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A STUDY OF THE AVAILABILITY, USE AND IMPACT OF COMPUTERS IN THE ADMINISTRATION OF SCHOOLS AND SCHOOL DISTRICTS

NOVEMBER 1977

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The comprehensiveness and quality of our findings were dependent on the willing assistance of over 130 individuals in school districts that form the TIES (Total Information for Educational Systems) computer cooperative.

While it is not practical to name all of these individuals, we would like to thank them for their participation and their support of the research effort.

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PREFACE

The use of computers in American education is increasing steadily. The expectation of many educators is that the capabilities of the computer will aid in the operation and management of schools and school districts. Because a growing number of educators must make decisions as to the value of computers for their school districts, it is important that more systematically developed knowledge about the scope of use and the nature of impact of computers in education be made available. This report contains the results of a study undertaken to determine the nature of computer use and the resultant impact within the context of the operation and management of schools and school districts.

It is important to point out at the outset that we have not attempted a quantitative, statistical cost/benefit study. With the assistance of numerous consultants, we thoroughly examined this alternative and discovered that the conceptual framework and methodology for doing such a study is relatively primitive, and perhaps more importantly, that little is known about the nature and scope of computer use in school management. Also, even less is known about the potential impact of such computer use. We therefore decided to take an important and necessary step toward the more systematic and quantitative measurement of impact and cost benefit--the identification of areas of use and impact. It is hoped that the findings reported herein will suggest a number of empirically based hypotheses regarding the impact of computer-based applications; that these findings will

help future researchers identify the critical independent and dependent variables; and will suggest the existence and significance of associated factors.

The report should also interest persons involved in the operation and management of schools and school districts. It contains a great deal of information about how computer-based applications can be, and are used in districts, and what personnel perceive the value and impact of these applications to be. It should be of value to those considering computer-based applications for the first time, as well as to those interested in how others use computers to handle the problems of educational management.

This study was conducted by the Special Projects Division of the Minnesota Educational Computing Consortium. The Consortium was established in 1973 to help coordinate and provide educational computing services on a statewide basis. The educational members of the Consortium include the State Department of Education, the University of Minnesota, the State University System and the Community College System. The basic mission of the Special Projects Division is to engage in research and development related to computer use in education. Nearly all of the work of the Division is supported by grants and contracts from federal and state agencies. This study was supported by the Finance and Productivity Division of the National Institute of Education.

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Background

The operation and management of schools are increasingly complex tasks. Given the problems and concerns spawned by rising costs and dwindling financial resources, educational decision-makers are constantly seeking ways to help them keep schools operating in a manner consistent with the goals and expectations set for them, and within the financial resources available.

In order to successfully manage educational institutions, personnel and programs, many school administrators have begun to employ computer technology and computer-based information systems. The purchase and development of computer-based information systems designed specifically for use in the administration of schools and districts, according to a recent nationwide study, is occurring with increasing frequency. In fact, given current growth rates, computers will be used by every school district in the country within the next decade.

The adoption and use of computer-based information systems is based on the expectation that these systems will produce favorable results: they will help save time and money, they will increase flexibility and responsiveness, they will produce more accurate, detailed and accessible data, and so forth. Unfortunately, few attempts have been made to identify the nature and scope of the use of computer-based information systems or to examine their impact on the operation of schools.

In an effort to shed light on the questions surrounding the use and impact of computer-based information systems, the Special Projects Division of the Minnesota Educational Computing Consortium with financial support from the National Institute of Education, undertook a field-based study that focused on a computer-based information system that can process and produce information dealing with students, curriculum, personnel, facilities/equipment/supplies, and finances. The system chosen for the study is made available through TIES (Total Information for Educational Systems), a cooperative developed and operated by fifty school districts in Minnesota. The TIES-member districts were selected for analysis because of their relatively long and stable history in using computer services, and because of the representativeness of the services offered. In-depth interviews were held with 134 school district employees in eleven of the fifty districts. Persons interviewed included superintendents, assistant superintendents, business managers, accountants, personnel managers, administrative assistants, directors of research and evaluation, principals, assistant principals, counselors, teachers, clerical and secretarial personnel, and each district's information system coordinator.

These district employees perform a wide variety of functions. These functions may be categorized as dealing primarily with strategic planning, management control, and operational control. Strategic planning, as the name implies, includes long-range planning and policy-making. For example, decisions about future facilities would fit into this category. Management control involves the development, supervision, and evaluation of programs/activities that are designed to meet the purposes of the

policies and long-range plans. Examples would be the development and analysis of alternative employee salary schedules, or the evaluation of the teaching staff. Operational control refers to specific and often routine tasks such as the development of mailing lists and labels, and payroll processing.

This study investigates the ways in which the computer-based information system interacts with the various functions performed in a school district.

Findings and Conclusions

Availability

The computer-based information system used in the school districts studied includes an integrated collection of computer-based administrative applications (e.g., scheduling, mark reporting, financial forecasting). Most of the applications were specifically designed to perform operational control tasks. The availability of a rather large number of computer-based applications designed to perform operational control tasks is similar to most other educational, as well as non-educational organizations. Since computers can perform clerical and computational tasks very efficiently, and since the development of these applications is quite straightforward, it is not surprising that this type of application outnumbers applications designed to support management control and strategic planning. However, after several years of experience in using computer technology and computer-based information systems some users are beginning to reach a higher level of sophistication and they are actively seeking ways to enhance current applications and develop new applications that will facilitate and support strategic planning.

Since the districts studied share a common computer-based information system, the applications that are available, for the most part, reflect the desires and needs of the majority of the users. The cooperative nature of the service does, however, mean that the individual district must learn to use the available system even if it is not exactly what they want or need, given their unique problems and structure. If a district does not have an individual(s) assigned to facilitate the use of the applications who knows enough about them to be able to adapt them to the district's special conditions, the availability of the computer-based information system for that district remains primarily at the clerical/computational level. However, if the district's information system coordinator understands the complexities of the system file structure, can use higher level information linking capabilities of the system, can employ projection applications, and makes use of the research and technical consultation services, the availability of the system as an aid serving management control and strategic planning is expanded considerably. As a result, the actual availability of applications to the various users in a district is affected by both the collective decision of the cooperating districts as to what applications and services should be offered, and the ability of the individual(s) charged with delivering and supporting the specific applications within the local district. The actual availability (the degree to which the district can utilize the system in support of all three levels of operation) can be effectively and significantly increased if the district utilizes a person(s) who has a good working knowledge of computer technology and related information systems, and provides that person(s) with sufficient resources and authority within the district.

Since all of the cooperating districts pay for computer services based on the same payment schedule, cost is not a significant factor impacting the availability of the basic applications. All districts, in essence, have the same applications available to them. However, because most smaller districts as well as some larger ones are faced with financial constraints which influence their ability to employ a person with the expertise and time needed to adapt the system to district needs, cost does become a factor determining actual availability.

Use

As might be expected, considering the nature of what is available, the greatest use of the computer-based applications is at the operational control level; this involves, for example, the production of class lists, mailing labels, and attendance reports. Functions of this type tend to be performed on a regular and reoccurring basis, so the frequency of use of the applications designed to perform these tasks is quite high. Use of the computer-based information system decreases as one moves toward the strategic planning level of district operation.

There are several basic reasons offered for the less frequent use of the system at the management control and strategic planning levels. First, and this is particularly true at the strategic planning level, the major decisions made and the tasks performed are long-range and thus naturally occur with less frequency. Next, the tasks to be performed and the decisions to be made must incorporate many factors other than just computer-stored and summarized information. Since it is difficult, if not impossible, to know exactly how a decision-maker actually makes decisions or to determine what factors influence a

decision and to what extent, the importance of computer-produced information is difficult to determine. While numerous examples were cited by the decision-makers interviewed (for example, the importance of census data in reaching vital decisions as to future staffing needs), the relative weight given the information by the decision-maker remains unknown. Experience, judgment, and understanding of the situation are all factors which must be entered into the decision-making formula. Third, since many decisions made at the top management level are influenced by factors which are beyond the control of the school administrator, the important information for decision-making is generated by the environment external to the school. For example, a school district's future funding and facilities needs are directly influenced by population growth and migration trends. Except for enrollment and revenue projects, there is very little information within the computer-based information system that can be used to analyze external factors; to analyze community attitudes and trends, to make comparisons and contrasts with other organizations, or to examine the impact of changing legal and structural trends and requirements. Finally, it remains true that there are many long-range, strategic decisions made that are based on information concerning the district's internal operation and situation. Decision-makers want and need summary information, reports of exceptions to normal operation, and internal trend information. Currently, this type of information is usually developed and compiled manually at a lower operational level within the district, although some information system coordinators have produced such information through the use of the system enhancements that are available. Indications are that

such information is valuable to decision makers and that those who have received it are demanding an increased capability of the computer-based system to produce it more easily than can be done using current procedures. This type of demand seems to offer the greatest potential for the expanded use of the information system at the strategic and long-range planning level.

Impact

It is evident that the available computer-based applications are used to perform a wide variety of important tasks in the school districts. As a consequence, the impact of computer use is found throughout each district, although not to the same extent in every district. While some persons report a desire to change or enhance the current applications, few persons feel that the computer and the information system it supports are producing unfavorable, or negative impacts. On the contrary, most view the computer as a tool that is enabling them to perform many vital educational and administrative tasks; a tool that they would not want to do without. The computer, according to most users, allows them to perform many tasks and to accomplish many objectives that would not be attempted without the aid of a computer. Listed below, in summary form, are some of the major impacts identified during the study. Except for the instances noted in numbers 5 and 6, the impacts were perceived by those interviewed as being favorable.

1. For many people, a significant amount of time has been freed from clerical tasks. While for some, this "freed" time is absorbed by computer-related duties, for others the time is truly available to perform other tasks.

2. More accurate personnel, student, and financial records can be kept. Records can be accessed more easily and the stored data can be sorted in a multitude of ways, thus facilitating flexible reporting to school personnel and external agencies.
3. More accurate projections of student enrollments can be produced, thus greatly aiding in planning for facilities and personnel needs, and in communication with constituents.
4. Decentralization of budgetary development and control is made more feasible because personnel receive accurate, detailed, and relevant budget information. Many more line items can be included in the chart of accounts.
5. More frequent and flexible scheduling of classes can be performed. More electives, and more classes of varying lengths can be offered. In schools with less complicated traditional schedules, this benefit is not realized, and the impact of computer use in scheduling is perceived as unfavorable by a few persons.
6. In most schools, a longer period of time now elapses between the end of a term and the distribution of student progress reports. Some teachers and administrators view this as an unfavorable impact of computer use.
7. Districts can more easily conduct research studies of their activities, such as student follow-up studies that aid curricular decisions.
8. Significant cost savings can be realized through use of the computer to aid in developing bus routes. Although the computer program does not

automatically determine routes, the data stored and processed by the computer greatly aids the building of efficient routes and the performance of day-to-day transportation tasks.

As this summary list illustrates, significant favorable impacts were found to exist across a wide range of functions and tasks performed in the operation and management of school districts. In the districts which make the most extensive use of the computer-based information system nearly all of these impacts, and many other significant favorable impacts, were found to exist.

Most of the impacts mentioned by those interviewed are related to the operational and management control levels of district operation. At the strategic planning level the most significant impact seems to be that accurate, timely and comprehensive census (population) data are enabling administrators and school board members to better anticipate changes in enrollments. Since for many districts the decline in enrollment is the root of most of the major problems and concerns facing the district, good census data are very valuable to top decision-makers. Because financial aid is linked directly to enrollments, and because operating costs do not necessarily decrease in proportion to enrollment decline, it is paramount that declines be predicted early and accurately.

Computer-stored and produced budget information is also important to the top administrators as they seek ways to use scarce resources more efficiently. In districts that are not facing the problem of declining (or shifting) school age populations, the perceived need for accurate census data and related strategic planning information is less evident, and the impact of the computer in decision-making at the strategic level seems minimal.

Value of Computer Use

Two different levels of benefits related to computer use have emerged in this research study. First, there are those fairly observable and tangible impacts of computer use which, in the opinion of the people who were interviewed, are beneficial. For example: timesavings; more accurate and timely data; the capability to schedule classes more flexibly; the capability to decentralize budgetary development and control, and easier reporting to external agencies.

Computer use enables the district to realize these benefits. Most of these benefits would not be realized or, at least, would be more difficult to achieve if a computer were not used to process and produce information.

While the evidence generated by this study supports the conclusion that these types of benefits can be obtained, the question of their ultimate value remains. Is having the ability to obtain these benefits of any real or lasting value to a district?

Most interviewees suggested that there is another level of benefits that derive from and are related to the first. Better decision-making, better long-range planning, more effective resource management, more time to work with people, and better educated students are claims often heard. For instance, in districts that have a decentralized budgetary development and control process, the claim is made that by placing budget responsibility and authority with the persons who are closest to the student, the curriculum and the learning resources, more effective planning and management of resources will follow. The computer, it is argued, enables the district to provide personnel with the type of information that is necessary before they can be asked to be accountable to management

for their specific area of responsibility. It is not the purpose of this study to determine whether or not this redirection of accountability is of ultimate value to the district. It is fair to conclude, however, that the computer at least offers a district the potential to make changes of this type that are thought to be important.

While the computer-based information system is a valuable tool, one should not expect computer use to automatically produce an improvement in the quality of management in the district. In school districts where careful planning is recognized as being essential for effective management, the computer becomes a valuable part of that planning process, and better planning may result. However, computer availability and use does not of itself lead to careful planning, nor does it create the desire to engage in long-range planning. It is not a cure for poor management; but it can be of immense value to the person looking for ways to manage more effectively.

The computer is one intervening variable in the complex process of educating students. It is a tool that can help administrators, for example, to bring students and teachers together more efficiently so that learning may take place. However, no evidence was found that "better learning" results from district use of a computer to aid administrative functions.

Nevertheless, the pervasiveness of the more observable and tangible benefits, and the potential for realizing the more intangible benefits, lead us to conclude that the investment of time and money yields very worthwhile returns. In the few districts that have gone beyond use of the standard applications, and have used special enhancements to meet unique needs of management, the

value has been even greater. They have effectively expanded the basic computer-based information system into a computer-based management information system. The expanded system has increased value because it meets the information requirements of a broader spectrum of district personnel.

It is important that potential users of computer-based information systems understand what such systems can and cannot do for their districts. If they "buy into" such systems solely because they expect to reap the more intangible benefits, they may have difficulty in the future justifying the investment. However, if they attempt to justify the investment on the basis of the more tangible and observable benefits that are to be expected, evidence to support the wisdom of the investment should be readily apparent to both users and observers.

INTRODUCTION

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Computers in American Education

Computers can be found with increasing frequency in American schools. Though the use of computers is by no means universal, the adoption of computer technology by American education has been both steady and stable. In the midst of rising costs for operating schools, increasingly tight budgets and declining enrollment, individual schools and school systems are committing educational funds to put the computer to work in their information systems and to enhance the quality of their instructional programs.

Computers were first used in education to perform rather straightforward clerical and computational tasks. Applications such as payroll, personnel records, student records and other essentially clerical operations were ideal tasks for computers. They have been used to store large amounts of information and to process it accurately and swiftly for the reports and records traditionally required in the educational community. In addition, use of the computer to perform these tasks could draw heavily from the experience of computer applications in business and industrial environments.

Recently, the computer has begun to take on a new role: that of a management tool for administrators and managers. Advances in technology and the complexity of school administration have made this role both possible and necessary. Accountability, cost-effectiveness,

program budgeting, forecasting and other related concepts which educators must deal with have placed new demands on administrative data processing and management information systems.

Computer Availability and Use

In mid-1974 the American Institutes for Research (AIR) undertook a study to determine the extent and type of computer use in U.S. secondary education. This study, a follow-up to one done in 1970, is significant because it documents the fact that computer technology has found a place in American education. According to the survey results nearly 60 percent of all secondary schools in the United States are currently using, in one way or another, a computer for administrative and/or instructional purposes. In 1970 only 34 percent were using computers. Given the findings concerning the growth of secondary school computing activity during the 1970-1975 period; and given the assumption that the current rate of new installations in schools (4.8 percent/year) will continue, it can be projected that within the next decade every secondary school in the country will have access to a computer for some type of administrative and/or instructional application. As the authors of the report put it, "Despite earlier difficulties with the applications of computers,. . .education has increasingly looked to the computer as a means to better administer the school's operation and as a tool to enhance the learning process."[1]

In the eyes of many educational observers, American education is slowly but steadily developing the ability to apply the many benefits of the computer to meet the needs and perform the tasks of managing a complex

organization. Others take a more pessimistic view and point to the difficulties associated with applying the computer to the operation of school systems and to the high cost associated with computer use in education.

A number of basic assumptions have been made by the supporters and critics of computer use in schools regarding the value and impact of that use. Supporters assume that there will be certain cost savings associated with computerized record keeping, for example. Or, there may be an expectation that curricular flexibility will be increased through the use of computer-managed class and course scheduling. One of the most often voiced assumptions suggests that decision-making will be improved when school administrators have access to and use computer processed and produced information.

Given the many points of view regarding the value of computer processed and produced information, it is important that assumptions be tested more fully so that both users and potential users can have better data with which to assess the value of computers.

Computer Impact Study

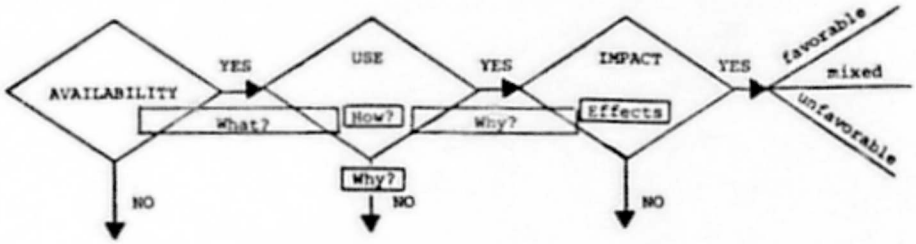
In an effort to shed additional light on one important dimension of computer use in schools, this report presents the findings of a research effort designed expressly to describe and explain the availability, use, and impact of computer technology in the operation and management of schools. It moves beyond the broad survey focus of the American Institutes for Research study to examine the use of a well-developed computer-supported information and management system designed specifically for public school

districts. By focusing on the use of computer technology and related management information systems within the context of the problems and operation of actual school districts, an attempt has been made to move beneath the surface features of computer use in education, to take a much needed look at the actual use and impact of the technology on the functioning of schools.

The fundamental intent of the study can be illustrated by a simple model of the relationship of computers to education.

FIGURE 1

COMPONENTS OF THE STUDY



The logic of the model suggests that if a computer and appropriate capabilities are available to school administrators, teachers and others, they may either be used or ignored: that if used, they can have a favorable impact; i.e., they may be perceived as being helpful, beneficial and productive. Or, they may have an unfavorable impact; i.e., perceived as having little or no value; or even of possibly having a detrimental effect in areas where applied.

More specifically, the basic questions that have formed the foundation of this research are:

1. What administrative computer applications are available to the school districts?

2. Of the computer applications that are available to these districts, which ones are used by the districts?
3. Why are the applications used or not used?
4. How are they used? That is, what particular function do they perform for the district?
5. Given the fact that applications are used for certain functions in a district, what are the perceived impacts of such use? Does computer use have any effect on a district's operations? If it does, are the effects viewed by district personnel as being favorable, unfavorable, or mixed?

Over a one-year period the principal investigators developed and implemented a research plan which involved in-depth interviews with school and district level personnel in eleven school districts. The school districts chosen for study were all members of an educational computer cooperative known as TIES (Total Information for Educational Systems) which has been in existence since 1968. The cooperative, which is governed by the Minnesota School Districts Data Processing Joint Board, includes fifty* independent school districts with a combined enrollment of about 275,000 students. TIES-member districts were chosen for study because they offer an example of a well-developed computer-supported information system in public education. The TIES concepts are now being adopted in all school districts in the State of Minnesota, and have been transplanted to several other states as well. The primary advantage associated with studying TIES is related to its all inclusive scope vis-a-vis the operation of schools and to its relatively long history of operation.

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* As of January 1, 1977.

It is hoped that the research reported here will be of use to the school administrator facing the day-to-day problems of running a school district as well as those who are interested in the more general questions associated with the value of computer-based information systems in complex organizations.

BACKGROUND

BACKGROUND

Information Systems

The increased demands for information by state, regional and national agencies--as well as by their local constituencies that make up the educational enterprise--have turned many administrators away from the manual and semi-automated information systems that schools and school districts have used in the past. This need for information that is more timely, more accurate and more comprehensive has prompted administrators to turn to computer technology in an attempt to satisfy these demands.

During the past decade, a number of significant changes in this technology has enabled the implementation of quite sophisticated information systems. These technological changes include:

1. Direct access storage.

   In contrast to magnetic tape, where data can be obtained from mid-reel only after the computer reads all preceding records, this device permits direct access to any desired data irrespective of the sequence in which it is stored. The necessity for this direct accessibility is most important in on-line systems that provide response to inquiries entered on remote terminals. The most popular direct access medium is disk storage. A typical disk system provides a capacity measuring in millions or even billions of data characters.

2. Data communications.

Transmission of information over a distance is known as data communications. Telephone companies--and other new communications companies--have responded to the increased demand for data transmission, and to change in computer technology, by providing services necessary to accommodate the requirements of educational information systems. A wide variety of computer terminals can be utilized in a communications network. Terminals may simply transmit and receive recorded data involving magnetic tape, punch cards, paper tape and other media; they may be utilized for direct human interaction via teletypewriter terminals, visual display units (VDU's), etc.

3. Advanced central processors.

The central processor executes the stored program and activates and controls the functioning of all devices attached to the computer system. Replacement of transistor and vacuum tubes by large scale integrated circuits now permits faster and cheaper computing. This, plus larger, less costly computer memories has enabled wider application of the computer to school administration.

4. Advanced system software.

Improvements here have facilitated the use of the hardware that manage system resources. Input-output control programs that handle the functioning of data communications and storage devices; compilers for various programming languages; programs that perform utility

functions such as copying magnetic tape--all have significantly enhanced use of the computer for information system purposes.

5. Data Base Management software.
   Computer technologists have done a great deal of work to develop techniques to structure and store data so that they can be effectively and efficiently accessed and processed. This involves the development of linkages that are logically related. The software that provides this capability is often called the Data Base Management System.

Given the above technological advances, it is possible to develop for education a computer-based information system with the following characteristics:

1. A systematic procedure for identifying information needs.
   This involves the establishment of a process for determining the specific data elements, or discrete pieces or items of data, which are necessary to meet the information requirements of the user. Examples of data elements would include student's date of birth; a teacher's undergraduate major; the number of teaching stations in a room; and, of course, many others.
2. The capability to gather data.
   This would include devices that transcribe data into machine-readable form. There are many such devices, including telecommunications terminals.
3. The ability to store large amounts of data and access it rapidly.
   Ability to store large amounts of data, in itself, is not enough. Given enough punched

cards or magnetic tapes, it is possible to store any amount of data. The ability to access the data quickly (in microseconds) is also necessary.

