business data-processing functions are also being widely accepted. On the engineering and scientific front, application packages are comparatively old stuff: packaged routines to handle matrix inversion, multivariate statistical analysis, transcendental functions, and many other common but lengthy and tedious computational tasks have been in widespread use for many years.

Two common types of software programs which may cost up to a quarter of a million dollars are (1) data-base management systems and (2) financial management systems. Since all computer users are required to create, store, maintain, process, and retrieve blocks of data, data-base systems are usually employed at the large centralized computer operations of corporations or governmental facilities that seek to accomplish multifunctional tasks for various departments or divisions as well as for the central office of the organization. When their data requirements are large and varied, data management systems provide an organized file structure and language routines to facilitate the utilization of massive data files.

Financial management systems are specialized data management software designed to handle multiple aspects of financial data including payroll, accounts payable, accounts receivable, general ledger, inventory, tax computations, payroll deductions, etc.

These large packages offer applications suitable for some health and social service agencies, including drug abuse treatment programs, particularly when these agencies are part of a large municipal, county, or State administration. However, few if any health and social service agencies have been given sufficient resources either to develop new or utilize existing software to meet their informational needs in a timely fashion. Since these agencies typically depend upon large computer centers for their services and such centers attempt to serve many types of users, the question of priorities: programing time, computer access, turnaround time, etc., becomes crucial. Most of these computer operations began with accounting departments or functions and have added other users, e.g., police and water and sewage departments, which they service until each of these can justify their own systems. Typically the larger users with more routine applications receive the higher priorities.

This situtation is not unique to health and social service agencies. A similar problem has been noted in business, industry, and education. As the demand for computerization has increased, certain departments, divisions, and individuals are denied the access, technical assistance, and other services required to accomplish their specific needs. The increased demand for programing time for writing specific applications has been particularly acute. This demand results basically from the lack of existing software for the numerous needed functions. However, this demand could be diminished were there more users (or potential users) who were aware of software and knowledgeable enough to use it without the assistance of programers or other computer staff. Programers themselves could reduce the demands on their time by being more knowledgeable of existing software.

Although software systems have the potential to narrow somewhat the gap between the capabilities of computers and their actual utilization, there still remains a great need to make computers accessible and usable to more types of individuals. Many more people should be able to utilize computers in their own special

areas of interest by acquiring a minimal knowledge of programing and software utilization. Such individuals, by stimulating the development and utilization of appropriate software, can hasten the greater acceptance and utility of the computer by:

- Reducing reliance upon technical computer personnel.
- Reducing costs of application programs.
- Making access to and provision of needed information more timely.
- Stimulating greater interest and knowledge in overall utilization of computers.

Many potential users are not prepared to utilize software because they do not know the specific organization of their data (format) and the minimal set of instructions needed to apply the software to it. Until such knowledge is commonly available, the initiative to utilize software must be taken by administrators and certain other knowledgeable agency personnel. However, there is also a continuing need for computer personnel to appreciate the informational needs and required applications of the users. It is especially important that these computer personnel be able to communicate effectively with the user concerning his needs.

Unfortunately it appears that computer personnel themselves have fostered much of the myth and mystery surrounding computer operations. The ignorance of most people concerning computers does not allow the external evaluation of computer personnel, their applications, and productivity using standard criteria. Their unique relationship and control over the operations and production of the computer have led to technical elitism and imperialism. The effect has been the accruing of considerable control of user organization functions, information production and performance to computer personnel.

User organizations are typically dependent upon computer personnel by virtue of the former's ignorance. By failing to communicate with the user, by relying on computer jargon and failing to document technical activities in understandable form, computer personnel have assumed the guise of practitioners who possess mysterious power over others. Given a desire to retain this autonomy and power, computer personnel see their vested interest in keeping the masses (of potential and actual computer users) in ignorance.

The naive user can be made to believe that s/he is obtaining extensive services from computer personnel by receiving voluminous output from the computer. In fact, however, many tasks of computer people are accomplished by short, simple instructions to software programs which represent small amounts of programer time. The user who knows nothing about computers or software is in no position to argue with data-processing personnel who deny his/er request for an application by saying it cannot be

done. Many such denied requests could in fact be fulfilled by programs that the programers do not wish or do not have the competence to write. The scarcity of technically specialized computer personnel (particularly high-level programers capable of designing software) has made them an expensive and powerful professional group on whom users are most dependent.