4. A data base management system.
   The data base must be designed in a manner that minimizes data storage requirements, yet permits efficient retrieval of the data.
5. An update capability.
   Much of the stored data is dynamic in nature; that is, it is constantly changing. There must, therefore, be a method of updating it to keep it current.
6. A data base search and retrieval strategy.
   This characteristic is crucial in the integrated data base environment where storage requirements have been minimized through "nonredundancy;" and where linkages have been established between related data records. For example, the street address of a family exists once for all members of that family no matter how large the family unit. This address is then available for many purposes: for use in mark reporting; for bus passes and boarding lists for drivers; and for research, based on whatever criteria are set forth for a particular study.
7. Application systems/program.
   The system and data base management software are an essential part of an integrated data base information system; but without the necessary application programs, the establishment of a data base would be a futile undertaking. Examples of such application programs would include: a "scheduler;" a "State Attendance Report;" a

"Grade Report Print" program, and so on. It is the application systems and associated programs that turn data into information that is usable (and hopefully, useful) by the many people who demand and work with the output from an information system.

8. A Communications Network between and among people.

This characteristic is often the last to be considered. Past experience has shown that without a people-communication-network, the effectiveness and efficiency of a computer-based information system never reaches the potential it could have. Involvement of the ultimate user at all stages in the design, development and implementation of an information system is important. Part of this communications network is the training function. This is essential to help users gain maximum benefit from having an information system available to them; and also to help them understand its limitations. Another integral part of this people network is good documentation written in the terminology of the users, not in "computerese."

Information Systems for Education

In this study we are concerned with the use and impact of computer-based information systems that process and produce information dealing with students, curriculum, personnel, facilities/equipment/supplies, and finance.

As the term "computer-based information system" is normally used, it refers to the utilization of computers for administrative strategic planning, management control,

and operational control. These three levels of administrative activity were described by Anthony[2], and have been discussed further by Hentschke[3]:

> Strategic Planning is seen as dealing with the development of policies and long-range plans. For example, plans for future facilities, and policies regarding student/staff ratios could be classified at this level.
>
> Management Control involves the transforming of the plans and policies into functioning activities. This process involves managers who work with people to get things done within the context of the previously established policies and plans. In addition, evaluation of the effectiveness of the prescribed activities in reaching the goals is part of the process. Examples would be the development and analysis of alternative employee salary schedules, and the evaluation of the teaching staff.
>
> Operational Control refers to the specific, routine tasks that are performed in a district. The emphasis is on the execution of activities, with little room for judgment. Examples would include the development of mailing lists and labels, payroll processing, and mark reporting.

These three levels of administrative activity can be combined with the five categories of computer-processed and produced information mentioned earlier to yield the matrix shown in Figure 2. In a school district, administrative decision-making takes place at all three levels, and over all five of the categories. While it is not meant to imply that administrative decisions/tasks, and the information needed for those decisions, can always be neatly and uniquely placed in the cells, the matrix does serve to illustrate the potential areas of use and

FIGURE 2

POSSIBLE AREAS OF USE AND IMPACT

	STUDENTS	CURRICULUM	PERSONNEL	FACILITIES/ EQUIPMENT/ SUPPLIES	FINANCE
I STRATEGIC PLANNING					
II MANAGEMENT CONTROL					
III OPERATIONAL CONTROL					

impact of an information system in a district. It is intended that the latter sections of this report will give the reader a clearer picture of what information is actually used in each cell, what the impact of the use is, and the relative importance of the information for administrative strategic planning, operational control, and management control activities.

The TIES Cooperative

The TIES cooperative exists for the purpose of providing instructional and administrative computer services to the fifty member districts. The member districts own, operate and fund TIES in its entirety.

TIES was designed with four primary propositions in mind:

1. Governance is by representatives of the member school districts. The board that governs TIES is made up of professional educators and a person appointed by each school board (usually a school board member). Policies that direct the work of the TIES staff are determined by the governing board. An organizational chart of the TIES staff is on page A-6 of Appendix A.
2. User involvement is sought at all levels of system design, development, and implementation. An extensive advisory committee structure is used to obtain this involvement. A chart illustrating this structure can be found on page A-7, Appendix A.

   On each nine-member committee are several Educational Information System Coordinators. These are district employees, each of whom has been designated as the official liaison person with TIES. For some this is a full-time responsibility; some combine this responsibility with other district tasks. The other members of the advisory committees are also member district employees but they hold different positions such as business manager, scheduling principal, teacher, etc.
3. An integrated data base concept is used so that data elements are stored only once, but through linkages the data are available to many administrative application programs.
4. A telecommunications network is used which places responsibility for and control of the data with the users.

The telecommunications network is a key part of the total TIES operation. Within the information system network there are close to 150 terminals for data input and inquiry. The on-line data base at TIES is maintained by each individual district through the telecommunications network utilizing the display terminals and intelligent mark readers. The ability to inquire into and update the data base from the school district, no matter how remote that location is from the central facility, establishes control of the data elements at the source level. It insures that at any given moment in time the data are as current and reliable as the local district determines they need to be for their use in everyday functions. Consequently, the information obtained from that data reflects that maintenance activity.

A more extensive description of TIES history, governance, committee structure, and data security procedures appears in Appendix A.

METHODOLOGY

METHODOLOGY

Introduction

The eleven Minnesota school districts chosen for study are all members of the computer cooperative called TIES (Total Information for Educational Systems). They include districts of varying size, duration of membership, geographic location, structural organization, and level of use of administrative computer services.

Information for the study was gathered primarily through in-depth interviews. These interviews were conducted between January and May of 1977. An interview instrument was developed, piloted, and then used with the personnel of the eleven districts. The interviewer spent about one week in each of the eleven districts and conducted 134 interviews averaging one hour in length. Written notes were kept of all responses, along with complete tape recordings for later reference. Persons interviewed included superintendents, assistant superintendents, business managers, accountants, personnel managers, administrative assistants, directors of research and evaluation, principals, assistant principals, counselors, teachers, clerical and secretarial personnel and each district's TIES coordinator.

Districts Selected for Study

A number of variables were considered in order to select eleven districts for in-depth study. The variables considered and the associated characteristics of the selected districts are:

a. District Size

Three of the districts are classified as small (900 to 2,100 students); three as medium (2,800 to 3,800 students); and five as large (8,000 to 30,000 students).

b. Years as a Member

No districts were chosen that had been in the cooperative for less than one and one-half years because the initial implementation phase was generally still occurring. This exclusion eliminated ten of the districts. Of the eleven chosen, two had been members for two years, one for four years, and eight for either seven or eight years.

c. Position and Duties of District Coordinators

Variations in this category include districts with full-time coordinators, assigned exclusively to this position; others with part-time coordinators; to one with no designated coordinator. In some districts the coordinator is a high level administrator; in others s/he is a member of the non-certified staff.

d. Background of Coordinators

The range of coordinator backgrounds include, among others, teacher, business manager, and assistant to a coordinator.

e. Geographic Location

Four of the districts are classified as inner suburban, four as outer suburban, and three as rural. One of these latter districts is located over 200 miles from the computer center.

f. Level of Use

The districts were grouped into three levels of use of administrative computer applications. Four districts were classified as high-use districts, four as middle, three as low.

Within each level of use, districts with differing characteristics were distributed as evenly as possible; and within the parameters described above, every effort was made to select a group for the study that would be truly representative of the total membership of the cooperative.

Persons Interviewed

During the main data collection phase of the study, 134 persons in the eleven districts under study were interviewed. The average length of the interviews was just under one hour. A few interviews were as short as twenty minutes, while some lasted over two hours. The shorter interviews were with employees who had minimal responsibilities that could be impacted by the computer. The longest interviews were with the district coordinators. Table 1 below reports the numbers of employees in various positions who were interviewed.

TABLE 1

DISTRICT EMPLOYEES INTERVIEWED

CENTRAL OFFICE EMPLOYEES	NUMBER INTERVIEWED	SCHOOL LEVEL EMPLOYEES	NUMBER INTERVIEWED
Superintendent	11	Secondary:	
Assistant Superintendent for Administration or Instruction	11	Principal	18
Administrative Assistant to the Superintendent	3	Assistant Principal	11
Curriculum Director	3	Department Chairperson/ Teacher	5
Personnel Director	3	Other Teacher	9
Business Manager or Accountant	9	Counselor	5
Research and Evaluation Director	3	Elementary:	
Bookkeeper, Clerk, Secretary, or CRT Operator	14	Principal	11
TIES Coordinator	10	Media Specialist	1
Others	6	Teacher	1
TOTAL PERSONS	73	TOTAL PERSONS	61

GRAND TOTAL: 134 Persons Interviewed

Interview Format

Development of Questions and Applications List

The basic development of the specific interview questions was guided by the model (Figure 1) which outlines the major research questions under investigation. With this model as a guide, discussions were held with a number of persons to determine what questions they would like to have asked in member districts. Some of the steps taken were:

1. A search of the literature was undertaken to determine some of the possible factors affecting computer use, etc.
2. Administrators in three non-TIES school districts in Minnesota were interviewed. While none of the districts were members of a computer cooperative which provided them with administrative services, they were all considering joining a cooperative in the future. In all three of the districts there had been some exposure to computer services through computer scheduling or payroll processing.
3. TIES staff who are responsible for the various administrative application areas (e.g., scheduling, attendance, finance/budget accounting) were interviewed primarily for the purpose of developing a detailed list of reports and services available to the member districts. This list was used during the actual interviews in the districts.
4. Suggestions from consultants to the study were obtained.
5. Telephone interviews were conducted with the superintendent and coordinator in each of the fifty member districts. While the main purpose of the telephone interviews was to aid in the selection of the districts to be studied in detail, those persons interviewed also identified a number of possible factors affecting use and impact of the computer applications.
6. The interview questions were then piloted in a member district. Nearly twenty hours of interviews were conducted in the district.

Based on these interviews, a number of changes were made in the format and content of the questions.

Nature of the Questions Asked

The interview questions centered around the principal research points outlined in the study introduction. For the district information system coordinator, the questions covered the following general areas:

1. Coordinator-related and other duties.
2. The coordinator's position in the district hierarchy of personnel.
3. Other employees who are involved with computer applications.
4. The procedures involved in using the computer applications.
5. The training and help received from TIES staff.
6. The specific reports, etc. used by the district. A detailed list of available reports and services was used to identify specifically what the district uses, who in the district is responsible for obtaining the information, and who receives it.
7. If the coordinator had mixed responsibilities in the district, questions were asked regarding the use and impact of the computer in meeting those other responsibilities.
8. Changes in duties, organizational structure, effectiveness, decisions, etc., that have occurred because of the district's use of a computer.
9. The effectiveness of the governance structure used at TIES.

10. The advantages and disadvantages of computer use.
11. Future expectations of use.

A somewhat similar set of questions was asked of other district employees. Since employees having widely varying responsibilities in the districts were interviewed, the particular questions asked varied accordingly. The questions covered the following general areas:

1. Position in the district hierarchy.
2. Major responsibilities in the district.
3. Computer applications used, including what, why, when, and how used.
4. The procedure for obtaining needed information from the computer.
5. Differences in the nature of information used in the job attributable to the district's use of a computer.
6. The accuracy, timeliness, comprehensiveness, and understandability of the information received.
7. Training and/or help received.
8. The effect that computer use has on the duties, role positions, skills needed, decision-making effectiveness, etc. of the person.
9. The effectiveness of the governance structure at TIES.
10. Future expectations for computer use.

Most of the questions asked required more than a simple categorical answer. The open-ended questions often elicited responses which led to new avenues of questioning. The structure of the interviews allowed the interviewer to pursue relevant areas not otherwise specifically covered.

Data Collection Procedure

As was previously mentioned, telephone interviews were conducted with the superintendents and coordinators in all member districts. These were undertaken as a follow-up to a questionnaire that had been sent to them. The main purpose of these interviews was to obtain information regarding the extent of use of administrative applications, coordinator role, etc. The data thus obtained also served as a guide and aid in the selection of the eleven districts that were to be studied in depth.

Once these eleven had been determined, their superintendents were contacted for approval. The superintendent of one of the original eleven declined on the grounds that his staff could not take the time necessary for the study. Another district was substituted. The others all agreed to participate.

Most of the data collected for the study came from the in-depth interviews previously described. Three to five days were spent in each of the eleven districts. In each case, the interviews began with the coordinator and proceeded to other appropriate district employees. The pre-determined interview questions, along with the detailed list of reports and services, were used to launch each discussion. Promising new avenues of inquiry, suggested by responses to structured questions, were explored. Time was pre-allotted for this purpose. Wherever necessary, questions were tailored to the position and responsibilities of the person being interviewed. All interviews were recorded on magnetic tape, and supplemented by written notes.

Data Analysis Procedure

The amount of data collected during the 134 hours of interviewing proved to be extensive. Over a period of several months, data reduction and analysis was undertaken through reorganization by district characteristics, responsibilities of interviewees, application area, use, impact, etc. Every response was studied in detail and compared with all other relevant responses so that pertinent patterns of use and impact could be discovered. When necessary, the tape recordings were used to clarify the responses noted by the interviewer. In addition, available printed materials such as job descriptions, organization charts, and program descriptions were utilized to achieve maximum pertinence in the findings.

DESCRIPTIONS OF AVAILABLE APPLICATIONS

DESCRIPTIONS OF APPLICATIONS

Introduction

The many administrative applications that are available to the school districts in the study have been touched on in a general way. A more detailed description is essential to the purpose of this study. It follows in this section.

For clarity, each application is treated as a separate entity; but it must be reiterated that because of the integrated data structure employed, an application may rely partially upon data that are usually thought of as related to other applications. This integration and "sharing" of data is a given that does not greatly concern the user in the pursuit of any specific applications. For this reason, the relationships between the "integrated file structure" and administrative applications are not dwelt on here. The descriptions that follow will delineate each application as it appears to the typical user. The applications are grouped under the major headings of Student Support, Personnel Support, Financial Support, and Supplementary Support.

Student Support

There are five major Student Support applications: Census, Scheduling, Mark Reporting, Attendance, and Geographic Location and Transportation. These are described in detail below.

Census

Since census data are often used for a number of student applications, these data are usually the first that a district collects in this application area. Two types of census data files can be built, with the choice left to the district. The two types of files are:

1. The "Family" Census File, which contains a master-record number assigned to each family or head of household in the district. If a family moves out of the district, the assigned family number is inactivated.
2. The "Resident/Dwelling" File, which contains a master-record number assigned to each address or dwelling in the district. This number remains with that address for as long as that dwelling is in existence. If the family moves, the number remains with the address and is then assigned to the next family that moves into that dwelling.

Regardless of which file structure is chosen, the basic data to be collected remain the same. Some examples of the type of data collected are names, addresses, birthdates, specific census area location number and dwelling type. In addition to certain other basic data collected by all districts, some districts collect information concerning the education and occupation of both the head of household and spouse.

From the census data, the following reports, lists, etc., can be produced by districts.

1. State Reports
2. Mail Lists and Labels
3. Census Tabulations and Analyses

4. Special Studies on Population Patterns

5. Enrollment Projections

Districts can use census data to make their own population projections, or they can use an Enrollment Projection program, stored in a different computer, that services the instructional timesharing network. The program is based upon the cohort survival-ratio method of projecting. The program will project enrollments for a five-year period utilizing five years of historical data. Five years of existing census data for age zero to four and enrollment data for grades K-12 are necessary as an historical base.

Districts can obtain reports which contain the five-year projection by grade, summaries, and other reports relating to comparisons, percentage changes, and survival ratios.

Scheduling

Districts may use the scheduling applications to assign students into classes, although the master schedule must be built manually. Districts may also request several reports and lists that are associated with class scheduling. For example, pre-scheduling reports such as tallies of student requests and conflict matrices can be obtained. Once classes have been scheduled, class lists and student programs are received.

The broad parameters and capabilities of the class scheduling service are listed in Appendix B, page B-3.

Mark Reporting

Districts may use the mark reporting application to produce several products, including:

1. Progress reports.
2. Teacher and departmental grade distribution reports.
3. Class rank lists.
4. Honor role lists.
5. Failure and incomplete lists.
6. Mark labels for cumulative records.

A flowchart of the mark reporting process is presented in Appendix B, page B-1.

Attendance

The reports, etc. that districts may use through the attendance service are:

1. Pre-Attendance Cards and Labels: Preprinted Period Attendance Cards, Preprinted Summary Attendance Cards, Preprinted Calendar-Locator Cards, Replacement Period Attendance Cards, Gummed Labels for Alternate Attendance Records.
2. Special Reports: Transportation Status and Eligibility Report, Tuition Student List, Student Transfer Report, County List, Summer Withdrawal Report.
3. Attendance Reports: Student Attendance Audit List, Period Attendance Report, Attendance Summary Report, Annual State Attendance/Membership Report.

Daily attendance accounting through the attendance application is not available, but some schools have used TIES' instructional timesharing network to perform this task.

A flowchart of the attendance accounting process is presented in Appendix B, page B-2.

Geographic Location and Transportation (GLT)

Through use of the geographic location and transportation application, districts may receive demographic information, and assistance in planning and facilitating the transportation of students.

While GLT uses data from several files for processing and producing reports, some of the necessary data are dependent upon the development of a very detailed map of the district. A district must be divided into school areas, census areas, census sub-areas, transported or non-transported areas, and location areas. The process of mapping must be completed in advance of implementing GLT.

Personnel Support

Personnel/Payroll

To use the available personnel/payroll services (PPS) each district must develop three types of data: first, district data, then personnel data, and payroll data.

The district data contain, for example, those elements which are common to all payroll runs such as the payroll master schedule which details the dates to be printed on checks, among other things.

Personnel data, the second area of a district's files, are the charge of the Personnel Department. Staff in this department are responsible for adding new employees to the file, maintaining all employees records and updating the file when there is a need to make certain data changes;

i.e., changes in name, address, marital status, personnel employment status, and building or sub-location. Also contained on an employee's personnel file, is certification data and credits earned (when applicable) as well as leave records and a history of personnel status changes.

The Payroll Department governs the third area and is responsible for ensuring that each employee is paid, maintaining payroll and tax status information, distributing wages to the proper budget account and deducting the proper amount from the employee's check for voluntary contributions.

Some of the reports and services that districts may use through the personnel/payroll application are: payroll processing, State Certification Report processing, leave and absence summary analysis, data for state and federal reports, employee directory printing, and the development of certification lists, wage distribution reports, seniority lists, and employee leave lists.

Salary Schedule Simulation

By using the salary schedule simulation application, districts may perform a great number of computations reflecting possible changes in such factors (among many) as: step-by-lane costs, experience and training increments, average salary per teacher and so on. The simulations can be used to compare old and new schedules and show dollar and percentage differences for each cell of a schedule; in short, to produce as many hypothetical salary and cost schedules as desired. The simulation program is accessed via the TIES timesharing network.

Financial Support

Finance/Budget Accounting (FBA)

The finance/budget accounting application is a modified cash basis reporting service. This means, for example, that while it does show encumbrances on reports, it will not actually reduce a balance until the bill is paid. It does not show the encumbrance on the unpaid bill as a liability.

Districts must provide the following data in order to use FBA:

1. disbursements history,
2. receipts,
3. budget information,
4. encumbrance amounts,
5. purchase order variances,
6. fund linkages,
7. chart of accounts descriptions, and
8. State code requirements.

These data are organized into five interconnected components that relate to the functions of the application:

1. Receipts File, which accounts for receipts according to fund, source, organization, and department.
2. Expenditure File, which records charges by organization, department, source/course/project, and object code. The expenditure file is the largest file.
3. Purchase Order File, which contains the encumbrance data and variance figures for liquidated purchase orders.

4. Balance Accounts File, which at a minimum, shows the distribution of monies, both to receipts and disbursements, by fund. At a more advanced level, the Balance Accounts can be expanded to reflect investments, payroll clearing, accounts payable and receivable, and student auxiliary monies. The degree of expansion is, of course, determined by each district.
5. Vendor File, which is a reference file used primarily for check writing.

A twelve-digit code is used to make the district chart of accounts correspond to the file structure. Sorting can be done by any of the code subparts.

Nearly all input of data is performed through keypunching so that an audit trail will exist. However, a district can inquire into accounts and build new accounts using the on-line Cathode Ray Tube (CRT) terminal. For example, a district may wish to add a vendor name to the vendor base using the CRT.

Districts may request a wide variety of reports through the finance/budget accounting application. These include:

1. Budget Reports. Fourteen standard budget reports are available. For example, reports can be made by organization, area of responsibility, department, fund, and object. Budget worksheets, which present data on the previous year's budget, year-to-date, and have space available for the next year's figures to be written in, are also available.
2. Board Reports. The twelve board reports are brief summaries of the more detailed expenditure reports. The name given to them is not meant

to limit their use to just reporting to the school board.

4. Receipt Reports by fund (two).
5. State Code Reports by expenditures or receipts (two),
6. Vendor Reports. These include lists and labels.
7. Purchase Order Reports (three).
8. Balance Account Reports (four).
9. Miscellaneous Reports (four), including reference lists and transactions reports.

In addition to the above mentioned reports, districts may have FBA produce checks, and a check register and expense report for all accounts payable. Also, a report from the circulating error file which lists the district's unprocessed transactions is received daily. Corrections may be made on-line via the terminal.

Financial Forecasting

The financial forecasting computer program became available early in 1977. It is a separate part of FBA that a district may choose to use in projecting expenditures over an ensuing five years. It has been built around existing elements within the Finance/Budget Accounting (FBA) System--primarily the Expenditure Line Items and the associated Object Codes. Specifically, the district will actually project expenditures for its FBA object codes.

The base from which the district begins to make projections is Current Year Budget which is stored in the FBA data base. From that base figure, the district projects its expenditures for Year 1. From the new figure arrived at for Year 1, the district projects expenditures for Year 2, etc.

A district can make projections in two ways:

a. It can use a standard table based on the Consumer Price Index which is stored in the data bank; or,
b. It can perform its own calculations, if the standard table cannot be used in a meaningful way.

Several computer reports may be requested by the districts. Three of the reports are similar, in that the expenditure items are shown projected out over a five-year period. These reports differ primarily in the available sort sequences and totals. They are sorted either by Account, State Code, or Fund for the previous year's actual, current year's budgeted, and the next five future years.

Supplementary Support

Research Services

Districts may use a number of applications that are classified as research services. These consist primarily of consultation assistance for district-originated research projects. Among these are:

1. Survey design, scoring, and analysis. Surveys may be either developed by a district with consulting aid or developed by the TIES research staff for the district.
2. Consultation, processing, and analysis for comprehensive research projects undertaken by districts.
3. Program evaluation assistance.
4. Follow-up study assistance.
5. Machine scoring of teacher prepared tests.

6. Vocational interest analysis.
7. Student profile analysis by grades.

Generalized Extract

The student, personnel, and finance support applications described above enable a district to produce standardized products, such as budget reports, personnel directories, progress reports. Since many districts found that not all their needs can be met by these "canned reports," generalized extract was implemented in 1975 to help districts meet special needs. It is a system of parameter-driven programs that districts may use to produce reports, labels, punched cards, and magnetic tape that require unique combinations of data associated with the student, financial, and personnel support applications. Any district-determined combination of sort specifications, conditional selections, and print specifications may be selected. In consequence, districts can and do obtain products that they could not get without generalized extract.

Special Applications

Except for the Enrollment Projection, Salary Schedule Simulation programs and certain Research Services, all of the applications described above use the administrative computer system. The three exceptions make use of the instructional timesharing system, which is totally separate from the administrative system. Districts may also write their own BASIC or FORTRAN programs to meet special administrative needs, and run them on the instructional timesharing system. All data to be used in these district-developed programs must be put into the instructional timesharing system, since there is no link between the two computer systems.

F I N D I N G S

FINDINGS

Introduction

Summarizing the perceptions, attitudes and feelings of 134 individuals about a phenomenon as complex as administrative computer applications is not a simple task. This, however, is the basic objective of the study, and it constitutes the substance of the following section on "Findings".

The information presented is drawn from an analysis of the interviews with the individuals actually using the various applications. Their responses were elucidated in narrative form, in an effort to shed light on the nature of computer/application use in school districts, and to recount the quality and intensity of the impact of such applications. In all cases, the findings reflect the perceptions and observations of the people involved with the work. The interview tapes and notes have been a constant source of reference. Frequent examples of the use and impact of particular applications are cited. It is intended that these examples will provide a "real world" framework against which the value of a computer-based information system can be judged.

The first three major sections of the findings deal with the specific applications used by school districts. These applications have been grouped according to their primary functions: Student Support, Personnel Support, or Financial Support. Also, because of their importance in enhancing the above functions, data on Research

Services, Generalized Extract and Specialized Applications are included in a fourth applications section titled Supplementary Support. This organization of the findings stems from the fact that district users tend to think of computer services in terms of separate application areas. Because of the nature of the total system, however, the use and impact found in the student support application, for example, affects much more than the student component of a district. Application areas overlap and interact. Student census information, for example, also affects decisions about curriculum, personnel, facilities/equipment/supplies and finance. In addition, within each application area, examples of use and impact are found at the strategic planning, management control and operational control levels. In perusing this section, the reader may find it helpful to keep in mind the previously discussed data base system model (page 13). This model provides a helpful conceptual framework for the entire subject area, and is the basis for the organization of the concluding section of this report.

The reader may also find it helpful to refer to Table 2, which shows the number of districts that use specific reports, etc., within each application area. This table enumerates the wide variety of services used by the districts. While the table presents only frequency data, the findings which follow should provide an understanding of the functions performed by the applications, and the impacts that users feel result from their use.

The fifth major section in the findings, People System, deals primarily with the District Coordinator Role, the Advisory Committees, and Training, Assistance and Manuals. While these sections do not deal directly with specific applications, they concern the most important

determinants of use and impact. Much of the discussion in these sections applies to the uniqueness of districts participating in a computer service cooperative. However, since these topics deal with coordination of services, setting priorities, and educating the users, their significance reaches far beyond relevance to just a cooperative arrangement.

The final section of the findings, Costs, reports on in-district computer-related costs, and on TIES Central Facility Expenditures.

TABLE 2

DISTRICTS' USE OF
AVAILABLE APPLICATIONS

COMPUTER APPLICATION AREAS	NUMBER OF THE 11 DISTRICTS THAT USE APPLICATION AREA
Census	
Census Tabulation and Analyses	11
Enrollment Projections Program	7
Family/Student Information	11
Kindergarten Roundup Mailings	11
Mailing Lists and Labels	11
Reference Lists	10
Special Studies (e.g., in/out ratios, multiple and single family)	8
State Reports	11
Statistical Reports	11
Student Directory	7
Class Scheduling	
Class List Development	11
Conflict Matrix Development	11
Course Tallying	11
Student Programs	11
Student Scheduling - Loading Only	11

TABLE 2 (cont.)

COMPUTER APPLICATION AREAS	NUMBER OF THE 11 DISTRICTS THAT USE APPLICATION AREA
Mark Reporting	
Class Rank Development	11
Failure and Incomplete Lists Development	11
Honor Point Computation	11
Mark Distribution Analysis	11
Mark Labels for Cumulative Records	11
Student Progress Reports	11
Attendance	
Quarterly Attendance Accumulation	11
State Attendance Report (Partial)	11
Geographic Location and Transportation	
Boundary Line Determination	1
Bus Passes	1
Incoming Students Roster for Schools	1
Information Card for Parents	1
Information for Bus Routing	1
School Assignment Lists	1
Student Passenger Lists	1
Personnel/Payroll	
Certification Lists	9
Credit Union Reporting	6
Distribution Reports	11
District Salary Analyses	8
Employee Directory	9
Employee Leave Lists	4
F.I.C.A. Reporting	11
Leave and Absence Summary Analysis	4
Paychecks and Registers	11
Payroll Distribution	10
Payroll Processing	11
Retirement Reports	11
Salary Schedule Simulation	6
Seniority Reports	6
State and Federal Reports	9
State Certification Report Processing	9
United Fund Reporting	5
U.S. Savings Bonds Reporting	4
W-2 Statements	11

TABLE 2 (cont.)

COMPUTER APPLICATION AREAS	NUMBER OF THE 11 DISTRICTS THAT USE APPLICATION AREA
Finance/Budget Accounting	
Accounts Payable	8
Budget and Board Reports	10
Circulating Error File	10
Cost Accounting Reports	5
Expenditure Reports	10
Financial Forecasting	0 *
Fund Accounting Reports	8
Property Record Keeping	2
Revenue Reports	10
State Reports	10
Transactions Register	10
Vendor Reports	9
Research Services	
Follow-Up Studies of Students	4
Local Testing and Analysis	1
Machine Scoring of Teacher Prep. Tests	4
Program Evaluation	4
Scoring of Parent-Teacher Opinion Surveys	5
Statistical Analysis	5
Survey Design and Analysis	7
Generalized Extract	
Specialized Projects/Reports	6

* While none of the eleven districts use this service, its use was investigated in a district that was not one of the primary districts under study. It was released for general district use in January, 1977.

Applications--Student Support

Census

Under State of Minnesota law, every school district in the state must conduct a census annually of all persons under twenty-one years of age and report the required data to the state. The school census must show the name and date of birth of each person required to be enumerated, and the name and address of her/his parent, guardian, or other person having charge of her/him.[4] Many methods of census-taking are used and these are represented in the eleven districts under study. In some districts, a door-to-door census is taken once a year with little follow-up in between. In others, the door-to-door canvass is updated throughout the year by reference to birth announcements, obituary notices, etc. In still other districts, the door-to-door canvass may be made only every three or four years, supplemented by a mail or telephone canvass in the intervening years. Generally, the more extensive procedures for census taking are found in districts where enrollment is declining, or where population shifts persist within the district boundaries.

Regardless of the procedure used, all of the census data are stored in the computer system. The total census process is generally under the direction of the district information system coordinator.

Use

Use of the census service in the districts varies according to the particular needs and capabilities of the users. For example, the most intensive use of the census data for projecting enrollments is found in districts where the number of students enrolled is changing rapidly.

Also, the ability of the district coordinator to use generalized extract capabilities to obtain special purpose information affects the usage. Three major categories of use have been identified:

1. Reports and Statistical Data

   The census service is used to produce information needed to complete necessary reports and to provide statistical data to individuals and groups. In every district, the annual State Census Report is produced by the census service and must merely be signed and dated by the district before being sent to the State Department of Education. Summary census information is also used for reporting statistics to other governmental agencies, school board members, district personnel, community groups, and the general public. For example, some districts share statistical summaries showing the ages of persons residing in the district with the district's adult education staff as they plan programs. Or, summary information is sometimes sent upon request to the local Chamber of Commerce or other community organizations.

2. Lists and Labels

   In every district studied, the census service is used to produce lists and labels. Districts are able to select labels for specific groups of persons. A wide variety of uses of mailing labels, produced from the census data base, abound in the districts. For example, they are used to send correspondence to all parents or to just the parents of first grade students. Also,

teachers often receive a computer produced list of the parents' names, addresses, and telephone numbers for conference purposes. In one elementary school, lists of parents' names and telephone numbers sorted by neighborhood are used for a telephone chain through which important communication is channeled.

A highly-used list tabulates the names, addresses, etc. of children who will be eligible by age to begin kindergarten in the upcoming school year. These lists are developed for each elementary school and are used by the schools to correspond with the parents and to plan for the coming year.

3. Enrollment Projections

A third area of particularly wide application is the use of the census data to make predictions on future enrollments in the districts. The census data areused at least to some extent for planning for future enrollments in all of the districts. However, the most intensive use for the data is found in districts that are experiencing either declining enrollments or major shifts of population density within the district. These districts are faced with major decisions that depend on accurate projection data. There appears to be a direct relationship between the severity of the enrollment decline or shift, and the extent to which: (a) time and effort are put into the process of obtaining accurate projection data; and (b) the degree to which developed projections are used for planning

throughout the district. This generalization seems to apply equally to the eight districts in the study that face these particular enrollment changes. In the three districts that are experiencing gradually increasing enrollments with no major internal shifts of population density, the collection of the data and their subsequent use in planning seem to be of lesser importance.

While all of the districts do use the census data to make predictions as to future enrollments, there is a difference in how they arrive at their predictions. Some scan the data on the numbers of children enrolled in various grades and the numbers at various pre-school ages to spot trends. They use the historical data to make judgments on future enrollments. In other districts the census data are used to explore alternatives to existing school boundaries. By examining specific streets, data can be obtained with reference to the children living on those streets.

In three of the districts, the enrollment projection computer program that is available is used extensively to develop enrollment projections. These are large suburban districts that are not experiencing a great deal of housing construction. These appear to be the types of districts for which the cohort survival method of projecting enrollments that is used in the computer program are most appropriate. The method works best in districts where historical population trends will be indicative of future trends.

Because any projections based on historical data are not as appropriate for districts where marked changes in their communities are occurring, some districts have performed special studies to improve their projections. For example, the census data have been used to determine the number of children of different ages living in particular types of dwellings so that the impact of future construction of similar types of dwellings can be anticipated more accurately.

It should be borne in mind that the census data are also affective in other applications such as attendance, mark reporting, etc.

Impact

A number of specific impacts that are derived from using the census service were noted by those interviewed. Nearly all of the comments made were of a favorable nature. The general areas of impact were:

1. Savings of time.
   Use of the census service results in a savings of time because of the ability to easily obtain information on selected groups in the data base. In particular, secretarial time is saved in developing and typing lists and labels.
2. Greater accuracy of census records.
   In several districts the census data are much more accurate now than in the past. While much of this increased accuracy is due to better collecting procedures, the accuracy is improved even more because of the storage of the data in the computer system. Also, use of the census service stimulates some districts to improve

their data collection procedures. An example of the improved accuracy of census records is given by an elementary principal who says that in the past lists of incoming kindergarten students contained about 75 percent of the students who actually enrolled, whereas now the lists are 98 percent accurate.

3. Better enrollment projections.
   Regardless of whether district administrators use self-developed projection techniques, use the enrollment projection computer program, or simply scan the figures to spot trends, the increased accuracy and accessibility of the census data have led to more accurate enrollment projections in many of the districts. Many persons noted that the result of having better projection data is that they can do a better job of allocating resources and planning for change.
4. Special lists and labels.
   Because of the ability to produce lists and labels of selected groups of persons, the unique information requirements of district personnel can more easily be met. The resulting impacts are seen throughout many of the districts. For example, one superintendent was able to obtain a list of district families with both parents working. This list enabled him to more readily anticipate the impact of early school dismissal due to energy shortages during the winter. The information would not have been available when it was needed if it had been obtained manually.

> Another direct impact--in more than half the districts--results from the capability of producing labels for specific groups. The ease with which labels can be processed yields an enlarged and more comprehensive correspondence to parents. Not only is the time-consuming job of typing labels eliminated, but now, personnel can design correspondence to specific audiences. More and better-directed communication has been the result, although, in some cases, budgetary constraints have limited this effort.

As mentioned earlier, several of the districts that were studied are faced with enrollment declines and/or shifts within their boundaries that have necessitated personnel cutbacks, school closings, and school boundary changes. In these districts, the census service has been particularly important as action has been taken to deal with the enrollment changes. Two case histories illustrate this fact.

A large-sized district with a steady enrollment level offers an example of the use of computer-recorded census data for boundary determination. Shifting population density within the district necessitated this action.

The district has used both computer and manually developed enrollment projections. This year, the computer projection was off by just over 2 percent--only fractionally less accurate than the district-developed projection, which took into account the number of building permits issued. This factor--new housing construction--will be weighted into future projections utilizing the TIES program, which the staff plans to continue to use.

The projections showed that the enrollment was not expected to increase in the near future, despite the fact that nearly 1,000 building permits for housing were issued in the district last year. However, the increase in home building and the crowding of some schools prompted residents to request that new construction be undertaken. Community meetings were held to discuss the recommendations, pro and con. The administration felt that census data and enrollment projections did not support the need for new school construction.

Using computer printouts and maps, the children on each street were counted, based on where the street fell on the map. Census data for specific areas within the district were evaluated. Various alternatives for boundary locations were developed by two of the district's central administrators and were presented to the Superintendent and the Director of Administration. And a plan was generated whereby school boundary changes could be made to balance enrollment among existing schools. Care was taken to minimize the distance travelled by students. Under the plan, nearly 2,000 students would change elementary schools at the beginning of the new school year.

The school board--and the community--accepted the plan; and any consideration for new construction was laid aside, at least for the time being. Acceptance, in the view of the staff who developed the plan, was based on a feeling of trust in the new projections; largely because past projections have corresponded favorably to actual enrollments. Accurate census data were a definite factor in deciding the issue.

Before the computer service was available to the district, the census system consisted simply of cards in a file cabinet. Under the old procedure, facts about

particular neighborhoods were obscure. Also, patterns could not be analyzed as well as they can be now. Less detail was available. Without the computer service it was much more difficult to associate children with neighborhoods, dwelling type, etc. It was felt that such information on density ratios and patterns is necessary in order to convince the public of district needs.

Information of this kind is requested often by people in the community. In one specific example, a parent wanted to find out how many new students would be enrolled in a particular school as a result of the construction of new housing nearby. She was concerned that the increase in enrollment would necessitate an additional school change for her children in the future. The administrator was able to provide her with immediate information on the expected impact of the new housing project.

Enrollment projection data are also received by other central and building level administrators in the district. They are used by the central administrators to allocate resources to buildings. They are used by building principals to plan textbook needs, numbers of sections of a grade required, etc. Census data are also used to aid in determining bus routes. Computer-produced lists of students can be organized by school, census area, municipality, etc.

The second example concerns a large district whose enrollment has been declining substantially for several years. The superintendent considers the enrollment projections which he receives to be invaluable for planning. He feels that this information has enabled the administration to manage a crisis situation in a more orderly fashion. Figures produced through the TIES programs are the official projection figures for the district.

Before the district became a member of TIES in the late 1960's, enrollment projections were developed by individual school principals. A tendency to overestimate the projected enrollment prevailed, since resource allotments were based on the projections. In 1969, a five-year computer-produced projection indicated that enrollment would begin to decline. Even though some of the staff did not believe the projection, the administration decided to begin basing staff planning on the prediction of declining enrollment. Their goal was to maintain a constant student/faculty ratio. Staff adjustments were made over the years so that despite a 34 percent decrease in enrollment--and a corresponding reduction in foundation aid--since the peak in 1968, the student/teacher ratio rose by only 2½ percent. It was felt that by making cuts in staff over a long period of time, some of the panic and trauma that the district might have faced in such a state of decline were avoided.

In addition to staff adjustments, it has been necessary for the district to close three schools in recent years. The superintendent noted that these closings have been conducted with little opposition from the public. Because early projections have deviated only one-half percent from the actual decline during the time span in question, he finds that the public has come to believe the district projections. In addition, parents have been involved early on in the study of possible closings, thereby reducing the element of surprise.

Several reasons were cited by personnel as to why the projections were so accurate for this district. The district covers a small geographical area (ten square miles) and further growth is limited both by density of population and housing. In addition, the census file is "pretty clean". A door-to-door census is conducted every September, with continuous update conducted throughout the rest of the year.

Several other administrators noted the value of the projection data in planning resource allocations both at the district and school levels. For example, a central administrator mentioned that the enrollment data which he receives are the most crucial data he gets because of their use in planning allocations. A building principal noted that he feels more confident about decisions and planning when he has such excellent enrollment data.

Finally, the coordinator stated that he could not do the census, population analysis, and projections as he does now if he did not have use of a computer.

It seems evident from the response obtained in the interviews in the eleven districts that census data and the subsequently derived enrollment projections were a vital aid in conveying to the public the enrollment trends for the districts. In only one district was the comment made that the public does not trust projections. It appears that the public trusts the data if they have found them to be accurate in the past. Several persons mentioned that the trust is primarily a function of accuracy, not the fact that a computer is involved in processing the data. They felt that the public is impressed by accuracy, timeliness, and detail. When

use of the computer enhances these qualities in the data, then the public is impressed with the computer.

Summary

The census applications are used in all of the districts under study to produce reference lists of specific groups of residents, mailing lists, summary information for reports to external agencies, and the base data needed to make enrollment projections. In three of the districts, the computer program that develops projections is used extensively.

The major distinction in use seems to lie in the degree to which the district calls for data to be broken down in various ways. In districts where the coordinator knows how to use the generalized extract capability and has the time to fill requests for information sorted in specific ways for specific users, greater use of the census service is evident.

The impacts of use of the census service were perceived by those interviewed as being favorable. Impacts that were mentioned frequently were timesavings, greater accuracy of records, better enrollment projections, and the ability to meet more easily the unique information needs that individuals have.

The mere use of the census service, however, does not mean that better census data will result. The accuracy and usefulness of the products of this service are dependent upon the thoroughness of the basic census-taking procedure followed by each district.

Scheduling -

Use

All of the twenty-one secondary schools that were studied use the TIES scheduling service. But the way the service is used varies considerably; not only between districts, but within districts as well. Types of scheduling vary, of course. For example, a high school in a large district follows a six-period day which is scheduled with computer assistance. The computer is used to develop course request conflict matrices, to schedule the students into classes based on the master schedule developed by a school administrator, and to produce class lists and student programs. Similar use of the service is made at a junior high school that uses a fourteen-module, seven-period day.

At another high school in the district, a nineteen-module school day is scheduled by an arena process. The actual scheduling occurs during a two- to three-hour period when students collect class cards for the classes they select. The arena process is essentially the same as that conducted at many college registrations for classes. Students choose desired courses (after prior consultation with advisors), teachers, and the time periods for particular classes. In this school, the computer is used to produce lists of conflicts based on the student's preliminary class choices made before the actual arena process, and to produce class lists and student programs.

Table 3 illustrates some of the variety of schedule arrangements found in the eleven districts. These differences in use appear in large (1,500 - 3,000 students) and small (200 - 500 students) schools alike.

TABLE 3

SCHEDULING VARIATIONS IN THE SCHOOLS

SCHEDULING CHARACTERISTICS	6- OR 7-PERIOD DAY	14- TO 21-MOD DAY	TOTAL
Computer Schedules Students Into Classes	14	2	16
An Arena Process is Used to Schedule Students Into Classes	4	1	5
TOTAL	18	3	21

Another variation is in the frequency of scheduling. In the majority of the twenty-one schools, scheduling is done once a year for courses that usually last for either a semester or a full year. In five of the schools, however, a complete scheduling cycle is performed three or four times a year. All of these latter schools have a six- or seven-period day. In three of them an arena process is used to do the actual scheduling of students into classes, while in the other two the computer is used for this function.

Variations in the application of this service, then, would be determined by individual school policies. The way the computer is used by school personnel for scheduling would be governed by a desire to obtain the benefits of different types of schedules. For example, the arena

process to allow students more freedom of choice of teachers and time periods; or more frequent scheduling to permit students to follow a broader, more diversified program.

The study also revealed differences in methods of communication between school people responsible for scheduling and the TIES staff. In most districts, communication referent to this service channels through the district coordinator. Opinion among administrators involved in scheduling is about equally divided on the advisability of this approach. Unfavorable reactions are most apparent in districts where the coordinator lacks experience in scheduling. In these instances, school people expressed a sense of being handicapped in having to communicate their needs, requests for assistance, questions, etc., through a third person who may not, in their opinion, be sufficiently knowledgeable about scheduling.

In some districts, a few scheduling administrators deal directly with TIES staff for answers to their questions, while others communicate through the coordinator. The former express preference for this arrangement because they feel their questions can be answered more quickly and clearly by direct contact.

Most actual maintenance work required for scheduling is performed on a terminal linked to the computer. In all but one of the twenty-one schools, this work is done in the districts' offices rather than in a school office. In a few schools--particularly in larger districts--a preference was expressed for locating the terminal in the school office to expedite control of input and maintenance. Delays were noted because a number of schools have demands at the same time.

In one large district, the volume of work required to enable the high school to schedule and do mark reporting three times a year necessitated placement of a terminal and operator under the direct control of the school's scheduling administrator. It is his opinion that for a school this size (2,300 students), this was the most efficient arrangement. Communication with TIES staff is improved; turnaround time is reduced; and the school has more control. As a result, too, teachers better understand the scheduling process because the person doing the procedural work is in the school and accessible to them. The district coordinator at this school supports the arrangement, but feels it works only because the scheduling administrator is competent and willing to assume responsibility.

It appears, then, that there is less satisfaction with the mode of communication and/or input procedures when the scheduling administrators must direct all requests through a district coordinator who may not be thoroughly cognizant of scheduling needs. Many administrators have chosen to circumvent this problem by communicating directly with TIES staff.

In summary, the use of the scheduling service--as indicated--varies widely in the eleven districts. In a few schools the computer seems to be used largely because the scheduling administrator has been told to use it. In most schools, however, it is used because of expectations that it will expedite scheduling along desired lines. How these expectations have been met is discussed below.

Impact

The impact of the scheduling service varies among districts much as the use does. Both favorable and unfavorable impacts were reported. In general, schools with somewhat complicated schedules reported favorable impacts, as follows:

1. Computer use facilitates more frequent scheduling.

   In nearly all schools where students are scheduled more than once a year, administrators felt that they would not be able to schedule as often without the computer service. Because of the time involved, a manual system would limit scheduling to once a year. They cited the savings of time by having the computer produce course request cards, conflict matrices, class lists and student programs, and schedule students into classes.

   In schools where an arena process is used, with students scheduled into classes during a two- to three-hour registration process, the impact does not appear to be as great. However, several persons noted a considerable time savings because of various functions provided by the computer. For example, four years ago, a high school of 1,500 students was scheduled four times a year through an arena process without the aid of a computer. The substantial paperwork required caused a great deal of dissatisfaction with the procedure. And students complained that they couldn't register for the courses they wanted. The computer was then introduced into the process to handle some

of the ancillary functions. Now, the school spends less time registering the current student body of 2,400 than was spent registering the 1,500. Also, they note that there are fewer conflicts and more accurate information now. The scheduling administrator attributes much of this improvement in the process to computer use.

2. Computer use facilitates an increase in electives. In several schools, an effort is made to offer students as many electives during each term as possible. The comment was made by several persons in these schools that they would not be able to offer as many electives if they did not have use of a computer because the scheduling process would be too time-consuming.

3. Computer use facilitates classes of varying lengths.

In some schools, classes of varying lengths are scheduled. For example, in a school that uses a fifteen-mod day with twenty-five-minute mods, classes may be one, two, or three mods long. In other schools, classes may all meet the same number of minutes in given day, but they may last for a different number of weeks throughout the school year. In these schools as in others, administrators note that without use of a computer, such complicated scheduling would be very time-consuming. While some of them feel that their schools could continue to schedule in the same manner even without the computer, they feel that other assigned duties would suffer because of the increased time that scheduling would take.

4. Computer use facilitates building, testing and altering master schedules.

Several administrators noted that the course request conflict matrix produced by the computer after students make course requests has enabled them to more easily identify conflicts as they build the master schedule. In addition, once the first master schedule has been built by the administrator, the computer becomes especially valuable because of its ability to schedule the students into classes based on the master schedule. The administrator may try several runs of the master schedule, making adjustments each time based on the conflicts that still remain. The computer, therefore, enables the administrator to easily test alternative schedules, and to solve related problems.

Since most of the scheduling administrators have had considerable experience building master schedules and are quite skillful at the task, between 85 and 99 percent of the students are scheduled on the first run in most of the schools. They emphasized that the important factor in successful scheduling is the administrator's skill in building the master schedule, but computer use certainly facilitates this task. They find that time is saved, fewer conflicts result, and more options can be considered.