The potential users of software are less dependent upon computer programers, as a result of software development. Some user applications can be accomplished by using software requiring minimal knowledge of computers and programing, thus reducing the user's reliance upon his/her own computer staff (should s/he have one) or upon the programing staff of large computing centers (e.g., city, county, or State government computers, university computer centers, or computer service bureaus). No software system yet permits very refined applications to a large variety of restricted tasks but such a development seems only a matter of time. Several existing packages are quite versatile.

As suggested earlier, the impetus for using computer power to maximum advantage must frequently come from professionals--administrators rather than computer personnel--who do not have the appropriate knowledge, substantive interest, and financial motivation in health and social service areas to provide the needed stimulation. Unfortunately the great advancement of software in financial, scientific, and statistical areas has not been matched in the health and social service areas. Nevertheless by utilizing existing software and writing minor modifications or interfaces, many software developments can be utilized advantageously by these professionals and administrators.

REQUIREMENTS FOR UTILIZATION OF SOFTWARE

Although software is designed to be transferred to different hardware configurations, one cannot assume that any specific software package will run on any computer. Compatibility of the hardware and software is determined by several requirements:

- The programing language(s) of the software and the capability of the computer system to handle it.
- The size requirements: How much computer storage space and processing space are needed to run the software?
- Accessibility: How may the software be accessed (card reader, terminal, tape, disks, etc.) by the computer and does that capability exist?
- Storage media: Storage for software may be cards or magnetic tape which will require operator assistance, or they may be

on some media such as disk that requires little or no operator assistance when accessed by remote devices such as terminals.

Once compatibility has been determined, the user must be aware of the various requirements of the software in order to utilize it, such as:

- The format of the data (the location and size of each piece of data on the type of storage on which it is located).
- File structure (how the data were stored, i.e., sequential, indexed sequential, fixed, or variable length records).
- Instructions: When software is designed, it must be determined how the user will be able to utilize the package. The designer decides what and how many instructions the user will have available and how the user must interact with the computer to receive the desired results. Each software package is designed separately and most likely by different people so the method for using one package may not be transferable to other software.

DISADVANTAGES IN THE CONSIDERATION OF SOFTWARE

Software programs represent much research and development with concomitant costs and, hopefully, sophistication and utility. They represent savings of time and finances to the user. However, there are certain disadvantages to be considered. The disadvantage of all software packages is that they are limited to general types of functions, and any specific requirements not met by the package requires extensive and expensive modifications. Many of the large and complex software systems are so complicated (and produced by so many different programers) that modification is extremely difficult or impossible. Although designed for easy use, such software generally requires a knowledgeable computer staff to maintain, modify, and correct errors in such programs.

The major disadvantages of utilizing software packages are summarized below:

1. Amount of space required for storage and computer processing. Each program requires a certain amount of computer space. This is limited on all computers, and space requirements translate into computer expense. The more options and tasks that can be accomplished by the software, generally the more space and time and, hence, the more expense to run it.

   If the user is only required to use a small number of the supplied options, then the time and space needed to process the entire software package represent a waste of computer

time and space. The user is trading on the advantage of not having to develop his/her own programs for the disadvantage of running a software package which is not totally utilized each time it performs a job for the user and, hence, is more expensive and time consuming than having a single economical program to do each specific task for each run. But many individual programs written specifically for a task can also be inefficient because there are many programing means to accomplish the same task and some of the routes taken by programers can be lengthy, time consuming, error ridden, and inefficient.

2. Although one of the major strengths of software is the capability to perform preprogramed tasks with minimal instructions and codes from the user, this strength can become a disadvantage when tasks other than those which have been preprogramed are needed. The modification of software can be time consuming and expensive. In some instances it is more efficient simply to write new programs to do the desired tasks although this is not always feasible when the additional tasks depend upon or interface with the routines of the standardized software package. This is particularly true of large data-base managment and financial management systems.

3. Other disadvantages concern the purchase and maintenance problems of some software. Since there is much invested in the research and development of software (and potentially much to be earned), some software is expensive to purchase and maintain. Also many software suppliers will not supply the source documents (original programing languages) so that user modification is impractical or impossible.