Impacts Perceived as Unfavorable

As mentioned earlier, the strongest favorable impacts appear in those schools where the schedule is more complicated. Fewer favorable impacts were found in

schools that have fewer electives and a traditional six- or seven-period day. Also, in schools that schedule only once a year (even if they schedule several terms at that time) and in schools that use an arena process, the favorable impact of the computer is not as great. In fact, in several schools that follow these formats, unfavorable impacts of computer use seem to outweigh the favorable impacts. For example, in a junior high school that has three-week, quarter, semester, and year-long courses scheduled once a year, the scheduling administrator says that he would prefer not to use a computer service at all for scheduling. Because most of the students have few electives to choose from, and because the administrator has been scheduling the school for nearly twenty years, he finds that the computer complicates his job. He does not use the conflict matrix because they have few conflicts. Also, he must now begin the scheduling process in January and stretch it out over a longer period of time than when it was done manually; and he claims that class lists and tallies are not as immediately available or changeable now. He says that he and his secretary used to schedule 1,800 students in three weeks; but now it takes longer from beginning to end for just 1,000 students, even though there is no increase in the actual hours worked.

Such feelings were expressed by a few other administrators as well. Besides noting that it now takes more time to conduct the scheduling process, they felt that they have lost too much of their control. For example, while they know immediately that a student has been changed from one class to another, the official records do not show the change until an update has been processed

by the computer. Also, in some schools, the scheduling administrator would, in the past, often adjust class lists (during processing) to separate certain students and put them in different classes--for various reasons; or to assign a particular student to a specific teacher in preference to another teacher. Some administrators claim that when the computer schedules students into classes it is more difficult to make such pre-determined assignments of students.

Summary

The scheduling service is universally used by the school districts, but variations in the application of this service are determined by individual school policies. Differences occur not only between districts; but also within districts, depending on the way classes and time are structured. Usage, then is governed by the desire to maximize the benefit of the flexibility of the service to accommodate many types of schedules.

The impact of computer use in scheduling tends to be perceived as less favorable--or even unfavorable--in schools that schedule once a year along more traditional lines; or that offer few electives or options. In some of these schools, administrators say that, given a choice, they would prefer not to use the computer.

However, impacts are perceived to be favorable in schools where the class schedule is more complicated; in schools, for example, that schedule more often than once a year; that offer classes of varying lengths; whose programs offer more electives, and that seek to provide students with more flexibility of choice. In such schools (and in fact, in a majority of those studied), administrators indicate that the computer greatly enhances their ability to meet requirements.

Use

As noted in Table 2, all of the reports and services available through the mark reporting application area are received in all of the eleven districts. While the extent and nature of use of the reports varies somewhat between the districts, one thing that nearly all of the schools have in common is that the input and maintenance procedures conducted via the terminal are performed through the district coordinator's office. Only one school is an exception to this pattern. In that school both the scheduling and mark reporting mechanics are handled through the assistant principal's office. In all of the schools, the teachers use a mark sense card to indicate a mark for each student and the number of absences. The teachers may also add one or two comments on the progress report from a list of about twenty pre-programmed comments that are usually developed by the school's faculty. Many teachers, however, do not use them because they feel that they are too general for their specific purposes. Some teachers prefer to write separate comments, telephone parents, or rely on parent conferences to relay the information.

In most schools, the teachers have two or three days after the end of a term to mark the input cards. Progress reports and available lists will generally be produced within about ten days of the end of a term. However, in a few schools this turnaround time has been cut to five days by eliminating the process of asking teachers to scan a computer produced audit list of the input before the progress reports are produced. The purpose of the

audit list is to allow teachers the opportunity to make corrections and changes before the progress reports are printed. In the schools where this step has been eliminated, administrators have found that there is no increase in errors in the progress reports, and teachers give fewer incompletes since they do not have the opportunity to change marks before the progress reports and associated lists are printed.

While personnel in all of the schools tend to use the progress reports in basically the same manner, the same is not true for the associated lists available. The class rank and honor point lists are generally kept in the school office and not widely distributed. The failures and incompletes list is usually received by the assistant principal and/or the counselor. Teachers may also receive parts of such lists when appropriate. Of particular interest because of its potential for use is the mark distribution list that is received by each school. This report shows the numbers and types of letter grades given, as grouped by teacher and subjects. In the majority of the schools, the report is received by the principal, assistant principals, counselors, department chairpersons, and teachers. In most of the schools administrators use the report to look at general trends in grading. In a few cases, however, the reports are used more as a check on teachers' grading policies. Some teachers have been asked to explain why certain patterns of grading are followed. The reports have also been used in a few cases as a guide in placing a student with a particular teacher.

It appears that many teachers who receive the mark distribution report do not use it to any great extent. The use is usually limited to making comparisons with the grades given in the school as a whole. The purpose is to give them a feeling for how their grading practices compare with those of other teachers. An interesting variation on the basic report is received by teachers in one of the high schools. This report shows the average grade given to a class as against the average grade for that group of students in all of their other classes. Since the comparison here involves the same group of students, school administrators feel that it is more valid and useful. However, as in other schools, actual use of the report may vary considerably among teachers.

Impact

A number of favorably and unfavorably perceived impacts of use of the mark reporting service were cited by persons interviewed. The favorable impacts upon which there was general agreement were:

1. School clerical staff time is saved.

   The computerized production of class rank, honor point, failures and incompletes lists saves a great deal of the time of the schools' clerical staffs. The computations involved in developing these lists were previously done either manually or by use of calculators. It should be noted that the production of these lists usually did not take teachers time, so no great savings of their time was noted.

2. The mark distribution report is available for the first time.

In nearly all of the twenty-one secondary schools visited the mark distribution information was not obtained before computer use because it would have taken far too much time to produce it. Because of its availability now, administrators and teachers can know more about grading practices in their schools. Teachers who use the reports say that they are valuable for comparison and self-evaluation purposes. However, many teachers do not seem to use them at all.

In several schools the administrators say that the reports have enabled them to get a first look at grading patterns in the schools. They feel that the identification of major discrepancies has been important because it has made people aware that grading is a subjective and sometimes inconsistent process. For example, in one school a newly formed grading committee made up primarily of teachers receives the mark distribution report and uses it to help make people aware of the subjectiveness of grading. The report has helped the committee get a clearer picture of grading practices in the school and in consequence to develop grading policies.

In only a few isolated cases does it appear that the mark distribution report has led school administrators to tell specific teachers how to grade their students. Rather than causing a shift in the control of grading, the impact seems to be an increased awareness of grading patterns. Teachers still determine grades, but detailed

information now available to them can help them analyze their own grading practices relative to those of other teachers.

The favorable comments noted above come primarily from the school administrators. In particular, the time-savings noted in list development, which particularly affects the school office staff, was repeatedly mentioned. However, a number of unfavorable aspects were mentioned by a few persons interviewed, particularly teachers. The most notable of these were:

1. <u>The mark reporting process takes longer in many schools</u>.

   There is a longer period of time from the end of a term to the sending out of progress reports than there was before the computer was used. In most of the schools, this length of time is ten days. In the few schools where the audit list produced by TIES is not checked by teachers before the progress reports are printed and distributed, time is reduced to five days. With the previously used manual methods of having teachers write the grades on the progress report, the reports were usually distributed on the last day of a term, or within three days of that time. Some teachers and administrators were quite irritated with the ten-day turnaround time. While many of the administrators feel that the delay is offset by the time saved through list development, this offsetting advantage does not affect teachers. One effect of the ten-day turnaround time is that since students are not willing to wait that long, they pressure teachers to tell them their grades

ahead of time. Teachers must either report the grades to all of the students through their own manual method, release grades upon individual request, or refuse to release grades. Several of the teachers cannot understand why the introduction of the computer means that they have to accept procedures that, from their point of view, are not as efficient and educationally sound as previous manual methods. A few of them have developed quite unfavorable attitudes toward the use of the computer for mark reporting.

2. More mistakes in reporting grades.

Another result of computer use that was mentioned by several persons was the increase in the number of mistakes in reporting grades and comments due to recording on the mark sense cards. In some cases, the errors are due to the requirement that the input cards must be precisely marked or the card reader will not read them properly. The sensitivity of the reader, coupled with teacher errors in marking the correct location on the cards, has led to numerous errors in some schools. It was noted, for example, that an embarrassing situation may arise because an error has caused an inappropriate comment to be associated with a particular grade given. In several schools, a school office worker edits all input cards to look for sloppy or missing markings. In one school, teacher error is minimized by a change in procedure: grades are turned into the office at least three

hours before the input cards are due. The office staff will then mark the cards.

3. Decreased use of written comments.

An impact in some schools has been that written comments concerning student progress are not used as often now as they were before. This is seen by some teachers and administrators to be an unfavorable result of computer use. Since there is no space on the progress report for teachers to write comments, they must include a separate sheet of paper if they wish to write comments. Some teachers who previously wrote comments on the manually developed progress reports have ceased to do so because of the inconvenience. While they can select two short pre-programmed comments for printing on the progress reports, many of them feel that these are not adequate.

Summary

The mark reporting service is used to produce student progress reports, failures and incompletes lists, rank orderings, honor point figures, and mark distribution reports. It performs many of the record keeping and computation duties that are required during a progress reporting cycle. Variations in use of the mark reporting products is evident primarily in reference to the comments available on the progress reports and the mark distribution analysis.

The primary favorable impact was noted by administrators, who have found that the lists and associated computations that are produced by the computer save their

offices a great deal of time. The primary unfavorable impact that was noted by some administrators and teachers was that a longer period of time elapses between the end of a term and the distribution of progress reports than when manual methods of reporting were used. Administrators seemed to be more willing to accept this increase in turnaround time because this disadvantage is offset by the time saved in producing the above-mentioned lists. However, teachers do not see this offsetting advantage and a few of them are very irritated because they feel that delaying the reporting of grades is both educationally unsound and unwarranted.

Attendance -

Use

The attendance service is used mainly by the school districts to produce the annual State Attendance Report, which is required by law. All of the eleven districts studied used the service to produce the report. This report tallies student days attendance by school, by grade, and by transportation eligibility. All required breakdowns and tabulations are included in the report.

Districts have the option of inputing individual student attendance cards at the end of each quarterly period or just once at the end of the school year. If they use a card that includes just one attendance period's information, the card can be transmitted via electronic scanner and the daily data will be totaled by the computer to give quarterly figures. If they prefer to use an attendance card that contains the full year's record of daily attendance, they must total the individual quarters manually and then transfer the figure to a card that can be scanned electronically. In the districts studied, both types of procedures were found, with the quarterly input process being more prevalent at the secondary than at the elementary level. In all of the districts, the input and maintenance procedures are handled through the central office, usually under the direction of the computer coordinator.

No daily attendance accounting and reporting capability is provided by the attendance service. However, in three secondary schools, daily attendance reporting has been attempted by using the TIES instructional timesharing computer. One school stopped using the computer to print

the daily absentee list because of the slow typing speed of the terminal. In a second school, there was difficulty experienced in using lists that had student numbers but not student names. In the third school, the computer is still used to alphabetize and print a daily attendance list based on cards that are input. It takes 30 minutes to produce the list at the end of the day. The attendance data that is input on a daily basis is not accumulated for more than one day. Also, the data that is processed and stored through the timesharing computer cannot be automatically transferred to the computer that is used for administrative applications. Therefore, the daily reporting process that the school developed is totally separated from the quarterly and year-end report process.

Impact

In most of the districts, substantial savings of time were found because of the computerized production of the State Attendance Report. The primary savings of time is due to the elimination of the need to manually accumulate yearly totals for several categories of students in each school, and then produce summations for the whole district. Some specific examples of time saved are:

1. In an elementary school, the principal used to spend 25 hours of his time, while his secretary spent 60 hours of her time on the report. Now it takes none of his time and a minimal amount of her time.
2. An Elementary Director for a very large district used to spend seven days compiling the data from individual elementary schools; now she just signs her name to the finished product.

3. In a medium-sized high school, the assistant principal used to spend several days working on the annual report; now he spends no time on it.
4. A secretary to a superintendent in a small district used to spend four days to do just the high school portion of the report. Now, she spends only a couple hours on the whole report.
5. In a small district, a central office staff person used to spend three weeks compiling the statistics for the district, but now it takes only 1.5 hours.

At the school level, the greatest timesaving occurs in those schools that use the period attendance card that can be scanned electronically to develop quarterly totals. In schools where these cards are not used, the school office personnel must still calculate totals for each quarter. However, most of them still note a considerable savings of time because they do not have to compute their school's portion of the State Attendance Report.

Many persons at the secondary level expressed a desire for a daily attendance service to be developed. Some of them would like to be able to input cards of absent students and receive an alphabetized list of those students within 30 minutes to an hour. For others, the production of a list at the end of the school day would be adequate. In addition, they would like to be able to input daily attendance figures via the mark sense cards so that the computer would process all period and year-end accumulations for the State Attendance Report.

This request was heard more often from persons in the larger schools. For various reasons, the manual daily attendance procedures used have not been able to adequately

account for all students. These reasons include: increased skipping of classes by some; irregular class schedules of others; and the necessity to excuse still others for certain non-school activities. In small schools, there is not as much need for a computerized daily attendance service. As one administrator expressed the situation: in his small high school, everybody just knows which students are frequently absent, and why they are absent.

Summary

The attendance service serves an important function for the districts primarily because of its ability to produce the annual State Attendance Report. A significant amount of time is saved at the school and district office levels by having the computer perform the necessary calculations. Many persons at the secondary level noted that the attendance service could be even more valuable if it had a daily attendance accounting and reporting capability.

Geographic Location and Transportation - - - - - - - - -

As was described in the section on Applications, the Geographic Location and Transportation (GLT) service is used as an aid in planning and facilitating student travel to and from school. The experience by one district is highly illuminating, and while it is unique, it is considered instructive enough to merit inclusion in this study.

In order to use GLT, it is necessary to develop a detailed map, dividing the district into school areas, census areas, census sub-areas, transport or non-transport areas, and location areas. In this school district, this was done by an outside map contractor at a cost of about $6,000.00. (The transportation manager suggests that the cost for a small rural district would be less than half of that sum.) It took the contractor about three months to develop the map. The district staff then identified the census areas, sub-areas, etc., and assigned dwellings to specific areas. This map refinement and file building process took about three and one-half months to complete, although--it was felt--the time could have been condensed by assigning more people to the project.

Use

In 1974-75, the district manually employed the basic GLT format, together with available census data and district maps to develop their bus routes and bus information cards. While the computer provides the needed information, it does not actually build the routes. During the route building process, GLT is used to identify students living in small geographical areas so that

alternative routes can be investigated. Students within specific areas can be grouped into several categories based on grade level and school, for example. After the routes have been developed, GLT is used to produce bus route listings, passenger lists; and a bus information card that contains the students' bus number, bus stop location, pickup time, school, grade, and address. These cards are mailed to parents of transported students prior to the first day of school.

Impact

The district's transportation manager noted a number of significant positive impacts that have resulted from their use of GLT. These were:

1. A significant savings of money.

   The district has realized a considerable reduction in transportation costs since the introduction of GLT. While some of this reduction was due to a change in management, a large part was due to the implementation of the basic program format used in the GLT. Based on actual F.T.E. expenditures in 1973-74 and considering inflationary increases, the district spent $140,000 less than projected for the 1974-75 fiscal year, which represented about 20 percent of that year's total transportation budget for the district. In the following two years--thanks to additional program and procedural refinements--the district experienced continued and comparable savings when measured against the base period. As further evidence of cost savings, in 1972-73 the district's

transportation costs per full-time equivalent student placed the district in the 54th percentile for all districts in the state, whereas now the district is in the 20th percentile.

The 1974-75 savings were attributed primarily to the use of the very detailed GLT map and census information, which for the first time enabled the transportation manager to know exactly where students live in the district. While the district had previously used the computerized census service, the defined geographical areas were too large for the purposes sought by the transportation manager. Through GLT, the kind of population information for smaller areas became possible as a guide to greatly improve route efficiency. Now, the district contracts for only 41 buses to cover the 2,500 miles travelled daily, as against the 52 buses required in 1973-74 and earlier.

2. Better communication to parents, less confusion. Before GLT was used, the district developed routes based on the previous year's routes. The routes and stops were published in the newspaper, and on the first day of school the students would go to the nearest stop to catch the bus. It would not be unusual--on opening day--for the number of students to greatly exceed the maximum allowable bus capacity. The routes would then be adjusted to balance the loads. By using GLT, the routes are accurately determined before the first day of school, and the computer-produced

card is mailed to the parents, with all pertinent information. On the first day of school, only one or two buses are overloaded, and very few changes must subsequently be made in routes. In addition, each driver receives a computer-produced list of students who will ride the bus, including their stop number and address. The transportation manager noted that occasionally a young student does not recognize his/her stop, and is still on the bus at the end of a route. The driver asks the student his/her name and then uses the bus's communication equipment to notify the district office that the student is still on the bus. The district office calls the parents to inform them that their child is not lost but will be late. The driver then takes the student to the address noted on the list. It is felt that the accurate information, therefore, helps to minimize confusion and apprehension.

3. Time is saved by using the computer.

The first year that the basic GLT forms and map were used without aid of the computer, the transportation manager spent 400 hours just developing the routes. Since he began using the computer to retrieve information as part of the GLT service, he has spent about 72 hours each year building routes. Since about 30 percent of the district's 12,000 students change residences yearly, this 72 hours of time includes provision for considerable re-routing The manager said that while they were able to use the GLT map to build efficient routes without actual use of

the computerized aspects of GLT during the first year, the great deal of time required to do this could have prevented them from using it a second year unless the computer had been available.

It should be reiterated that the increased efficiency in routing that this district has experienced may not be totally due to use of GLT. Other changes in procedures (beyond those associated with GLT) introduced by the new transportation manager probably account for some of the increased efficiency. Exactly how much of the results were due to factors other than GLT use cannot be measured. Nevertheless, the manager notes that most gains in efficiency were made because of use of GLT, since without the type of detailed, accurate and timely information available to him through GLT, he would have very soon reached a barrier to further improvement.

As noted earlier, none of the other eleven districts under study use GLT. Several reasons for not using it were found in these districts. These included:

1. Lack of knowledge.
   Since GLT is a relatively new application, many persons are not yet fully aware of its characteristics and potential.
2. It is difficult to use.
   Some districts have refrained from using GLT because it is somewhat difficult to use. Some feel that the documentation is not yet sufficiently developed to enable a district to use GLT easily.
3. Map development seems difficult.
   Since the districts do not already have the type of detailed map that is required, the expense and time involved in developing it have acted as inhibitors.

4. Manual routing is not difficult for some.
Some persons feel that GLT would not benefit their districts because their routes are not complicated. They need very few buses, so actual routing is a simple process.

Summary

Geographic Location and Transportation is used in only one of the eleven districts under study. The district reports a considerable savings in time and costs during each of the three years GLT has been used. This district's experience indicates a considerable potential for savings in other districts.

Applications--Personnel Support

Personnel/Payroll -

Use

The use made of the payroll processing service is quite similar in the districts, but the use of personnel services varies considerably. All of the districts have the payroll processed by TIES service, with checks being printed by TIES. A payroll clerk generally handles all of the input, maintenance, and distribution procedures. By district choice, some variation in use exists as to the types of payroll deductions that districts make on checks, as can be noted in Table 2.

In the past, most districts have primarily used only the payroll part of PPS, but with staff cutbacks being more frequent in many districts now, the personnel part of the service is being increasingly considered. Some larger districts, especially, have found that their manually kept personnel records are not adequate to deal with the increasing volume of staff changes caused by declining and/or shifting enrollments. If a district must make staff cutbacks due to enrollment declines, accurate seniority and certification lists must be available. Or, if a district is experiencing a shifting of enrollment within the school boundaries, even though the overall enrollment is constant, these lists are important as teachers are reassigned to different schools.

Considerable variation is found as to the numbers of services used in the districts. For example, while nearly all of the districts receive computer-produced employee directories, only about a third of them receive employee leave lists, and just over one-half receive seniority reports. The employee directory is used as a reference

source at both the central office and school levels. Employee seniority and certification lists are used primarily by those persons charged with teacher assignment, hiring, or layoff responsibilities. In some districts, a personnel manager may have that responsibility; in other districts the directors of elementary and secondary education may be the persons making those decisions. In smaller districts that do not have such positions, the lists may go to the principals, or they may reside in the superintendent's office. Therefore, not only is there variation as to what lists the districts choose to receive through the personnel service, but also as to who receives certain lists.

Four of the districts stand out as particularly high users of the personnel services. In all four of these districts, the coordinators are active users of the generalized extract service. Therefore, they are able to make specialized use of the personnel services that cannot be made in districts where generalized extract is not utilized. Some of the examples of specialized use are:

1. Personnel Lists

   Certain lists are produced in a variety of formats. For example, in one of the districts, the seniority lists are produced in several formats so that reference to them can be made more easily. The lists are arranged alphabetically by the subject that a teacher is certified to teach, or by years of service. These lists are distributed throughout the district so that all employees have access to the same seniority information. It was felt that because of the large size of the teaching staff, and the need

to make staff reductions and reassignments, the computer should be utilized to produce accurate lists that could be used by many persons.

In another district, the employee leave list includes the frequency of sick leave taken by teachers and the reason for the absence. In this way an analysis of the reasons for absence can be made more easily. Other types of leave are not recorded in the data bank for this district because the staff is so small that less frequently occurring types of leave could easily be accounted for manually.

2. Special Reports

Some specific information that is needed for reports and other purposes is obtained. For example, a list of all employees who have life insurance is obtained in one district. Often, a list of all employees who need a medical exam is obtained. Information on the number of Full-Time Equivalent employees in different job classifications are developed.

Some of this information that is accessed through the personnel service is used to meet the requirements of federal reporting. However, to obtain the information needed to complete a given report, it may be necessary for the coordinator to access the personnel data base several times by using the generalized extract capability. In one of the four districts, the coordinator is working with TIES staff persons to develop a means of making one simple request that will provide a great deal of the information needed for reports to federal agencies. In particular,

the coordinator wants to be able to more easily complete a United States Office of Education report that requires the district to report statistics about employees (e.g., full/part time, male/female, ethnic background).

3. Employee Directories

   Employee directories are obtained in many formats. For example, directories of all district employees or of employees in particular schools are obtained.

In several districts, very little use is made of the personnel services. A number of reasons why the personnel services are not used more by these districts were identified. Not all reasons fit all of the low use districts, but taken as a whole, they account for much of the lack of use. The reasons identified are:

1. Inaccurate manual records.

   The manually kept district personnel records are so inaccurate that use of a computer for keeping records on employees at this time would result in a "garbage in-garbage out" situation. That is, automation of inaccurate data would merely produce inaccurate lists. It seems that part of the reason for the personnel record keeping problem in some districts is that personnel information has traditionally been maintained at the school level, with little coordination through a central district office. Failure of schools to notify the central office of teaching assignment changes and actual transfers of teachers between schools, for example, has caused central office records to be inaccurate.

2. Few staff changes.

In some small districts very few staff changes occur, so a manual system of record keeping has proved to be adequate for most needs. For example, teacher seniority list development is not a large consumer of time in districts that have fewer than a hundred teachers. However, in some of the small districts, the need to categorize and report employee information to state and federal agencies has now prompted them to be more interested in using the personnel service.

3. Shortage of people.

In a few cases, the districts' limited use of the personnel service is attributed to a shortage of personnel who have the time to do file building and maintenance work. District priorities have been such that the clerical staff in the personnel area has been kept to a bare minimum, and the perception is that sufficient time is not available to properly maintain the data base.

4. Non-use of Generalized Extract.

In about half of the districts, the potential for more expanded and more flexible use of the personnel service is hampered because of the districts' inability to use the Generalized Extract capability. In several cases the district coordinator does not have sufficient familiarity with the workings of Generalized Extract to be able to use it to meet certain specific information needs in the districts. For example, use of the personnel service could be expanded in the

area of reporting employee data to insurance companies and governmental agencies if the Generalized Extract capability existed in a district.

Impact

For the payroll portion of PPS, the primary impact seems to be that time is saved in processing the payroll and producing associated reports. For example, in one district the processing for 200 employees used to take one week, whereas it now takes two days for 500 employees. Also, a social security report used to take two days to complete, but it now takes practically no time for the district.

In the personnel area, districts that have made more than just a minimal use of the service have found that there are a number of impacts that have resulted. Some of the impacts that were frequently reported by persons in these districts are:

1. Timesavings.

   Time is saved in maintaining and accessing personnel records and in producing necessary lists. For example, in one large district a clerk's full-time job before computer use was to handle insurance payments and requests for information, and record sick leave for personnel. Now, the job takes one-half day of work for each bimonthly update of the records. In the past, when an insurance company requested a list of employees grouped by age or some other category, several days of work would be involved. Now, one day turnaround can be expected for securing the information.

2. Seniority and certification lists.

In some districts, seniority and certification lists were developed for the first time. While information concerning years of employment and teachers' areas of certification has always been kept on file somewhere in the districts, the information was sometimes not available in an easily distributed form. Some of the districts have found that this information can be more easily disseminated throughout the district now that lists are produced via computers. Having data that are shared and accepted as valid by all of the staff has tended to lessen the shock of teacher layoffs and transfers because teachers can see where they stand on the list.

3. Consolidated personnel information.

Use of the computer has enabled the personnel information to be consolidated in a central office rather than to be dispersed in offices throughout the district. The information is now more standardized and accessible than before. Most of the persons interviewed in districts where the consolidation has occurred view the change as favorable.

4. Flexibility through Generalized Extract.

Particularly in the districts where Generalized Extract is used, the capability now exists to rearrange the personnel data in many ways. For example, it is much easier to produce information that enables one to compare the ages of employees in various job classifications. This flexibility in reporting data has eased the task of providing information to external agencies.

Summary

The payroll processing function is used by every district studied, with the result that there is generally a savings of time. The personnel service is used very little by some districts and to a fairly large extent by others. The personnel services are just beginning to be recognized by the districts as having considerable value to them. This is because more districts feel the need for accurate and accessible data that will enable them to meet reporting requirements from external agencies and to deal with the staff cutbacks and transfers necessitated by declining enrollments. In a district where the coordinator is able to use the Generalized Extract capability to more precisely tailor the service to the district's needs, greater value from the personnel service has been realized.

Salary Schedule Simulation - - - - - - - - - - - - - - - -

A salary schedule simulation program is available to districts through the TIES timesharing network. Districts input data, and request and receive output through terminals that are housed in school buildings. The terminals are connected to the computer that serves the instructional applications at the central facility.

Use

Of the eleven districts under study, only four of them use the salary schedule simulation program to compute salary schedules. In a fifth district, a program that was written by the district coordinator is substituted because of the district's use of half-steps and career steps which are not accounted for in the TIES program.

In these districts that use the computer to compute salary schedules, a great number of schedules are computed. For example, in one district, up to fifteen schedules are computed and then used by the business manager to look at alternatives both before and during negotiations. In another district twenty to thirty schedules are computed before negotiations begin. A special use of the computer in this district is made by placing the district's teachers on the salary schedules of neighboring districts and computing costs. Comparisons are then made between several districts while controlling for the educational background and seniority of the district's teachers.

In a third district, the administrator in charge of negotiations runs over fifty salary schedules before negotiations begin and uses them for comparison purposes. As a check on accuracy, after the first computer-generated schedule, he does the calculations manually. He has

always found them to be correct, but he feels more sure if he has checked one himself. The schedule that is part of the final proposal of the district is checked manually several times because he must be absolutely certain that there are no mistakes. A similar checking procedure is used in some of the other districts that use the computer program. It should be reiterated that this checking is done not because there has been a history of erroneous output caused by erroneous input or program malfunction, but because it is essential that the costs of the adopted salary schedule be accurate beyond a doubt.

As in the case of the other two districts discussed, additional schedules can be run during the actual negotiations sessions if they are needed. One of the administrators said that it takes him from five to thirty minutes to obtain the costs on a complete salary package. The difference in time is basically a function of the changes that must be made in the input to obtain the new schedule.

The above examples concern use by district administrations. In one of the districts, salary schedules are run for the bargaining units also.

In districts where the computer program is not used, various reasons were offered in explanation. In the smaller districts with the usually simpler schedule, the general feeling is that salary schedules can be readily computed with a calculator. One business manager said that he can calculate a schedule in ten minutes during a negotiations session. Another computes six schedules manually without difficulty.

In two large districts, differing reasons were offered for non-use. In one of these, the feeling is that hand computation is easier because interim steps receive

set dollar increases rather than percentages. They need only identify three salary levels and then add set dollar amounts to compute other levels. A calculator is used to develop about thirty schedules before and during negotiations. Past use of the computer, they said, did not yield major gains for them. Because of the time required to input data, and because the computer program does not deal with fringe benefits and extra-curricular costs, no significant timesavings resulted for them.

In the other large district not using the computer program, it was explained that the district's personnel data are not current enough to provide accurate input into the program. Also, concern was expressed about the confidentiality of the data. It was not desirable, they felt, for the bargaining unit to have access to their information through the computer. It should be noted, however, that because of the password procedure used to access the timesharing system, districts that do use the program have no problem with confidentiality. In this district, and one other, it would seem that the reasons given for non-use of the computer stem from incomplete knowledge of the program.

Impact

In the five districts where the computer is used to develop salary schedules and compute costs, several specific impacts were identified and are noted below:

1. More schedules computed.

   More schedules are computed now than when they were done by hand. For example, in one district about five salary schedules were computed in the past; now twenty to thirty are computed. Most

people said that their districts would not develop as many schedules if a computer were not available because of the time factor.

2. Alternatives available for study.
   The ability to produce so many salary schedules quickly permits district administrators to study many alternatives both prior to and during negotiations. The feeling expressed was that by having many alternative schedules to study, better decisions are made before and during negotiations.

3. Added credibility.
   The ability of the administration to quickly produce detailed and accurate information during the negotiation process has reinforced their credibility, according to some administrators. For example, one coordinator said that given a total salary schedule figure of 1.5 million dollars as a goal, he can produce a computer generated schedule that totals to within $15.00 of that figure. The accuracy and timeliness of the computations help to establish an atmosphere of expertise.

Summary

In five of the districts studied, the computer is used for salary schedule simulation and cost analysis. The rationale given for this practice emphasizes the ability to compute many more schedules, in less time, than was previously possible. This, in turn, permits the evaluation of alternative salary packages, leading to more thorough planning for negotiations.

In the other six districts, where the computer program is not used, it was generally expressed that a great many alternative schedules were not necessary; and that what needed to be done could be accomplished by use of a calculator.

Applications--Financial Support

Finance/Budget Accounting - - - - - - - - - - - - - - - -

Computer service for Finance/Budget Accounting (FBA) first became available to all member districts in July, 1974. Before that time, a less comprehensive computer-supported service was offered. Ten of the eleven districts covered by this study now use FBA, and the other is preparing to do so in the near future. The way in which FBA is used in the districts varies considerably, as does the impact of the particular use.

Use

As can be seen in Table 2, the ten user districts receive nearly all of the reports and services available through FBA. Differences occur not so much in what is used, but who uses specific reports, and how they use them. Basically, these differences stem from the districts' philosophies of where the functions of budgetary development and control should reside in the district management structure; namely, whether these functions are centralized or decentralized. In three of the ten districts--two large and one small--a centralized approach is taken; that is, decisions are concentrated at a higher level in the district hierarchy, and reports produced through FBA reach a limited number of persons. In the other seven districts, a decentralized approach prevails. FBA reports are disseminated to many persons so that they may develop and monitor their own budget areas.

To provide a better perspective of how the usage of FBA differs, a comparison of two districts may be helpful. Both are long-time members of TIES that employ knowledgeable and experienced coordinators who have been leaders

in TIES development. In both districts, the business office staff and numerous other district personnel have also been active in the development and use of TIES services. As in all of the FBA-user districts studied, most communications with TIES and all input and maintenance procedures, are handled by the business managers' office rather than through the district coordinators' office. In both districts around 2,000 line items are used in the account structure. The uses made of FBA in these two districts are fairly representative of those found in the remaining districts, depending on their degree of decentralization.

In the district where budgetary development and control are more decentralized, the district accountant says that everything he does in the accounting area is served in some way by the computer. He receives regular reports of receipts and disbursements, encumbrance information, budget worksheets, etc. The central office makes a per-pupil allocation of monies to each school and holds the schools responsible for the bottom line figure. They may make transfers of money between categories within their budgets if the transfers are legal. In the schools, monthly budget summaries in the form of computer printouts dealing with each area of control go to the principals, department heads, and to teachers who need to use them. These persons also receive a budget worksheet printout that contains historical and current budget information that can be used during the budget development process.

The Superintendent uses a monthly printout which deals with all major expenditure areas. He uses this to monitor the major expenditure areas. The school board receives a summary printout to inform them of major account categories.

In addition to regular monthly budget printouts, people may also receive specific re-arrangements of information so that they can look at various accounts differently. For example, the assistant superintendent for elementary education may request a printout that will tell him how much money is budgeted, and has been spent, in the elementary textbook account. He notes that the variety of reports that he can get is limited only by his need and ability to conceive them.

The monthly budget printouts are received in the district about ten days after the end of the month. Therefore, the information is at least ten days old when delivered and as much as five to six weeks old toward the end of a monthly cycle. While they may be sufficiently current for those persons who monitor broad categories, most school-level users of FBA in the district find it necessary to maintain manually a daily update of the monthly report so that they can have a better idea of balances at any given time. The daily update and the monthly printout are reconciled monthly.

In the district where a more centralized budgetary development and control process is evident, the same basic reports are received in the district but their distribution and use is not as widespread as in the case cited above. The business manager uses monthly budget printouts to control category over-runs by individual schools. The superintendent uses a monthly report to help relate costs to long-range instructional goals and specific programs. The school board uses a summary report for general overview purposes. The head of secondary education uses a monthly printout to control the purchases and to aid in developing budgets. The control of the

supplies and instructional capital expenses for the secondary schools rests with him. His office authorizes all such expenditures, and his secretary keeps a daily record of expenditures. He produces warning lists that he sends to principals when accounts are running low.

The school administrators receive a monthly printout for their schools. They also keep their own records for a check on the reports. The department heads and teachers do not receive monthly reports, but they can obtain figures showing the current status of their accounts, and any remaining balance. While the school-level personnel do have some control over the budgets for their particular areas, neither this control process nor the budget development process used in their district allow for as much authority at the school level.

These two districts serve to illustrate some of the diversity that exists in the use of FBA-produced information. It should be noted, however, that differences in usage exist even among the decentralized districts. The level of interest by the participants can be a factor in how information is used. For example, in one district where control is supposedly decentralized, some of the school personnel do not regard budgetary matters to be their primary concern. So budget control here appears to be quite lax. While printouts are distributed to many levels in this district's hierarchy, the expected acceptance of responsibility for control has not taken place at lower levels. This may possibly be explained by the fact that this is a growing district that has not experienced the financial problems faced by so many others.

As was indicated earlier, most persons who are responsible for specific accounts also maintain a manual record of expenditures--usually on a daily basis--to

update the monthly report. This, they feel, is necessary as a guide to whether, and when, certain expenditures can be made. The manual update process is not considered burdensome. In contrast, others would like to have the capability to update balances daily through the computer, and to receive printouts on request.

One district offers an interesting example of how the perceived need for more up-to-date accounting at the school level was met. Each of the secondary principals was given one additional administrative position to be filled as he or she saw fit. Some chose to hire business managers. In one of these schools, the business manager keeps a separate set of books to update the monthly report, and also produces a monthly exception report for his principal; as well as using the computer printouts to analyze programs. For example, departmental cost-per-student ratios are both computed and plotted by hand. Based on these ratios, decisions to cut back certain classes were made by the principal.

Two principals were interviewed in this district, and both prefer to have data summarized for them by their business managers rather than have the capability of updating daily through FBA. They say they would not have the time to look through a massive quantity of printouts.

Impact

Nearly everyone interviewed cited several examples of favorable impacts resulting from their districts' use of FBA. In fact, the overwhelming opinion expressed repeatedly was that FBA use has had a very favorable effect. Little unfavorable opinion was expressed except for a few comments dealing with adjustments that some

people had to make in their work habits to deal with the formatting and mechanical procedures for data input and file maintenance work. Several of the impacts of FBA which were cited by almost all of the persons interviewed were:

1. Augmented information.
   In most of the districts, between 100 and 250 line items were used in the districts' charts of accounts before FBA was implemented. For most of them, this number has increased to at least 1,500 to 2,000 line items. The business managers and accountants generally felt that the great increase in detail would not have been achieved without use of a computer. In only one of the FBA-user districts visited had the number of line items not increased substantially. That district is currently restructuring its chart of accounts to increase the detail.
2. More flexible reporting.
   It is now possible to look at expenditures in more ways. The ability of the computer program to rearrange data in several patterns allows the users to look at five or six different ways that the same dollar is spent. This enables them to determine more precisely where and how money is being spent.
3. The ability to decentralize.
   In the majority of the districts, the increased detail and the ability to examine data in many ways have enabled a philosophy of decentralization of budgetary development and control to be put into practice. Responsibility for

exercising control can be pinpointed and assigned. Consensus was that if employees are to be held responsible for budget development and control (bottom line budgeting) for their areas of responsibility, they must have accurate, detailed, and relevant budget information. In these districts more information now goes to more people than before FBA was used. However, it must be reiterated that a cause/effect relationship between FBA implementation and decentralization should not be inferred. In two of the ten districts the detail was increased and the sorting capability was used, but decentralized authority over budgets did not follow. Nevertheless, in the more decentralized districts, nearly everyone felt that without the FBA service, their districts would not have been able to decentralize as they have. They could not afford to hire enough people to do the job that FBA does.

4. Timesavings.

A great deal of the manual bookkeeping that was needed in the past has been eliminated. While it is still necessary for many people to update daily the monthly printouts they receive, the majority of the respondents cited some timesavings. This was especially true for several administrators, who said that their time has been freed from detailed accounting work, or the supervision of that work, so that they may now deal with areas closer to the main functions of the schools.

These impacts were repeatedly credited for a number of very favorable benefits. Most frequently mentioned by administrators were:

1. Better planning.
   For example, a broader knowledge base and timely data have enabled administrators to foresee financial problems rather than to learn after-the-fact that an account is in trouble.
2. Better decision-making.
   Nearly all administrators agree that the increased knowledge base facilitates better decisions. Timely data also lead to more timely decisions. Alternatives can more easily be explored. In addition, the accuracy of the information lends conviction that decisions are correct.
3. More efficient use of resources.
   Numerous persons cited examples of using FBA printouts to identify areas of unusual expense that went unnoticed in the past. For example, a superintendent was able to identify detailed operating costs for individual schools. He discovered that certain operating costs for one school were considerably higher per pupil than for the other schools. Having identified this fact, he could then investigate the reasons for the difference and take corrective measures.
4. Less budget "mystery".
   More people now understand how the district's money is being spent and what resources are actually available at all times. In some districts, it has been common practice to assume

the existence of a "hidden budget", an unaccounted-for balance, a supply of funds that could always be depended on for unplanned expenditures. Now, computer printouts have dispelled this concept. There is far greater trust in the reality of accounts. And, as one person put it, the more open budgeting process can bring greater rationality to the use and distribution of resources.

Most persons seemed quite pleased with FBA. They were generally satisfied with the accuracy, timeliness, understandability and comprehensiveness of the reports they receive. However, a number of suggestions for improvement were mentioned during the interviews. The suggestions mentioned most often are noted here.

1. Accounting system.

   Three of the business managers said that while FBA has served a valuable purpose by being a good interim reporting system, the need now exists for an accounting system. They believe that FBA should provide a general ledger with double entry debit and credit, accrual, and daily accounting. They cite the need to change from a cash base to a modified accrual based system, as will be required by UFARS.[5]

2. Shorter turnaround.

   A number of persons would like to see shortened the ten-day time interval between the end of a month and the distribution of the monthly printout. Since they are not able to process any business for the current month until the prior month is closed, on the tenth, they feel they get too late a start in writing checks.

3. Daily updating.

A few persons would like to be able to dispense with the manually kept books that are used for daily updating. They want the data base updated daily with reports available upon request. This suggestion came less from higher level administrators who usually only look at general categories of expenditure.

Summary

In only one of the eleven districts visited was FBA not being used, and that district plans to use it. Most of the user districts receive the same types of FBA services, but a few use Generalized Extract to make the reports somewhat more flexible. The differences in use come not so much in what FBA services are used as in how they are used. In a few districts, printouts are used primarily by central office administrators for the purpose of developing and controlling budgets in a very centralized manner. In contrast, in just over half of the districts, budgetary development and control are decentralized and the printouts are used by many persons at various levels. Central office administrators use the printouts to monitor general categories and develop broad budget areas. Building Principals use printouts to monitor the general programs in their schools. Department Heads use them for their department accounts, and individual teachers have access to printouts for their areas of concern. In these districts, personnel are responsible for the bottom line figure for their departments and they can make legal transfers of money between categories in their assigned areas. Budget development and the transfer

of money are usually part of a participative process in these districts.

Among people in districts with decentralized budget development and control, it is generally agreed that detailed and relevant data are vital for the proper exercise of budget responsibility. And it is also agreed that FBA is a tool that makes it possible to decentralize. FBA greatly increases the number of line items and programs in the charts of account. Expenditure information can be sorted and analyzed in many new ways. The data can be broken down and disseminated among more people. Without this computer service, Business Office personnel say, decentralization would not be feasible.

Not all districts increased the number of line items and programs when they went to FBA. And even among those that did, not all of them decentralized the budget process. For, along with FBA with its detailed accounting, a philosophy of decentralization had to be present for the change to be made. Where it did happen, it is regarded favorably by almost everyone affected. The benefits listed are substantial: a more reliable knowledge of financial positions; a greatly improved basis for planning; a better picture of priorities; better decision-making; a readiness for UFARS requirements as the state activates this law; and more confident and satisfied school boards.

Satisfaction with the actual budget printouts varies from district to district. Central office administrators who deal with general categories of expenses are pleased with the monthly reports they receive. These reports keep them on top of general trends and problem areas. At the school level, however, there is an appetite for more frequent printouts. Persons who must deal with daily

transactions find it necessary to keep a manual record of expenses and balances that they usually reconcile monthly. Monthly printouts, they find, are not current enough as a guide to certain types of purchases; they would like to see a capability for updating accounts and producing budget reports on request through an on-line system.

In an era of rising costs, and the attending financial crunch besetting school systems everywhere, accurate accounting of financial resources is more critical than ever. FBA, by consensus, is the enabling tool that equips school districts to meet the exigencies of the times; to fine-tune controls; to manage more precisely and efficiently. For many of the people consulted in this study, it is considered to be the most valuable service offered by TIES.

Financial Forecasting - - - - - - - - - - - - - - - - - -

In addition to the more standard services available to districts through FBA, a program that computes five-year projections of expenditures is available. Ten of the TIES-member districts use this program, although none of the eleven districts under study do so. Therefore, information on the use and impact of the financial forecasting service was gathered in a district not included in the major study.

Use

The impetus for development of the financial forecasting program came from a Citizens Finance Advisory Committee that was formed in the district. With declines in enrollment being projected over a five-year period, the committee considered it to be important to be able to project expenditures accurately as a sound guide for planning necessary cutbacks. Using Consumer Price Index (CPI) figures, and allowing for changes in expenditures resulting from such factors as decreased staff, five-year predictions of expenditures are obtained for each line item in the district's chart of accounts. The Finance Committee and administrative staff then use the computer program to help answer "what-if" questions in planning for future budgetary changes. For example, based on projections obtained with CPI percentages, questions may be asked about how these projections might look if variations occur in the inflation rate.

Additionally, this district used a revenue prediction program written by the coordinator. The program produces five-year projections of revenues, categorized

by seven major scurces of funds. Expenditure and revenue projections are then combined in a computer-produced balance sheet that readily shows the predicted positive or negative balance. This district is the only one using both programs.

Impact

Prior to the advent of this service, the district was limited to making only general projections for just one year. Because of time limitations, it was impossible to compute expenditure increases for each line item, nor to make projections beyond one year. The predicted expenditure figure for the upcoming year was obtained by simply increasing the current year's total by a given percentage of inflation. Now, specific inflation figures are used to compute increases for several types of commodities and services, thereby yielding a more accurate picture of expected spending. In addition, figures can be generated for a full five years, rather than just one, and alternative predictions can easily be obtained to broaden options.

By using both programs, the district obtains information that permits staff, the citizens finance committee and the school board to see more clearly where the district is heading financially. It is felt that this information not only helps the district identify necessary cutbacks at an earlier stage, but also legitimizes the needs for such cutbacks. Since people know that a great deal of study has been undertaken to obtain projection figures, they more readily accept the conclusion that cuts must be made. Input is then systematically gathered from teachers, administrators, citizen groups and secondary

students as to where cuts ought to be made. The final decision, of course, rests with the school board.

The coordinator offers the opinion that use only of the expenditure prediction program limits its value. The corresponding revenue prediction, he feels, is essential to obtain the proper balance figures--projected over five years--that provide a district with an adequate picture of future financial standing.

Summary

The financial forecasting program, which projects line item expenditures over a five-year period, is used in ten TIES-member districts. In one district, a revenue projection program is used in conjunction with the above program to obtain balance projections that are used extensively in planning. By using the programs, the district has been able to obtain more accurate balance figures projected over a longer period of time. This information has greatly aided the staff, citizens committee and school board in planning for future budgetary cutbacks, and in building acceptance for necessary action.

Applications--Supplementary Support

As mentioned earlier, Research Services, Generalized Extract, and the special administrative applications developed on the instructional timesharing system may be used by districts to enhance the standard applications. Since they are "extras", some districts make no use of them, while others use them extensively. Reported below are some of the examples of how unique needs of districts can be met through use of these enhancements.

Research Services -

Use

In all but two of the districts under study, some use has been made of TIES research services. In the two exceptions, there has not been a recognized need up to this time. Mainly, districts receive assistance in designing and analyzing survey instruments for studies they conduct. Some examples of types of evaluation and research efforts that have been undertaken with assistance from TIES research staff are:

1. A study comparing male and female participation in sports.
2. Follow-up studies of graduates.
3. A study of pertinent facts of kindergarten students.
4. An adult education needs study conducted by a community service director.
5. A study of student preferences for classes, activities, etc.

6. A study of community residents and school staff on the goals and priorities of an elementary school.
7. A study of student extra-curricular activities.
8. The evaluation of basic skills programs.

Some districts conduct a number of studies on a more or less regular basis. Others may run only one or two at widely spaced intervals.

The scope of research assistance varies, depending on the complexity of the study, the skills of district personnel in the subject area, and the extent of help desired. In some cases, TIES consultants are involved only in offering suggestions on formatting of questionnaires. In others, involvement may include assistance in sampling, developing questions, and in performing statistical analyses via the computer.