SOFTWARE DEVELOPMENT AND UTILIZATION IN DADE COUNTY

The many needs for the use of computers in Dade County in the area of treatment, program evaluation, management, planning, and research have made us fully aware of the great lag between the potential capabilities of computer systems and users' actual utilization of them. Our experience in having to devise a computerized data system to handle large and varied data files has led us to utilize many software programs developed by others as well as to devise some of our own software much of which was developed to take fuller advantage of existing software.

The gap between the capabilities of information systems and managers' actual use provided the incentive for us to devise a computerized data system to handle a large variety of data files. Consequently we developed an interactive system which illustrates the advantages and capabilities of software systems. Our software makes it possible to handle simultaneously many different data files with large N's and a large number of variables with a minimum

of effort and knowledge. The heart of our system is what we call "The Quick Interactive System."

Although the use of the Quick System is very simple and requires little user knowledge or skills, one should have a competent programer to set up and modify the system as is required by most software packages. However, programing time spent on the system is minimal considering the time the user can actually access and analyze the data rather than having to rely on a programer to submit each request for information. Our system was developed to free our programer's time to design new systems rather than having that time used just to submit program runs. In addition the system gives the user the much desired capability of quickly manipulating data in a variety of ways.

Some preliminary assumptions were made which we do not discuss in detail here but they must, however, be mentioned. The system is designed for use on an interactive terminal to interface the basic computer. Any data must be designed, collected, and implemented to assure an appropriate format for computerization and a capability of being transferred to magnetic tapes and disks. Also the data variables and values need to be clearly defined and labeled for best results (e.g., following SPSS[3] procedures). Not only does this facilitate and improve output but it hastens access from the terminal. In other words, the system assumes that the preliminary data processing has been performed in such a manner that permits quick and easy identification and formatting of all data items. This is of course extremely important for setting up, maintaining, and expanding any data-based information system (manual or computerized), i.e., that it will take full advantage of what is already available as well as make possible easier development of one's own programing-software routines.

Among the major strengths of the Quick System is the capability of working on large and varied data sets which can be stored, updated, recoded, merged, and manipulated very quickly--a capability not always possible with other statistical software processing.

Another very important aspect of the Quick System is the full utilization of another very frequently used software package, SPSS, which is a package of statistics ranging from simple percentages and frequency counts to complicated algebraic prediction equations. However, Quick operates without many of the inconveniences of SPSS such as the need to resubmit control cards. Quick also has the added capability to execute numerous runs simultaneously, even of different statistics. Because of the complete development of SPSS in meeting most of our needs for tabular and statistical analyses, we have developed our system utilizing its full capabilities. But one would not necessarily be

---

[3]Statistical Package for the Social Sciences, an example of an applications package discussed earlier.

limited to such a particular system although SPSS seems to have great advantages over other software packages because of its ease of use and complete structure for retaining and maintaining data files. Familiarity with SPSS requirements also aids one in the design stage of constructing and collecting data items to assure the fullest utilization of a computerized data set. The Quick System extends more fully the capability of computerization by permitting easy and fast manipulation of many and varied data sets within the same terminal session.

The basic advantages of the Quick software package are the following:

- Allows different data sets to be investigated in one terminal.
- Allows two (or can be expanded to more) separate runs to be initiated on the same data set in one terminal session.
- Allows data files and software to be combined in an interactive system that can be completely accessed through a single terminal (at any of the usual computer terminal sites, or leased for one's own research site).
- Requires use of security key to safeguard confidentiality of the data base.
- Permits dynamic troubleshooting of itself.
- Accepts all SPSS procedures (or could include other software packages or one's own package).
- Allows incorporation of permanent recodes categorization.
- Most important, allows easy and quick expansion of data bases and expansion of the interactive system itself.

The following example illustrates the use of the Quick system by showing one of the many possible interactions between the user and the computer via a terminal.


```
*   EXECUTE QUICK

    QUICK INTERACTIVE SYSTEM READY FOR USER

    THE FOLLOWING DATA FILES ARE AVAILABLE FOR ACCESS

        01 - CDP CLIENT SURVEY -- '73

        02 - CDP CLIENT ADMISSION -- '74

        03 - CDP CLIENT ADMISSION -- '75 - '77

        04 - CDP CLIENT PROGRESS -- '75

        05 - CDP CLIENT TERMINATION -- '73 - '77

        06 - JMH EMERGENCY ROOM ADMISSION RECORDS --
             '72 - '77

        07 - JMH EMERGENCY ROOM INTERVIEWS

        08 - JMH EMERGENCY ROOM FOLLOWUP

        09 - SCHOOL SURVEY

        10 - ARRESTEES INTERVIEWS

        11 - TASC FOLLOWUP

        12 - NEIGHBORHOOD TRACTS -- DRUG RATES AND
             SOCIAL VARIABLES

    WHICH FILE NUMBER DO YOU WISH TO EXAMINE?

*   03

    THANK YOU FOR SELECTING FILE 03

    WOULD YOU LIKE TO:

        01 - MAKE AN SPSS RUN ON THE RAW DATA IMAGES?

        02 - MAKE AN SPSS RUN ON THE SAVE FILE?

        03 - CREATE A SPECIAL SUBFILE AND RUN SPSS ON
             IT?

        04 - USE INTERACTIVE CODE BOOK ROUTINE?

        05 - USE INTERACTIVE GROSS TABS ROUTINE?
```

*. User Response
No *. Computer Response

```
*    02

     WHERE DO YOU WANT THE PRINTOUT SENT?

          01 - MEDICAL SCHOOL

          02 - COMPUTER CENTER

          03 - TERMINAL

*    03

     HOW MANY COPIES DO YOU WANT?

*    2

     DO YOU WISH TO USE LEVEL 5 OR LEVEL 6 OR SPSS?

*    6

     ARE THERE ANY PREBUILT RECODES FOR THIS FILE THAT
     YOU WOULD LIKE TO USE?

          01 - YES

          02 - NO

*         01

     WHAT IS THE NAME OF THE RECODE?

*    005-DRUG LIST, 010-SEX

     ANY OTHER PERMANENT RECODES?

          01 - YES

          02 - NO

*         02

     ENTER ALL PROCEDURE CARDS NOW
     (AT END, TYPE @ EOF, THEN HIT CARRIAGE RETURN)

*    CROSS TABS          VAR 05 BY:010
*    STATISTICS          ALL
*    @ EOF

     (NOTE:  YOUR RUN FILE NUMBER IS 00311461 FOR
             CHECKING YOUR RUN)

     DO YOU WISH TO REENTER THE QUICK SYSTEM?
```



```
          01 - YES

          02 - NO

*         02

     EXIT QUICK
```

To further illustrate how software packages are being used in Dade County, we will demonstrate how they answer certain management and administration questions.

One demonstration of software utilization comes from seeking an answer to a seemingly simple question: What are the communities of origin for drug clients: Where are the drug clients located; or, what is the spatial distribution of the clients in treatment in the drug programs? The answer to this question has been used for many purposes in Dade County such as to determine whether clients attend clinics in or near their own neighborhoods. Are there, for instance, clusters of clients where no treatment facilities exist? Administrators from the city of Miami wished to know before allocating any funds how many and what type of clients lived specifically within the city as opposed to the rest of Dade County; and the Dade County administrators wanted to know whether the drug clients were from specific neighborhoods in which other county services were located.

Data collected from drug programs provided the data elements which were processed into requested information through the utilization of computer software. In order to construct numbers and rates of drug clients for specific neighborhoods, each client's file contains some geographic designation of residence. In many cases that designation is not the exact address: whenever there is a need for the respondent to remain anonymous, exact addresses are replaced by some geographic location such as the nearest street corner. So as to allocate each respondent to meaningful geographic units such as police districts, catchment areas, zip codes, census tracts and blocks, etc., certain computer software routines are used. Each address (or substitute) is processed through two software programs designed by and available from the U.S. Bureau of the Census (Ad-Match and DIME reference programs, Bureau of the Census, 1970). This processing allocates specific geocodes to the address so that each individual's computerized file may be identified with several geographical units in Dade County. We have found the census tract to be most useful for our purposes.

Following the geocoding of data files it is possible to analyze two types of data: (1) individual characteristics, and (2) aggregated data which may be grouped according to the geocoded units designated in individual files. We aggregate the data by census

tracts so as to utilize the extensive data collected by the U.S. Census which represents a rich source of interview data on the total population available on computer tape.