In most districts, a given study is directed by the person most familiar with the subject area. For example, a follow-up study of graduates is generally conducted by a counsellor. Two districts, however, employ directors of evaluation and research to supervise and direct most of their research activities. Because of the expertise of these persons in the design and analysis of measuring instruments, their involvement with TIES is largely limited to using the computer for statistical analyses. They do avail themselves of the TIES program and statistical packages at the University of Minnesota Computer Center, to which their districts have access as members of TIES.

Four of the districts make use of the test scoring service offered by the research services staff. While TIES is not involved in scoring standardized tests, they

do score teacher prepared tests. Some basic computations such as item analysis are also provided. Some teachers use the service for routine tests, while others use it just for final examinations. The district computer coordinator is charged with explaining how to employ the service and handling all input procedures once the answer cards are marked by the students.

In the majority of the districts there is an expectation that use of the research services will increase in the future because of new legislative requirements that all school districts in the state begin a program of evaluation and planning. The Planning, Evaluation and Reporting (P.E.R.) legislation requires that "The school board of each school district in the state shall develop and adopt a written educational policy which establishes educational goals for the district, a process for achieving these goals, and procedures for evaluating and reporting progress toward the goals."[6] Several persons interviewed mentioned the need they will have for consultation services and computer assistance in order to meet the requirements of the law.

Impact

One of the most important impacts of having a design and analysis service available is that districts are provided with an expertise they normally do not possess. Most districts either cannot afford to employ specialists in evaluation and research, or they do not feel they have sufficient need to justify a regular position on the staff. This consultation service, coupled with the use of the computer to perform statistical analyses, has enabled the districts that use the service to more thoroughly and

systematically investigate goals, needs and performance. For example, one district used the computer to aid in the analysis of 600 questionnaires that provided the primary data for a follow-up study of graduates. The district administrator in charge of this research effort felt that they could not have done the analysis without use of a computer.

In the three districts most actively engaged in research and evaluation, the values of self study are highly cherished. For example, the use of follow-up studies, coupled with community surveys, has enabled the districts to identify needed curricular changes. One high school principal said that the results of such studies have led to specific changes in course offerings and staffing in the school. Another example comes from a district that employs a full-time coordinator of evaluation and research to conduct evaluations (among other duties) of student progress in basic skills. Through correlation studies, it was determined that higher test scores were positively correlated with longer instructional periods. As a result, the periods of instruction for certain lessons were changed from twelve to twenty minutes.

In the districts where there is an ongoing program of research and evaluation, it is generally agreed that the more a district knows about itself, the better it can make decisions about needed changes.

The scoring of teacher prepared tests by computer is not a widely used service. However, where teachers do use it, two direct impacts were noted:

1. Time is saved.

   For example, a high school biology teacher finds that he can have 140 tests corrected, with the results in hand, in one-half hour total elapsed time.

2. Item analysis is available.

Item analysis is available for the first time, since manual methods are too time-consuming to make the analysis feasible. The frequency counts of responses to test items enable teachers to more readily identify questions that may have been particularly difficult, easy, or confusing.

Summary

The use of research services--as with other services--varies widely among districts. Where research design and analysis are not recognized as high needs, survey techniques to gather information are little used. This is true of almost half the districts studied. In the others, research services are used extensively to assist with sampling design, questionnaire formulation and data analysis. Results have encouraged further activity, and have effected curricular changes in some districts.

Impacts of timesavings and increased information for test analysis were cited by teachers who use the test scoring service.

Forthcoming legislative requirements on program evaluation and reporting indicate more involvement by all districts in the use of the research services in the future.

Generalized Extract - - - - - - - - - - - - - - - - - - -

Generalized Extract (GE) provides a means of accessing and sorting information for specialized purposes from districts data files. Ordinarily, this kind of information cannot be obtained by any other means. It is used in five of the eleven districts in the study, with coordinators writing the GE programs. In only one of these districts does a non-coordinator have a working knowledge of GE. In the other six districts, GE is either not used, or used only on rare occasions, largely because coordinators do not have an adequate working knowledge of Generalized Extract.

Use

Examples of GE applications are diverse and generally unique to individual districts. In a few, it is used quite regularly. District personnel who have experienced its benefits now have an expectation that there is a way to satisfy their needs for special information. It appears that once coordinators begin using GE, more people come to them with specific requests.

Some of the applications have become standardized--outgrowths of "canned" GE reports. Others require coordinators to expend considerably more effort in developing reports because of the uniqueness of the projects. Examples of the wide variety of applications that have been developed follow:

1. Specialized Lists and Labels

   Applying GE to the census and student files to produce lists and labels for very specific groups. For example, in one district, the coordinator

produces a list of all students receiving special services, and the F.T.E. figures for each category of special services. Also, in one school, student locker lists for each home room are developed.

2. Migration Studies

   Conducting migration studies of residents. One coordinator has used GE in conjunction with the census file to develop a report on the residents who move in and out of the district in a given year.

3. Age by Housing Type Studies

   Determining the numbers of various age children living in different housing types.

4. Federal Reporting

   Producing specific personnel information for federal reports. One coordinator is working with TIES staff to develop a "canned" GE report that will provide much of the information needed for certain federal reports.

5. Unique Sorting

   In several districts, charts of accounts are sorted in unique ways to produce budget information dealing with specific categories of items that have been purchased.

6. Media Management

   One coordinator has worked with the district's instructional director to develop a file of all of the district media center's resources, including information on books, films, records, and cassettes. Information listing author, subject level, location in the district, and

quantity is stored. This stored information can be sorted by subject, grade level, purchase time, dewey decimal number, etc. With this capability, for example, a list of all media center resources that deal with sixth grade arithmetic can be produced for a teacher. The coordinator was able to store the information on a separate census file that the district no longer uses because of a change in its attendance boundaries.

These examples illustrate a few--but only a few--of the ways in which GE is used. To implement some of the more unusual and extensive applications, coordinators must be thoroughly familiar with the file structure at TIES, and must have a good working knowledge of GE itself. Coordinators working with GE regularly find the process quite time-consuming, but facility comes with experience. Because of the time factor involved, some of the coordinators have been hesitant to expand their use of GE.

In districts where GE is either not used, or used only minimally, several reasons for non-use seem to be evident. In some cases, coordinators indicate they have not had sufficient time to learn about the process. Some have found it too difficult to master. And in some districts information needs have apparently not risen to the level where GE would be advantageous.

Impact

The major impact, as expressed by coordinators who use GE regularly, is an enhanced and expanded usefulness of the administrative applications available to the district. They attribute this to the greatly increased

flexibility in the choice of information that is accessed and how it is reported. They can, for example, combine information from as many as four different files for one report. They feel that they have an improved ability to satisfy special information needs. Most of these special needs relate to management control and strategic planning functions. They have been able to provide people with information that would not be available without GE. And this added data has been beneficial to administrative practices. Some of the specific impacts resulting from the use of this specialized information have been described in other application sections of this report.

Summary

The Generalized Extract capability offered through the computer service is used on a regular basis in five of the eleven districts under study. In districts where it is used, the coordinators have found that they can meet certain specific information needs of their districts that could not be met otherwise. They believe that use of GE does much to enhance the basic offerings of the computer service and opens the door to the development of a true management information system for education.

Special Applications - - - - - - - - - - - - - - - - - - -

Use

As described previously, the enrollment projection and salary schedule simulations are stored on the instructional computer. These are "canned" programs, used by many of the districts. Except for one of the districts under study, very little additional use is made of the timesharing network for administrative tasks, largely because--other than the "canned" applications mentioned--special programs would have to be written. While four of the interviewed coordinators do have some programming experience, only one of them has regularly written programs to handle administrative information needs. This is a unique and special situation, but it may be instructive of the possibilities inherent in the system.

The coordinator in question makes extensive use of Generalized Extract to meet specific information needs. But he has felt it necessary to write a number of original programs--using the timesharing network--to perform other specialized tasks. Some examples follow:

1. A program to help the District Staff Development Director plan and coordinate professional development.

   First, teacher committees and central office staff worked out a list of 80 areas of competency applicable to the profession in four major categories: (1) diagnostic; (2) planning; (3) instructional; and (4) evaluative. Each teacher then rated his or her current and target proficiency for each of the 80 skills. These self-ratings also indicated whether an

individual was capable of teaching other teachers how to improve or develop certain competencies. The processed data identified areas where the perceived need for improvement was high, along with the names of teachers seeking improvement in specific areas. Desire for training in the field of behavior modification, for example, showed up strongly. This computer program enabled the director not only to identify needs, but to link teachers with areas of need and requested training.

2. A program to aid in better defining school attendance areas within the district.
Census data on the numbers of K-6 students by grade, and the numbers of children under school age were input for individual census areas. In addition, percentages of projected enrollment changes for each census area were included so that these changes would be reflected in the enrollment totals. The program then computed totals for various combinations of census areas so that alternative boundary locations could be quickly explored.

3. A program to format weekly enrollment figures into a directly usable weekly report.
This, along with several others developed by this coordinator, has become a standard report produced via timesharing.

4. A program to calculate retroactive pay amounts when a union contract is settled after the school year has begun.

   All related payroll deductions are also recomputed, and the new figures are then transmitted to the regular payroll service at TIES.

In addition to using the timesharing facility in this manner, the coordinator also writes short programs on an ad hoc basis. Usually, such programs handle calculations that would be quite time-consuming if performed manually. He notes that a small program can often be written and usable in about ten minutes.

Impact

As stated, the situation in this area is unique. But it does illustrate the flexibility possible where a coordinator has the time, skill, and impetus to write specialized computer programs. This district has been able to avail itself of opportunities to perform functions of data analysis and quick turnaround that would not be possible if specialized programs were not written. One result has been substantial timesavings in performing some types of calculations. Another is that certain information needed for planning can be obtained more easily than by manual methods.

Summary

In one of the eleven districts studied, considerable use is made of specialized computer programs written by the district coordinator and run via the instructional timesharing network. Some programs are short and written

on an ad hoc basis as short term needs arise, while others are complex and designed to meet long term needs. This kind of flexibility expands the availability of computer services, and brings these services to many more district personnel.

People System

Coordinator Role -

Introduction

In the original conception of TIES, the role of coordinator was held to be central to the most effective utilization of available computer services by the members of the cooperative. The person of the coordinator would serve as the nerve center of communication. Through this person, the needs of the member district would constantly be communicated to the TIES staff; and he or she would be responsible for keeping school personnel aware of services available from TIES, and for providing access to the acquisition of the skills and knowhow in making maximum use of these services. In short, the coordinator would do just what the title indicates: bring user and provider into an optimal functioning relationship to make TIES work, for individual districts, and for the cooperative as a whole.

Since the concept of TIES was new, the position was, likewise, equally new. A telephone survey of forty-eight of the TIES districts produced the data shown in Table 4, as to the previous background of current coordinators. One-third had been teachers, the majority of them in mathematics. Nearly two-thirds had been certified personnel in their previous positions. The table also indicates previous positions of coordinators in districts selected for in-depth interviews.

TABLE 4

POSITION HELD
BEFORE BECOMING COORDINATOR

POSITION	NUMBER	NUMBER IN SAMPLE
Teacher	16	4
Counselor	6	0
Principal (or Assistant)	5	1
General Administrator	5	0
Secretary/Assistant	4	2
Business Manager	4	3
Not in Education	4	0
TIES Central Staff	3	0
Research and Evaluation	1	0
TOTAL	48	10*

* One of the eleven districts does not have a designated coordinator.

Most of the current coordinators carry other responsibilities. They were asked to specify other duties that they perform in their districts. Table 5 shows the response.

A third of the number carry general administrative duties along with coordinator responsibility. However, these functions are likely to be integrated with computer use. In the same group, for example, three of the four persons listed as having "general administrative duties" are considered to be full-time coordinators. The two persons listed as "full-time" are truly full-time coordinators with duties related directly to, and essentially confined to the computer.

TABLE 5

OTHER DUTIES PERFORMED IN DISTRICTS
BESIDES THAT OF COORDINATOR

DUTIES	NUMBER	NUMBER IN SAMPLE
General Administrative Duties Usually within Central Office	16	4
Teacher	8	1
Evaluation and/or Research	4	0
Business Manager	4	3
Full-Time Coordinator	4	2
Part-Time Employee having just Coordinator Duties	4	0
Principal or Assistant Principal	3	0
General Secretarial/Assistant Duties	3	0
Counselor	2	0
TOTAL	48	10

It was desirable to determine how coordinator time is allocated. Table 6 indicates percentages. The most frequent percentages reported were in the 50 to 59, and 20 to 29 percent brackets. The data, however, are not precise. It was indicated that time allocated to coordinator activity might vary considerably throughout the school year. And the basic figure may be misleading. A 20 to 29 percent coordinator may have a staff performing many routine activites; while someone in the 50 percent

category may perform nearly all functions alone. The table follows.

TABLE 6

PERCENTAGE OF TIME
PERFORMING COORDINATOR DUTIES

PERCENTAGE OF TIME	NUMBER	NUMBER IN SAMPLE
100	3	2
90-99	1	1
80-89	3	0
70-79	4	1
60-69	4	0
50-59	11	1
40-49	4	0
30-39	0	0
20-29	10	2
10-19	1	1
Little	3	0
Duties too Integrated to Assign %	2	2
Don't Know	2	0
TOTAL	48	10

Given these variations, the following portion of this report will recognize and describe some of the variety of coordinator backgrounds, actual and desired roles, along with a synthesis of the commentary of those interviewed.

Structuring the Coordinator Role

There is no single mold from which to produce an ideal coordinator. The shape, scope and substance of the coordinator role stems from the perceptions, the needs, and perhaps the financial capabilities of the authorities in the districts served. It seems that the greatest overall satisfaction comes from districts where coordinators have the most time to provide services to personnel. In districts where coordinators have divided responsibilities, there is less overall use of available services, and less satisfaction. This seems to be characteristic of the smaller districts.

Districts that do not employ full-time coordinators generally do not use as many services as the districts that do. This causes discontent, particularly among school administrators and teachers who see school applications deferred or neglected. Some teachers express unfavorable attitudes toward administrative computer use because promised help with instructional use has not been forthcoming. If, they say, a district can afford a coordinator for administrative services, why not for instructional areas? The appetite for applications in instruction is strong in some districts, and in all probability (as one coordinator put it) the teachers' awareness and acceptance of the overall value of the computer will flower when they see it serving their instructional needs. The solution to this impasse would be for administrators not to excite expectations unduly, not to promise more than can be delivered. If, for example, a district can provide only for services in the financial areas, this should be candidly and clearly explained before contracting for computer services.

The coordinator remains crucial and pivotal to the successful implementation of a TIES-like computer service. Yet, opinions vary widely as to the qualities that a coordinator should have and the official position that the coordinator should occupy in the district hierarchy. One body of opinion holds that a person of authority and knowledge is necessary for launching and establishing the program; but that once it is under way, a lower paid "non-professional" can handle "routine" coordinator duties. Others say that proper servicing of educator needs calls for a professional education background. And still others rate personality above background and hierarchical placement in importance. For these people, intelligence, enthusiasm, interest and service-orientation are the qualities valued most in the coordinator. In any case, each district tends to consider itself unique.

The types of coordinator arrangements found in the eleven districts seemed to fall into four general categories.

1. No coordinator at all.

   One of the eleven dist- -ts no longer employs a designated coordinator. The work has been parcelled out and delegated to several persons. The district has had to make cuts in staff due to declining enrollment, and it was felt that while a coordinator had been essential in getting things started, now that the system was established, it could be decentralized and handled by people with the acquired skill to coordinate their own computer use. However, most persons interviewed felt that the absence of such a designated person will be a hindrance to

expansion of use of computer services in the future. Many persons expect that these services will remain static in the district, and not keep pace with new developments.

2. The "add-on" coordinator.
In some districts, an employee who already had full-time responsibilities has been given the additional task of being the coordinator. This usually occurs in a small district, where the business manager is the person who is given coordinator duties.

The superintendents of these districts favor having the coordinator's role centered in the business manager's office, mainly because they want financial services to be well-used. On the other hand, many of the school people feel that the role is misplaced; that they are being shortchanged on available services. The "coordinator" may spark the initial implementation of financial services, scheduling and mark reporting. Thereafter, computer activities seem to remain static because they become subordinate to other, "major" responsibilities.

3. Part-time coordinator with other district duties.
In some districts, the coordinator also has a part-time role as an administrator or teacher. In two cases, the coordinators serve as administrative assistants to the superintendents. The coordinators say their duties are too integrated to pinpoint the percentage of time spent solely as coordinators. This concerns both persons, since non-coordinator functions usually claimed

priority. An assistant to a superintendent can experience conflict; for example, between completing a non-computer related project for the superintendent or writing a generalized extract for a school administrator. Without a clearly defined set of priorities, this produces a dilemma. By attempting to juggle requests to please both persons, the coordinator may please neither. Superintendents want an administrative assistant; school administrators want a service person to deal with both administrative and instructional areas; teachers want an educator who has time to train them in computer use; and the coordinator wants to please everyone.

An alternative to the above is to have a teacher as a coordinator on a half-time basis. A clear division of time is feasible here: one-half in a single continuous block to classroom; the other half to coordinator tasks. In the district where this arrangement was found, most persons were generally satisfied with the coordinator role. The coordinator is thought of as a service person rather than as an administrator, and the teaching background is viewed favorably. However, a desire for additional attention to instructional areas was expressed.

Some of the disadvantages noted in such a teacher/coordinator role were that (a) classroom responsibilities make it difficult, if not impossible, for the teacher to be active in the committee structure at TIES, or even to attend meetings; (b) it may be difficult for a teacher to anticipate administrative needs because of a

remoteness from administrative decisions, or because of reluctance by administrators to allow a teacher access to certain information; (c) if a teacher does become involved in the administrative decision-making process, he or she may no longer be viewed as a colleague by other teachers.

4. Full-time coordinator.

Two types of arrangements were found where the coordinator is employed as a full-time coordinator, although certain other duties that are highly integrated with computer use may also be performed. In the first type, the coordinators are "non-educators" who report to top central administrators. In the districts where this arrangement was found, consensus opinion indicates a high degree of satisfaction with this coordinator role placement, stressing the need for a full-time person with good technical knowledge; one who reports to a cabinet level administrator who, in turn, has thorough knowledge of TIES services and administrative needs.

In two districts, the full-time coordinators are former teachers who now occupy high staff positions. Both persons have been actively involved in TIES development as well as in their district's managerial operations. And in both districts, the consensus indicates that the benefits derived from the computer services justify the investment made in the coordinator position. In one of these districts, the coordinator reports to the superintendent and is

a cabinet member--one of six top administrators in the district. His job originally was to make TIES work, and work in his district--contributing to TIES' growth and development, as well as utilzing its services in the district. He came to the coordinator position with experience in teaching and computer programming. In this district, there is general satisfaction with the placement of the coordinator role and the type of coordinator background existent. Among the opinions offered: someone with less background than the present coordinator could not understand district needs as they relate to TIES services; the skill of the present coordinator is a stimulus to others in developing innovative uses of the computer; computer services are well integrated into both administrative and instructional areas by having a coordinator who handles both. The consensus here would have the coordinator be a high-level, service-minded administrator with computer skills and an instructional background.

Obviously, there is diversity among the fifty TIES districts in the structuring and evolution of the coordinator role. Variously, some persons combine this role with primary jobs as counselors, principals, assistant principals, researchers/evaluators, etc. Time limitations excluded in-depth interviews with persons of this class.

One other arrangement, however, is of interest--the case of one coordinator who serves two small TIES-member districts, devoting half of his time to each. His status is that of a full-time employee of one district, which is reimbursed for his time by the other. This is the first

instance of such a sharing arrangement, and it may offer insights to others interested in a similar arrangement.

The coordinator had served one district for several years, and has just recently begun serving an additional district. This coordinator states that he definitely has more influence on administration in his original district than in the new one; but he feels that time-wise, he can be effectively involved in administration in both districts if both have good CRT operators. In his opinion, what is most important for the success of such an arrangement is for the "combined" districts to be very similar in needs. Where such similarity exists, and where district objectives are well defined, training time is more manageable, and he feels a coordinator can adequately handle two--or even three--small districts.

Summary

The coordinator role is vital to dynamic growth in the use of computer services. Districts must clearly define the scope of the role relative to the directions they wish to take. On that basis, they can best shape the role and select the person to best serve their needs. A wide variety of definitions of the role was found in the districts under study. The greatest satisfaction with the role, and the computer services, comes from districts where coordinators have the most time to provide services to personnel. Regardless of which role the districts have chosen, the general consensus is that the role calls for a person who is creative, is service-minded, learns quickly and continuously, likes problem-solving, and who--

in a sense--is a good sales person; that is,

a. knows the product well
b. believes in the product
c. knows the needs of potential clients, and
d. is willing to work to improve the product at the clients' behest.

Advisory Committees - - - - - - - - - - - - - - - - - - -

Over the years of TIES existence, committees have been the primary mechanism for directing development. Through the committees, valuable input has been obtained from members, and the committee participants have been able to exert a large degree of control over development. As might be expected in a cooperative, however, opinions about the appropriateness of priority setting have varied, dependent upon the degree to which individuals perceive their needs being met. It is to be expected, also, that there will be unfavorable opinions about the cooperative's priorities and development, since limited resources dictate the rejection of some requests. Based upon the interviews conducted, these generalizations would seem to be true for the TIES cooperative.

Many of the persons interviewed were well satisfied with the results of the committees' work. They work well, they said, for their districts and for their areas of primary interest. Others criticize the committees, saying that they are not fairly constituted; large urban districts, they felt, could more easily provide staff to participate in the committee structure. Others felt that the committees are dominated by a few knowledgeable, vocal persons who are adept at getting their districts' needs met. Still others felt that because teachers and others with instructional interests are not adequately represented, applications more directly related to the classroom teachers are subordinated to administrative applications. One interviewee pointed out that it is more difficult for a district to release a classroom teacher to attend meetings, since he or she would have to be replaced by a

substitute. Each district decides for itself whether to participate in committee work, and if so, designates who the participants will be. Persons who cannot release themselves can attend meetings only with administration approval. Several of the interviewees claimed that this results in over-representation by "administrative types" not sensitive to the needs of clerks, secretaries and teachers.

Many of those interviewed seemed to have no knowledge of the advisory committee structure. In fact, many did not know that the committees existed. Most of these came from the school level--teachers or elementary principals. Teachers, especially, have little knowledge of TIES committee structure. They are not involved in governance through the Board of Directors, the Functions Committee, or the various administrative application committees.

In summary, it seems that while most people are satisfied with the advisory committee structure and accept life in a cooperative as a necessary compromise, others feel rather strongly that the present committee structure cannot fairly determine TIES' priorities. On the other hand, those who have served say that membership and participation is the best way to acquire full understanding of an application area, and to keep abreast of new developments.

Training, Assistance, and Manuals - - - - - - - - - - -

The scope of use, and the concomitant value/impact of computer-enhanced administrative applications and services relate directly to the level of awareness, knowledge and understanding that school people have of these applications and services. If, for example, a school administrator is aware of an application, knows how it functions and understands how it can be applied to a particular situation or problem, the application is likely to be used and to have a beneficial impact; i.e., help solve the problem at hand. Conversely, where awareness and understanding are absent, the application is not likely to be used. Or, if knowledge and understanding are fragmentary, and an application is used to tackle a problem, it may not produce the desired result--thus causing frustration, and even antagonism.