Because of the geocodes which are recorded via the software onto each individual's record, it is possible to convert other variables into aggregated data which represent geographical units.

Through the use of other software (sort-merge routines) the entire client population of one clinic or an entire comprehensive program is sorted into the respective geographical areas. By sorting the client files by geographical areas, we then create geographical files which indicate the number of clients, etc., for each specific geographic unit. The geocodes used and the created files are constructed such that other data like health and crime statistics (as reported by other agencies) will be added for comparisons with the drug program's client statistics.

The computerization of data in such a fashion by the use of software programs permits descriptions of the data by mapping and graphing as well as by statistical descriptions. For example a computerized mapping system being developed at present by our staff permits the data to be displayed on detailed maps by the computer. Comparative analyses of the distribution of the different study populations will reveal the differential spatial and social patterns of the comparative groups. Detailed descriptions of the characteristics of the neighborhoods will also permit accurate profiles of the various neighborhood environments in relation to different rates of drug use.

SUMMARY

All organizations are accountable for an output whether it is the production of goods or the delivery of services. The quality and quantity of such output is determined by the organization of resources including the personnel and the tools with which the personnel work. Most business and scientific organizations have concluded that the automation of data provides necessary tools for meeting their goals. Similar decisions confront service organizations today, and the future will exert even greater demands upon health service delivery organizations to computerize. However, computerization itself does not insure increases in organizational effectiveness, efficiency, or timeliness. Increases in organizational effectiveness are only accomplished through compatability between organizational structure and the organization of the computer system. Critical to such compatibility are the factors of (1) knowledge, (2) time, and (3) expense. Optimization of each of these factors by organizations requires effective utilization of software.

Few organizations can afford computer staffs to accomplish all their needs. And even with knowledgeable computer personnel, maximization of accessibility, timeliness, and appropriate computer

application require that other personnel have some access to and control over the computer and its functions. Therefore, software becomes the bridge between the people with minimal computer knowledge and computer utilization.

Time more than any other resource requires full optimization in an effective organization. Not only does it determine how much is accomplished, but also the quality. If time is inadequately organized and utilized, then services are performed poorly and, in many cases, not performed at all. A properly designed computer system including user-oriented software permitting most or all personnel access to the computer to accomplish all types of paperwork and information processing is potentially the greatest of "timesavers" and it also allows for the providing of other services not possible without computerization. Regardless of satisfaction or dissatisfaction with "paperwork," most service organizations spend as much or more time in some type of paperwork and information processing as they do in actual contact with clients or other activities.

The amazing processing speed of computers permits maximization of time if certain conditions are met:

- Concomitant speed and timeliness must be available in getting information in and out of the computer processor.
- Personnel must have sufficient access and knowledge to utilize such input/output procedures.
- The output of information must be in a form and language understandable to the users of the information.

Meeting these conditions requires effective utilization of software. The allocation of the resources of an organization must include a sizable investment in information processing of all types regardless of how such information processing is accomplished. Expense is represented by both the type of personnel and the time allocated to the particular required functions. Manual and semicomputerized operations probably utilize more personnel and time than is realized, and preclude many activities that could be accomplished with computerization. The release of staff time from certain information processing functions to other needed functions would be one great benefit of computerization in addition to enabling the accomplishment of tasks not possible before either because of constraints of time, knowledge, or capability.

Of course computerization itself represents a great expense to the organization although the actual purchase of hardware by health and social service agencies has come more within the realm of possibility in the last few years with the advent of minicomputers. Also competent and economical computer service bureaus allow organizations to share the costs of computerization with most of the advantages and few of the disadvantages of having one's own large system.

However the operation, maintenance, and utilization of the computer system represent the greatest expense. A great part of that expense is programing the machine to meet exact organizational needs and to maximize the efficiency of both computer time and personnel time. Optimization of resource allocations relating to computerization and its accomplishments requires the utilization of software developed either by the organization or using software developed by others. Having to write specific programs for the computer for each specific task is expensive, inefficient, and slow. With the availability of an effective software network, the utilization of personnel, knowledge, and expense is more efficient, timely, and effective.

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