Awareness, knowledge and understanding, in turn, are dependent on the training and user support structure offered by the agency providing the services. If training support is inadequate; or if the user's perception of it is unfavorable, the use and ultimate value of the entire system is diminished accordingly. Because of the importance of training support, this study includes an evaluation of the users' perception of the TIES training programs.

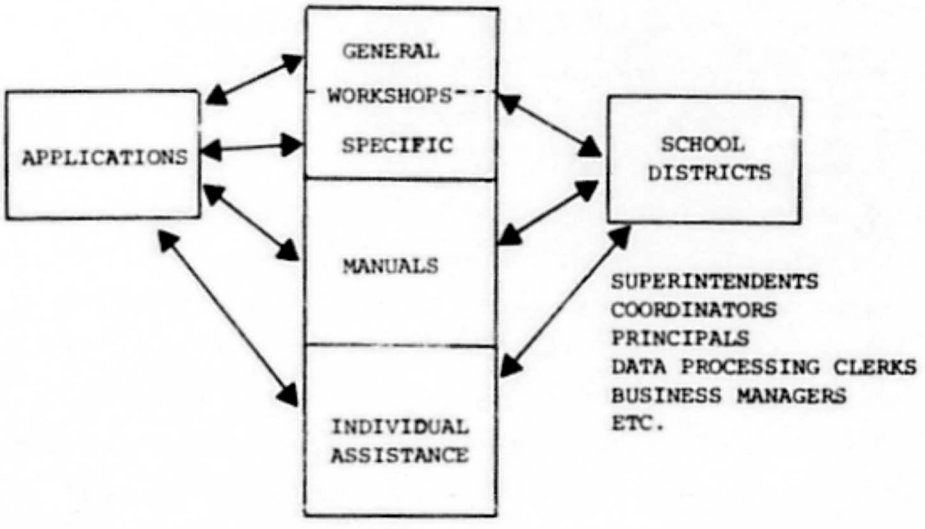
TIES provides both general and specific training services. General training is aimed at developing awareness of available applications, and how these applications relate to the functioning of a school district. Specific training is directed to operational level staff, and is designed to prepare people to work with and apply a given

application. General and specific training is provided in workshop or seminar format with TIES staff or knowledgeable district personnel serving as instructors. During the 1976-77 fiscal year, over 1,400 employees from TIES-member districts attended the 76 workshops that dealt with administrative applications.

This training approach is supplemented by a series of written manuals which describe the structure and operation of each application. In addition to the manuals and the training workshops, individual assistance is available to school districts upon request. This three-level training and support structure is shown below.

FIGURE 3

TIES TRAINING AND SUPPORT SYSTEM



The majority of persons interviewed were satisfied with their current knowledge of TIES services. As might be expected, the coordinators have had the most extensive training, and they are generally the most knowledgeable persons in the district about computer services. Most of them appear to be quite satisfied with the training and assistance they have received from the TIES staff. All have attended both general and specific workshops in the past, and many still attend sessions fairly regularly. While giving full credit to the value of workshops attended as new coordinators, they attribute even more importance and value to self-study, "hands-on" experience and individualized assistance from TIES staff. A point is made that a workshop directed to coordinators from many, differing districts cannot penetrate deeply into the unique needs of any one district. Coordinators like the fact that service staff are non-technical people who generally come from an education background. They are--by general consensus--open to questions and talk the coordinators' language. This results in better mutual understanding and better communication.

Most business managers, accountants, bookkeepers, CRT operators, secondary administrators and researchers have received training in the use of TIES services for their specific areas. But this training, as a rule, has been confined to these areas of specific responsibility. For example, an assistant principal responsible for scheduling would tend to learn only the scheduling service. While nearly all these people express satisfaction with the training they have received, and with individual help forthcoming from TIES staff as called for, a few would like more training in order to acquire a broader knowledge of available offerings.

People not directly responsible for specific administrative applications offered by TIES receive less training. The scope of their duties require no direct interaction with TIES, so they have only a sketchy knowledge of available services. Some superintendents, other central office administrators and elementary principals would fall into this category. Several of them have made judgments as to the relevance of applications for their districts lacking sound information about such applications. A number have expressed interest in attending workshops to learn more, but most feel they have sufficient general knowledge of what's available, and can turn to the district coordinator for answers to questions they may have.

There are individuals in TIES-member districts who have chosen to explore computer applications beyond those pertaining to their areas of responsibility. And they have expended considerable effort to learn more. Coordinators have helped greatly in these efforts, as have the manuals and assistance from TIES staff. Motivation often derives from a perceived idea for a new or peripheral application, and they have looked to the computer as a tool, seeking the knowledge on how best to use it. And even if the computer turns out to be inappropriate for that particular project, the acquired skill enables them to make rational decisions about its appropriateness in the future.

TIES staff have developed technical manuals, centered around specific applications, for every major service offered. They are detailed "how to" books that, for example, instruct schedulers how to use the scheduling service; accountants how to use the financial service, and so on. These manuals are well accepted by those

working in the areas covered. They may, however, be too technical for those who are not involved in the daily aspects of computer use. An implicit desire was evident for more general type manuals: for example, one designed for elementary principals that would show how the computer might be used to record student mathematics scores, and then group such students by scores and other facts; or a "manual" for secondary school administrators showing, for instance, how the computer might do the record keeping for locker assignments; or a manual for counselors offering general information on the different ways that students can be sorted for reference lists--thus obviating the necessity for reading highly procedural manuals to obtain such information.

The need was expressed for information about what is being done in other districts, what could be done, what tasks would have to be performed to implement specific ideas, which data files would have to be tapped, and how long it would take to do the job. While it is true that, in many districts, the coordinator provides this kind of information to interested personnel, not all coordinators appear to have the time, knowledge or the desire to do so.

Summary

The training and support structure at TIES includes general and specific training services and written manuals. District employees who have responsibilities directly served by the administrative applications have received considerable technical training in their use, and are generally satisfied with both training and manuals. Persons removed from direct contact with applications usually do not receive this kind of technical training. Some have

been exposed to instruction covering TIES offerings; but most have not, nor are they interested in such training.

Costs

Costs to Districts -

As stated earlier, the TIES central facility is totally funded through membership fees paid by its member districts. For the school years of 1976-77, this fee was $8.75 per student enrolled as of October 1, 1976. In addition, cooperative members incur operating expenditures within their own districts. These include salaries of coordinators, CRT operators, expenses associated with terminals and telephones, local equipment maintenance costs, etc.

Table 7 displays these costs over the past three years, based on the Pupil Unit concept which is used in Minnesota to allocate state funds, and to determine local tax levies. (Pupil Units are calculated as follows: Kindergarten, one-half; grades 1 through 6, one; and grades 7 through 12 as 1.4 pupil units.) The table also shows these costs as a percentage of the total dollars spent for education. Only figures from districts who have been TIES members for at least two years are included.

The source of these cost figures is a yearly study carried out by TIES Research Staff, and reported in the TIES Annual Report. Each district is asked to provide an accounting for all expenditures related to the computer services they receive.

It should be noted that the listed district expenditures include those for both administrative applications (Information Services) and for instructional timesharing. While a detailed separation of the two categories of cost is not available, an estimate of the percentage breakdown was obtained. From 75 to 85 percent of the districts' total computer-related expenditures are estimated to be for the administrative applications.

TABLE 7

COMPUTER SERVICES COSTS COMPARED
TO TOTAL COST OF PROVIDING EDUCATION

	1974-75	1975-76	1976-77
Number of Districts	30	38	38
Enrollment	225,899	242,064	238,156
Pupil Units	261,928	280,756	279,000*
Mean Total Cost/Pupil Unit	$1,367	$1,507	$1,640*
Mean Operating Cost**	$956	$1,034	$1,120*
TIES Membership Fee/Pupil Unit	$6.72	$6.72	$7.48
In District Costs/Pupil Unit	$4.24	$4.07	$4.02*
Total Cost/Pupil Unit	$10.96	$10.79	$12.40*
TIES Membership Fee as Percentage of Total Costs	0.49%	0.45%	0.46%*
TIES Membership Fee as Percentage of Operating Costs**	0.70%	0.65%	0.67%*
Total Computer Services Costs as Percentage of Total District Costs	0.80%	0.72%	0.76%*

* Estimated

** Operating Costs do not include expenditures associated with community services, transportation, capital outlay, debt services and federal dollars spent. In Minnesota the foundation aid program is related to Operating Costs not Total Costs.

Central Facility Expenditures - - - - - - - - - - - - -

Along with the study of member districts' costs, a study of internal expenditures at TIES was made. The study involved the analysis of eight years of data on expenditures.

Four categories of expenditures were identified including:

People costs

Equipment costs

Support costs

Building costs

"People" costs include such items as salaries, fees for consultants and others on contract, pension plan costs, insurance and others. "Equipment" costs include rental, lease or term payment and maintenance expense for the computers and associated hardware. "Building" costs are those associated with housing the TIES staff and equipment. "Support" costs are all the other costs not included in the other three categories, the largest of these being that for contracted services such as delivery, legal, audit, and keypunching. This category also includes utilities and telecommunication costs for the computer system and supplies for operations. Percentages of total expenditures were computed for each category for each of the eight years.

Table 8 summarizes these data.

It is important to note that "People" costs for TIES staff constitute the largest share of the budget. It must be reiterated that the coordinators are not included in this "people" cost since they are employees of the individual member districts.

TABLE 8

CENTRAL FACILITY EXPENDITURES

	PEOPLE COSTS % OF TOTAL	EQUIPMENT COSTS % OF TOTAL	BUILDING COSTS % OF TOTAL	SUPPORT COSTS % OF TOTAL
1969-70	40.8	35.0	5.1	19.1
1970-71	42.6	35.3	4.4	17.8
1971-72	42.1	30.3	4.0	23.7
1972-73	40.7	32.6	4.9	21.8
1973-74	40.2	36.0	4.5	19.3
1974-75	44.2	33.8	2.5	19.5
1975-76	44.9	30.2	1.9	22.9
*1976-77	47.7	31.0	1.4	20.0

* Estimates based on expenditures through May 30, 1977. Total expenditures for the 1976-77 fiscal year were approximately $2,500,000.

The downward trend in percentage expenditures for equipment reflects the industry-wide experience of more processing power per dollar.

Building costs declined considerably over the eight-year period. During the 1973-74 school year a decision was made to buy the TIES building rather than continue to lease facilities. This decision is reflected in the percentage figures for the subsequent years.

Support costs have remained at a fairly constant percentage of the total cost from year to year.

Summary

The total expenditure for computer-related services in the districts--as the cost data indicate--represents about 0.75 percent of the educational budget. Of this, 75 to 85 percent of what is spent for computer services is for administrative applications, with the remainder going for instructional services.

The largest portion of internal expense at the TIES computer center is for "people" costs.

CONCLUSIONS

CONCLUSIONS

Introduction

This study has investigated the availability, use, and impact of computers in the administration of schools and school districts. The perceptions of a large number of experienced users of administrative computer applications have been reported.

Availability

Through the computer-based information system, the members of the cooperative have available a wide variety of administrative applications. Most of the applications are designed to meet operational control functions in the districts. These were the first applications the districts developed, and they remain the core of available services. This pattern of availability seems to be similar to that found in other educational, as well as business-oriented, organizations. Applications that are more closely related to management control and strategic planning were found less frequently. However, after several years of experience with computer technology and computer-based information concepts and applications, some users have reached a higher level of sophistication, and they are actively engaged in the modification and development of more applications that facilitate strategic planning.

Since the districts under study share the same computer-based information system, the applications that are available for the most part reflect the desires and

Use

As might be expected considering what is available, the greatest frequency in the use of applications is at the operational control level (payroll processing, progress report printing, etc.). Functions at this level tend to be performed on a regular basis, so the frequency of use of the applications is quite high. The frequency of use is less as one moves toward the strategic planning level of functions. The matrix on page 158 shows examples of use at the three levels, grouped as to whether the use primarily affects functions relating to students, curriculum, personnel, facilities/equipment/supplies, or finance.

Several reasons are offered for the lower frequency of application use at the management control and strategic planning levels of operation. These are:

1. Major decisions made and tasks performed (particularly at the strategic planning level) are of a more long-range nature and naturally occur with less frequency.
2. The tasks to be performed, and the decisions made must incorporate many factors other than just computer-produced information. It is difficult, if not impossible, to know exactly how decisions are made. For example, the study cites many instances of use of computer-produced information at management control and strategic planning levels. Census data were especially noted as being key ingredients in important decisions. But it is difficult to assess the relative weight of such data to the decision-makers. Experience, judgment and political considerations are other factors in the process. Since, therefore, the computer-produced

FIGURE 4

EXAMPLES OF USE

	STUDENTS	CURRICULUM	PERSONNEL	FACILITIES/EQUIPMENT/ SUPPLIES	FINANCE
STRATEGIC PLANNING	- Enrollment Projection	- Use of follow-up studies of graduates to aid curriculum content decisions. - Studies of curricular goals of community and staff.	- Census data used to plan future staff needs. - Seniority lists.	- Census information for projecting school needs.	- Census information incorporated into finance projections. - Expenditure and Revenue Forecasting.
MANAGEMENT CONTROL	- Statistics on students/families (summarized). - Enrollment Projection --school level. - Mark distribution analysis (looking at students). - Statistics on male/ female sports participation.	- Mark distribution analysis (looking at subjects). - Assistance with evaluation of basic skills programs.	- Salary schedule simulations for contract negotiations. - Mark distribution analysis (looking at teachers). - Information for staffing changes. - Determining staff development needs.	- Census data for school closing and construction decisions, and boundary changes. - Equipment and supplies allocations based on enrollment projections.	- Enrollment projection used to decide on resource allocation. - Budgetary development and control. - Exception noting-- 90 percent spent.
OPERATIONAL CONTROL	- Mailing lists and labels. - Statistics for reports. - Record keeping. - Honor point lists. - Report cards. - Incompletes lists. - Failures lists. - Rank ordering. - Annual attendance report.	- Class lists, student programs. - Scheduling students into classes. - Aid in building master schedule (conflict matrix). - Teacher prepared test scoring. - Inventory of media resources, sorted by subject, grade level, etc.	- Personnel records. - Leave lists. - Seniority reports. - Information for state and federal reports. - Employee directories.	- Locker lists.	- Monthly financial reporting. - Payroll processing.

information is not the sole basis of any complex decision, it must compete with several other important factors, and its frequency of use is not high at the upper management levels.

3. Since many decisions made at the higher management levels are dependent upon external factors that administrators cannot control, the critical information for these decisions must deal largely with the "outside world". For example, a district's future funding and facilities needs are directly influenced by population growth trends. Except for enrollment and revenue projections, there is very little computer-produced information that can be used to analyze community trends, make comparisons with other organizations, etc.
4. Certainly, there are many high-level administrative decisions made that require information about a district's internal operations. Decision-makers want summary information, reports of exceptions to normal operations, and trend information. Currently, such information is, as a rule, compiled manually at a lower operational level, although some coordinators are effectively using generalized extract for this purpose. Decision-makers who are recipients of information compiled in this way place high value on it, and are demanding an improved capability to produce it more easily than can be done through generalized extract. It is the production of this type of information that seems to offer the greatest potential for the use of the information system at higher administrative levels.

Impact

It is evident that the available applications are used to perform a great variety of important tasks in the districts. As a consequence, the impacts of computer use are found throughout each district, although not to the same extent in every district. While some persons would like to see changes made regarding which applications should be available, and the procedures for using them, very few persons feel that computer use is producing unfavorable impacts in their districts. On the contrary, most see the computer as a tool that is performing and supporting many vital tasks; a tool that they would not want to do without. The computer enables them to perform many tasks that would not be performed otherwise.

Table 9 lists the major impacts that were identified during the study. As the list demonstrates, significant favorably-perceived impacts were found to exist over a wide range of activities performed in the management of the districts. Few unfavorably perceived impacts were determined. In some of the high-use districts, nearly every impact noted in the table was evident.

Most of the impacts affect functions at the operational and management control levels. At the strategic planning level, the most significant impact is that accurate, timely, and comprehensive census data are enabling administrators and school board members to better anticipate changes in enrollments. Since for many districts the decline in enrollment is the root of most of the major problems that the districts face, the accurate, timely and comprehensive census data are very valuable to the top decision-makers. Because financial

TABLE 9

MAJOR IMPACTS

Students

1. More accurate projections of student enrollments are produced. Many persons felt that the projections have led to better planning in many facets of district operation.

2. Time is saved in obtaining and reporting student statistics.

3. Student/family census records are more accurate.

4. Special lists and labels can be developed more easily.

5. A great deal of time is saved because the annual attendance report is done automatically.

6. In many cases, more time elapses between the end of a term and the distribution of student progress reports. This is seen as an unfavorable impact by some teachers and administrators.

Curriculum

1. Scheduling of classes can be done more often during a school year.

2. More electives can be offered.

3. More classes of varying lengths can be offered.

4. Building, testing, and altering the master schedule is facilitated in schools that have complicated schedules. In some schools with less complicated traditional schedules, the impact is viewed as less favorable, or even unfavorable.

5. The mark reporting application produces lists that save time.

6. Mark distribution analysis is made possible. This allows teachers to more easily evaluate their own grading practices.

7. The scoring of teacher-prepared tests saves time and provides teachers with item analyses, which usually have not been calculated in the past.

8. Follow-up studies of graduates, and studies of curriculum goals, aid content decisions.

Personnel

1. Accurate enrollment projections have enabled districts better to plan ahead for district staffing needs, and reduce the trauma associated with staff cutbacks.

2. Time is saved in maintaining and accessing personnel records and lists.

3. In some districts, seniority and certification lists were developed and disseminated for the first time. The lists have helped inform personnel as to the probability of their being put on unrequested leave of absence.

4. Personnel data are consolidated into one office. This has led to more accurate record keeping and better coordination.

5. Data are more easily rearranged in many ways for reports. Some have found this capability to be particularly valuable for reporting to external agencies.

6. More alternative salary schedules are computed and studied both before and during contract negotiations. Thus, negotiating strategies and decisions are based on more complete information.

Facilities/Equipment/Supplies

1. Accurate, detailed, and accessible census data have greatly helped some districts to determine school construction or closing needs. Some major facility decisions have been based upon the census data.

2. It is easier to convince the public of facility needs because of the good census data.

3. Significant cost savings can be realized in the area of transportation of students due to more efficient bus routing.

4. The allocation and accounting of equipment and supplies are improved because of better financial and enrollment projection data.

Finance

1. More line items can be included in the chart of accounts. Thus, expenditures can be broken down into more specific categories.

2. Financial reporting is more flexible, because expenditures can be grouped in many ways.

3. Decentralization of budgetary development and control is made more feasible because personnel receive accurate, detailed and relevant budget information.

4. Time is saved in the business office because of automated bookkeeping. However, most persons responsible for individual budgets at the school level must still maintain daily-updated records to supplement the computer-produced monthly report.

5. Planning is improved because financial problems can be predicted more readily. It is easier to monitor expenses and recognize exceptions to normal operation. Expenditure and revenue forecasting is made easier.

6. More timely and increased information available often leads to more timely decisions and the exploration of more alternatives before decisions are made. Nearly all administrators believe that better decisions are thereby facilitated.

7. Less "mystery" in the budget because more people understand how money is being spent and what resources are actually available.

8. More sound resource allocation to schools, grade levels and programs because of better enrollment projections.

aid is linked directly to enrollments, and because certain operating costs do not necessarily decrease proportionately with the decline in enrollment, it is paramount that declines be predicted early and accurately. Computer-produced budget information is also important to these top decision-makers as they seek ways to use dwindling resources more efficiently. In the districts that are not facing the problem of declining (or shifting) populations, the perceived need for accurate census data and consequent strategic planning information is less, and the impact of the computer in decision-making at the strategic level seems to be minimal.

Variables Influencing Overall Use and Impact

In the methodology section of this report, several variables that were considered during the process of selecting the eleven districts were mentioned. In the findings section, several differences in the nature and scope of use of computer services were evident, and the variables help to explain these differences. The most important variables and the effects on use and derived benefits were:

1. District Information System Coordinator Role

   Those districts that have invested the most time and money in the coordinator role have experienced the highest use of computer services and reaped the most benefits. Full-time coordinators who occupy high level administrative staff positions have had the greatest success in integrating the computer services into many aspects of district operations.

2. District Size

Generally, the smaller districts do not find it worthwhile to use as many of the computer services as do the larger districts. Size is also related to coordinator role in that larger districts are more apt to be able to make larger investments in the coordinator role.

3. Coordinator Background

No particular pattern for coordinator background seemed to emerge as the most desirable. More important are the less tangible qualities such as interest, inquisitiveness, ability to learn quickly, strong desire to meet the needs of users, and a willingness to work hard.

4. Number of Years of Use of the Services

Generally, the longer that a district has been using the computer services, the greater the number and variety of services used. Because the available applications affect so many different aspects of district operations, the growth in breadth and scope of use depends upon the interest and cooperation of many persons in a district. Therefore, expansion is usually a continuous, gradual process occurring over several years. While all basic services can be in operation within a year or two in a district, the integration of more sophisticated applications, and the development of uses unique to a district, come only over a long period of time.

5. Geographic Location

For the communication of data through telephone lines, location is not a factor in a district's use of services. However, turnaround time for printed material is longer for districts situated some distance from the computer center. More importantly, coordinators and other district personnel from remote districts are not able to attend workshops and committee meetings as often as they feel is necessary to gain the most benefit from the computer service.

6. District Priorities

All of the above mentioned factors affect the extent of use and impact found in the districts. However, a major underlying reason for differences stems from the impetus initiated by top administrators, by their interest and enthusiasm. Priorities that are developed at high levels determine what a district is willing to invest in time and money at the district level, and the level of use and subsequent value of the services are directly proportional to this willingness to make the necessary commitment.

Value of Computer Use

Two different levels of benefits related to computer use have emerged in this research study. First, there are those fairly observable and tangible impacts of computer use which, in the opinion of the people who were interviewed, are beneficial. For example: timesavings; more accurate and timely data; the capability to schedule classes more flexibly; the capability to decentralize budgetary development and control, and easier reporting to external agencies.

Computer use enables the districts to obtain these benefits. Without the information produced and processed by the computer, most of these benefits would not be realized.

While the evidence supports the conclusion that these types of "enabling" benefits can be obtained, the question then becomes: "so what?". Is the ability to achieve these tangible benefits of any real value to a district? Most persons interviewed feel that there is another level of significant benefits that derive from the first, and that they are also valuable. Better decision-making, better long-range planning, more effective resource management, more time to "work with people", and better educated students are claims often heard. For example, in districts that have decentralized budgetary development and control, the claim is made that by placing budget responsibilities with the persons who are closest to the "action", more effective planning and management of resources will occur. The computer enables the districts to provide personnel with the type of information that is necessary before they can be asked to be accountable for the management of their areas of responsibility. It is not known for sure that this redirection of accountability is of ultimate value to the district, although many experienced users of computer services claim that it is. The computer at least offers a district the potential to make changes that are thought to be of ultimate benefit.

Computer use, however, does not automatically produce an improvement in the quality of management in a district. For example, in school districts where careful planning is recognized as being essential for effective management, the computer becomes a valuable

part of that planning process, and better planning may result. However, computer availability does not induce an awareness that careful planning is desirable. It is not a cure for poor management practices; but it can be of immense value to the person who looks for ways to manage more effectively.

The computer is one intervening variable in the complex process of educating students. It is a tool that can help administrators, for example, to bring students and teachers together more efficiently so that learning may take place. However, no evidence was found that "better learning" is taking place because the districts use a computer to aid administrative functions.

Nevertheless, the pervasiveness of the more observable and tangible benefits, and the potential for realizing the more intangible benefits, lead us to conclude that the investment of time and money yields very worthwhile returns. In the few districts that have gone beyond use of the standard applications, and have used generalized extract and other enhancements to meet unique needs of management, the value has been even greater. They have effectively expanded the basic computer-based information system into a computer-based <u>management</u> information system. The expanded system has increased value because it meets the information requirements of a broader spectrum of district personnel.

It is important that potential users of computer-based information systems understand what such systems can and cannot do for their districts. If they "buy into" such systems solely because they expect to reap the more intangible benefits, they may have difficulty in the future justifying the investment. However, if

they attempt to justify the investment on the basis of the more tangible and observable benefits that are to be expected, evidence to support the wisdom of the investment should be readily apparent to both users and observers.

FOOTNOTES

FOOTNOTES

[1]Bukoski, W. J., and Korotkin, A. L., "Computing Activities in Secondary Education," American Institutes for Research, 3301 New Mexico Avenue N.W., Washington, D.C. 20016, September, 1975.

[2]Anthony, Robert N. Planning and Control Systems: A Framework for Analysis. Boston: Harvard University Press, 1965.

[3]Hentschke, Guilbert C. Management Operations in Education. Berkeley, California: McCutchan Publishing Corporation, 1975, pp. 433-442.

[4]Minnesota Statute 120.095. School Census, Subdivision 1 [1969 c 1082 s 1; 1971 c 84 s 1, 2].

[5]The Uniform Financial, Accounting and Reporting System as prescribed by State law. Minnesota Statute 121.92. Mandatory Utilization of Computer Systems; Appeal, Subdivision 1, Subdivision 2 [1976 c 271 s 34].

[6]State of Minnesota House File 1997, Section 2:23-28, page 2.

APPENDICES

A P P E N D I X A

The Minnesota School Districts
Data Processing Joint Board (TIES)

THE MINNESOTA SCHOOL DISTRICTS DATA PROCESSING JOINT BOARD (TIES)

History

In 1963-64 the superintendents of the over forty member districts of the Educational Research and Development Council (ERDC), of the Twin Cities Metropolitan Area of Minneapolis and St. Paul, developed an interest in the utilization of computers to aid in the instructional process and to facilitate the management of their schools. With the aid of funds from the U.S. Office of Education a feasibility study was set in motion. Dr. Van D. Mueller of the ERDC headed up the study. Members of the study team talked to operating personnel in all areas of school district function in over forty school districts in Minnesota. They researched all aspects of current, anticipated and desired uses of computer technology and other automated services. Visits were made to intermediate school agencies in Massachusettes, Michigan, Florida, New York, Tennessee, Iowa and California where other groups of educators were studying or developing cooperative approaches to providing services through the use of computer technology.

The report of the feasibility study was completed in November 1966. It was accepted by many of the participating local educational agencies. Nineteen of these school districts, by school board action, elected to form the Minnesota School Districts Data Processing Joint Board in order that a Total Information Educational System (TIES) be developed. The Joint Board was established through a

Minnesota statute which allowed governmental agencies with similar powers to form a cooperative agency to share these powers.

Six similar "Joint Board" operations have been initiated in Minnesota during the last three years. Every school district in Minnesota has the opportunity to become a member of the Joint Board operation most conveniently located to provide efficient service. Nationally, the TIES concepts in part or in total have been a model for cooperatives serving school districts in Mississippi, Illinois, Arkansas, California, North Dakota, Iowa, and Michigan. Recent visitors to TIES have come from twenty-five states and from the United Kingdom, Canada, Saudi Arabia, France, Holland, Australia, and Japan.

Governance

The governance structure of the Minnesota School Districts Data Processing Joint Board is unique in that the board itself is made up of professional educators and publicly appointed representatives serving in concert. The Superintendent of Schools is one of two delegates from each member district. The other is appointed by the school board and is usually a member of the school board itself; though sometimes a school board will appoint a knowledgeable member from the public at large.

This large group of individuals meets together semiannually. The day-to-day operational policy decisions have been delegated by the Joint Board as a whole to an eight-member Executive Committee elected from the Joint Board. This Committee meets monthly and is in direct charge of the total TIES function.

The Minnesota School Districts Data Processing Joint Board, as a cooperative of local educational agencies, is governed by all the Minnesota statutes pertaining to education. For example, employees of the Joint Board are public employees in the legal sense and the bidding process required for major expenditures is applicable. The Executive Director of TIES reports to the Executive Committee in much the same way as a school superintendent reports to the school board. The Executive Committee is accountable to the full Joint Board as a school board is accountable to the electorate or a board of directors of a corporation is accountable to the shareholders.

One of the major recommendations of the original study team was that the Executive Director not be a technical person, in the computer sense, but instead someone knowledgeable in education with strong management skills. This recommendation was strictly adhered to and the first (and only) Executive Director is a former superintendent of schools from one of the original nineteen member districts. This emphasis on knowledge of education and management skills has always been one of the prime requirements for employment in a senior position at TIES.

Internally TIES is organized into two divisions, the Design and Development Division and the Division of District Services. The Design and Development Division is responsible for the software and attendant matters. The District Services Division works on a day-to-day basis with the user and provides training and consultation services in the use of the many application systems available. An organizational chart of this internal structure is found on page A-6 of this appendix.

Advisory Committees

It is from the advisory committees that new system design is initiated. It is their responsibility to assure that an application, when implemented, works and is useful. It is these committees that recommend priorities for design and development within application areas, and who, along with staff members, negotiate for the means to meet development needs. This point must be emphasized: it is the member districts, through the committee structure, who actually determine priorities; who shape the course of the total program; and who, within the parameters of available resources--both people and money--exercise major control over development.

The work of the user advisory committees does not end with the setting of priorities. They are part and parcel of the whole development process, providing insights into how an application system would be used within a district, helping design usable reports, giving advice on suitable algorithms to be used, and serving in many other ways. Where necessary, other district personnel with special expertise or special needs are invited to serve on subcommittees for special projects within an application area. Day-to-day user contact is maintained through the direct interface of the District Educational Information System Coordinators and other key district personnel with the TIES staff at both the development and operational level.

Data Security

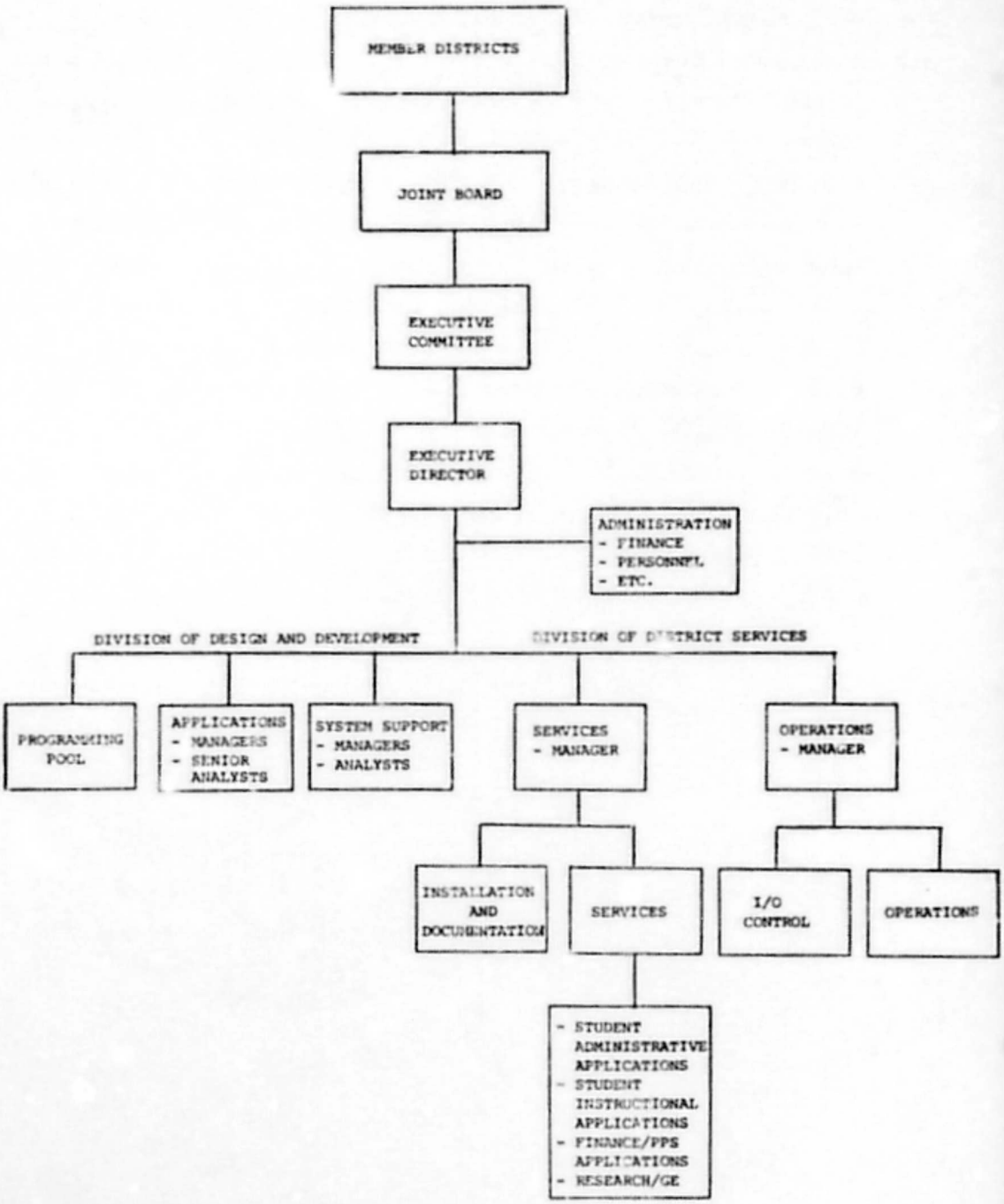
In keeping with the philosophical concept of local control over data, the TIES Data Base Management System, coupled with the telecommunications system, places the responsibility in each individual district of determining

who may access and/or update the many data elements via the CRT's. The system security has been designed to provide each member district with control over issues of data security internal to district operation.

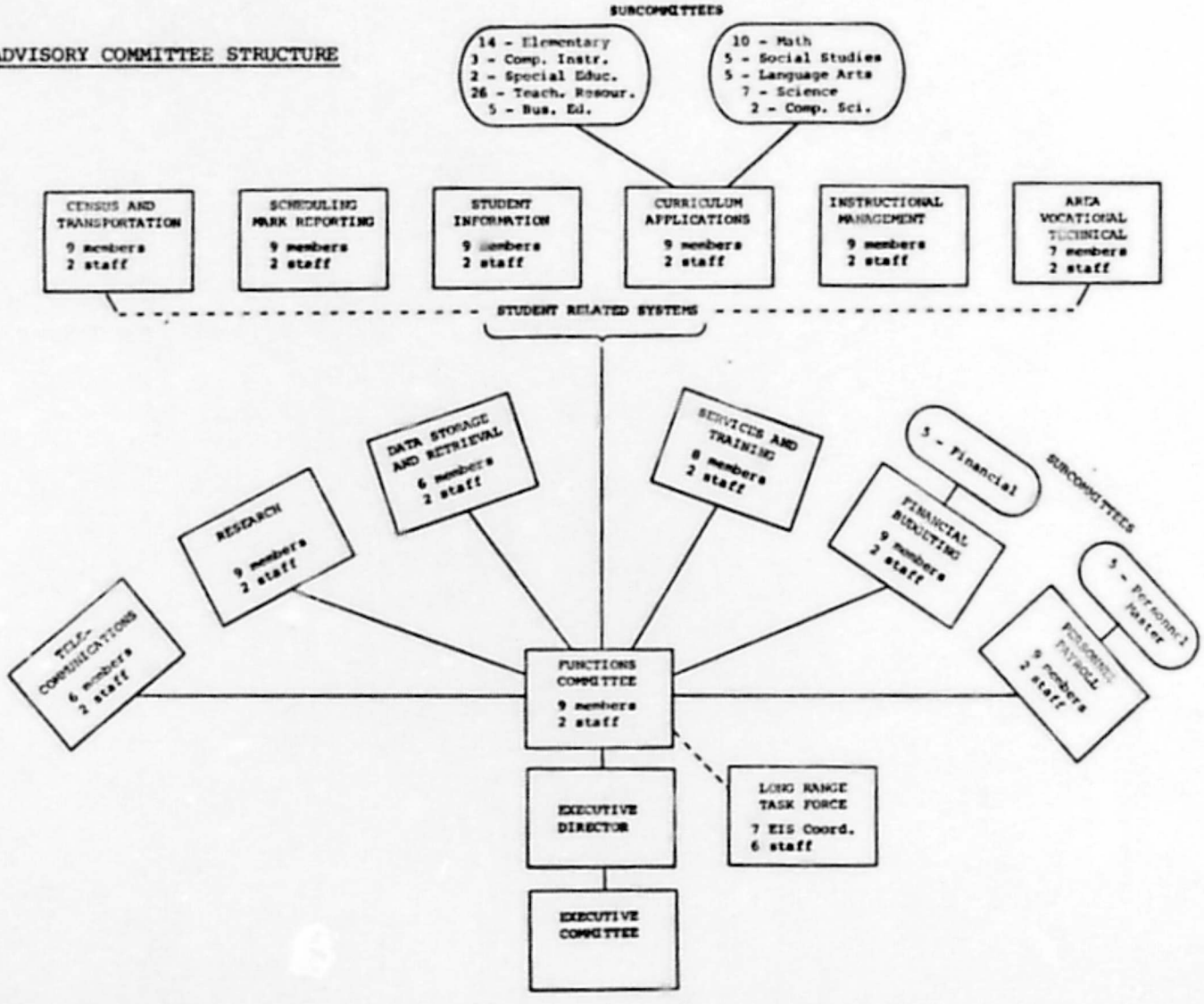
Individual district files can be accessed from designated terminals only. When a message is transmitted to the computer from a user terminal, unless the terminal identification (controlled by hardware) matches the district identification (software controlled), no processing can be done. Further, individual identifiers and code words are necessary for a terminal operator to access a particular file and get data displayed.

There are over 200 possible CRT display formats available to district personnel. However, it is not necessary that all individuals involved in the district management process have access to all files (i.e., an attendance clerk does not need access to a financial file). The responsibility for determining who can access what data rests with school district administrators.

TIES CRGANIZATIONAL STRUCTURE



ADVISORY COMMITTEE STRUCTURE

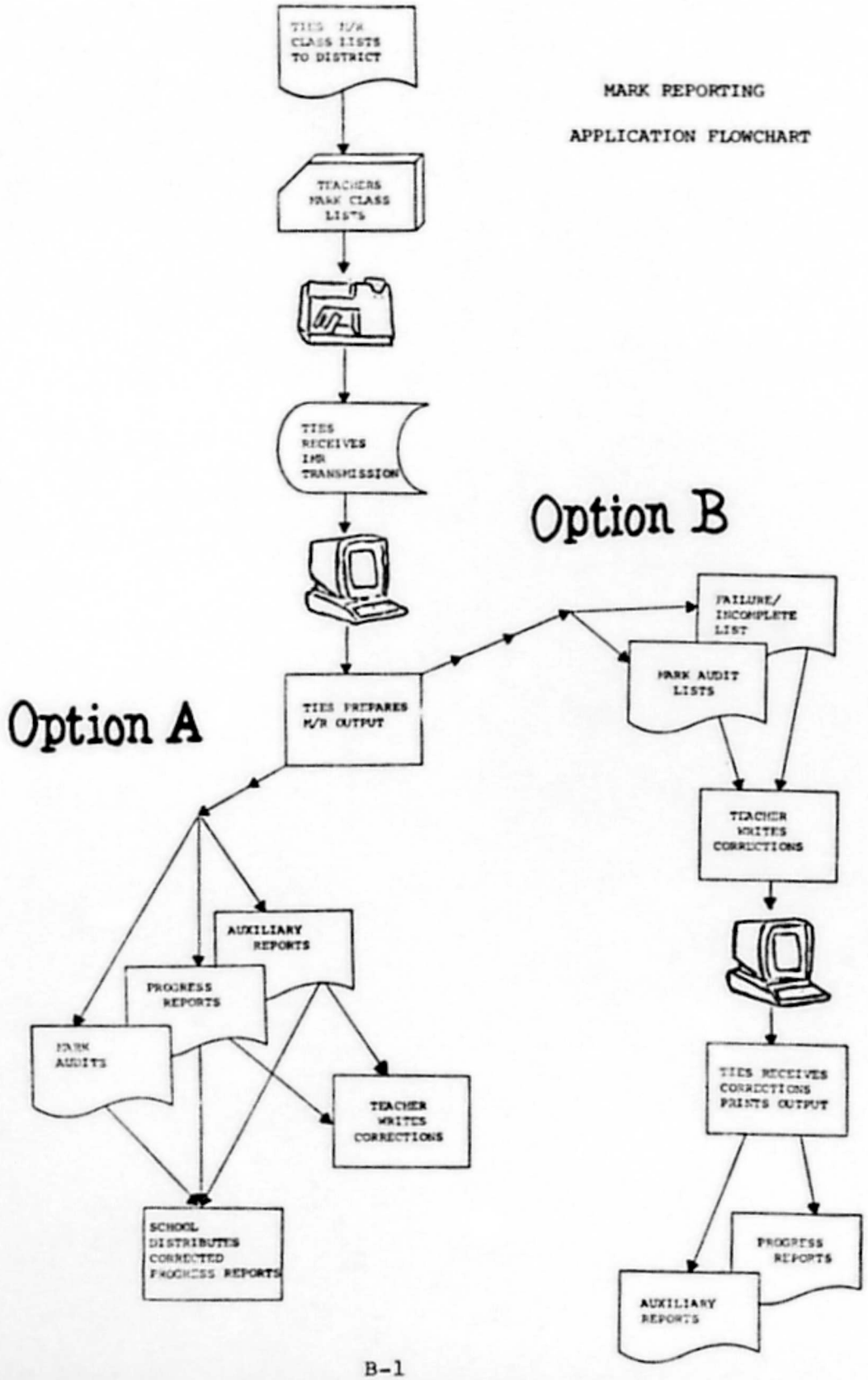


A P P E N D I X B

Selected Flowcharts and System Capabilities

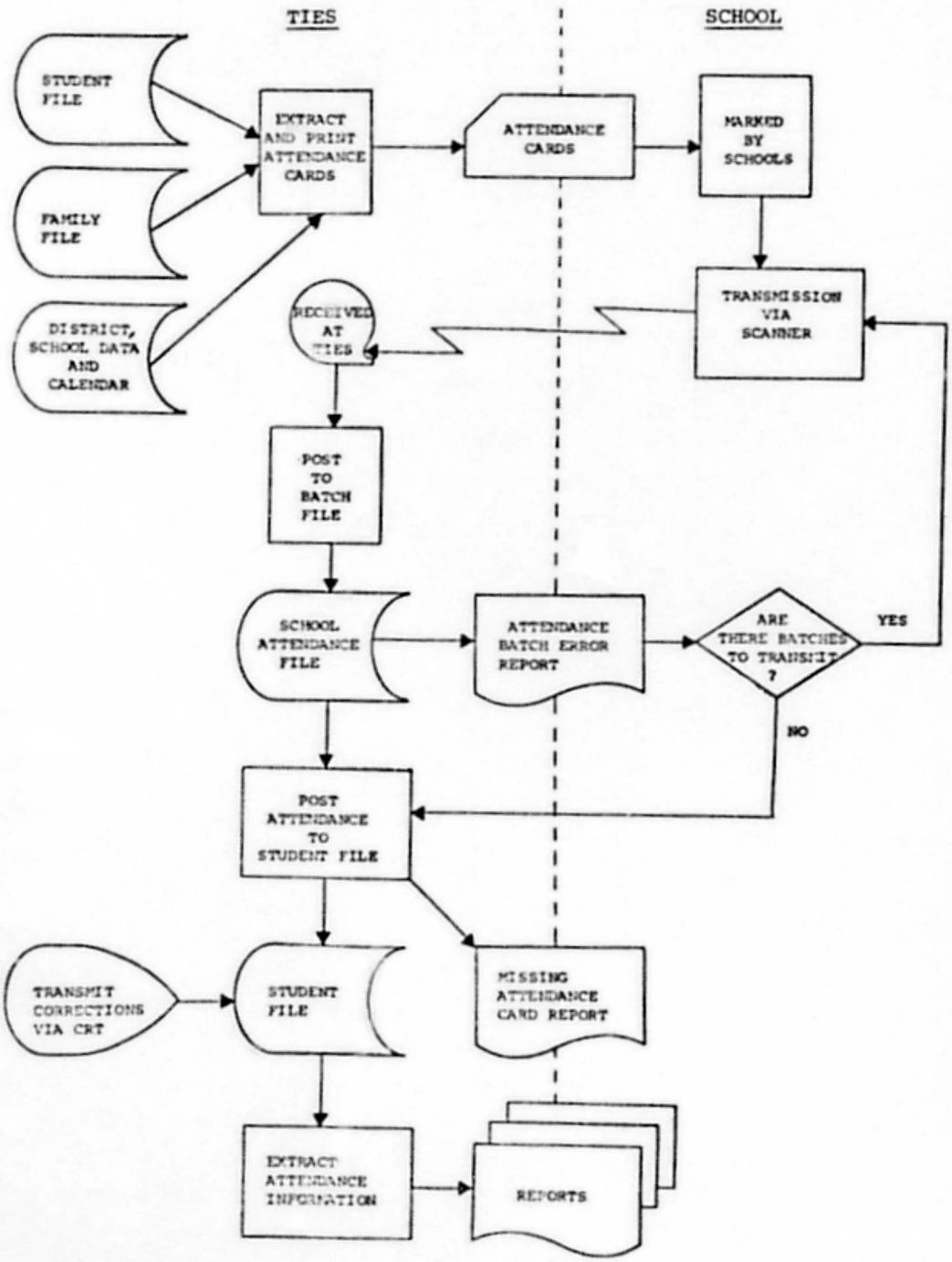
MARK REPORTING

APPLICATION FLOWCHART



ATTENDANCE

APPLICATION FLOWCHART



FEATURES OF THE SCHEDULAR

General Parameters

1. 32 modes per day
2. 1 - 10 day cycle
3. 1,000 courses of 99 sessions
4. 4 teachers per activity-session
5. 60 classes per student
6. 10 student priorities
7. 99 course priorities
8. 1 - 16 terms per scheduling cycle
9. 26 term codes

General Capabilities

1. Defining term codes and term lengths by school
2. Retaining course offerings and/or master schedule through multiple cycles (years)
3. Setting scheduling priorities on courses
4. Assigning sex designation to activity-sessions
5. Setting up one alternate per activity
6. Creating blocks of up to 10 activities
7. Tracking students through phased courses
8. Balancing activity-sessions by sex
9. Scheduling students in priority or grade order
10. Scheduling individual grades
11. Providing computer produced course request cards
12. Assigning teacher-counselor and/or homeroom to students
13. Adding or deleting common courses and/or activity-sessions
14. Demand scheduling students into specific activity-sessions

General Capabilities (cont.)

15. Assigning one alternate per student to avoid conflicts
16. Balancing student's courses per term
17. Scheduling students into multiple sessions of the same activity
18. Filling a student's program with defined study halls
19. Reserving and assigning lunch
20. Maintaining students and courses in district via CRT