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A Study of School District Administrative Computer Functions

William Ross Murison

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A STUDY OF SCHOOL DISTRICT ADMINISTRATIVE

COMPUTER FUNCTIONS

by

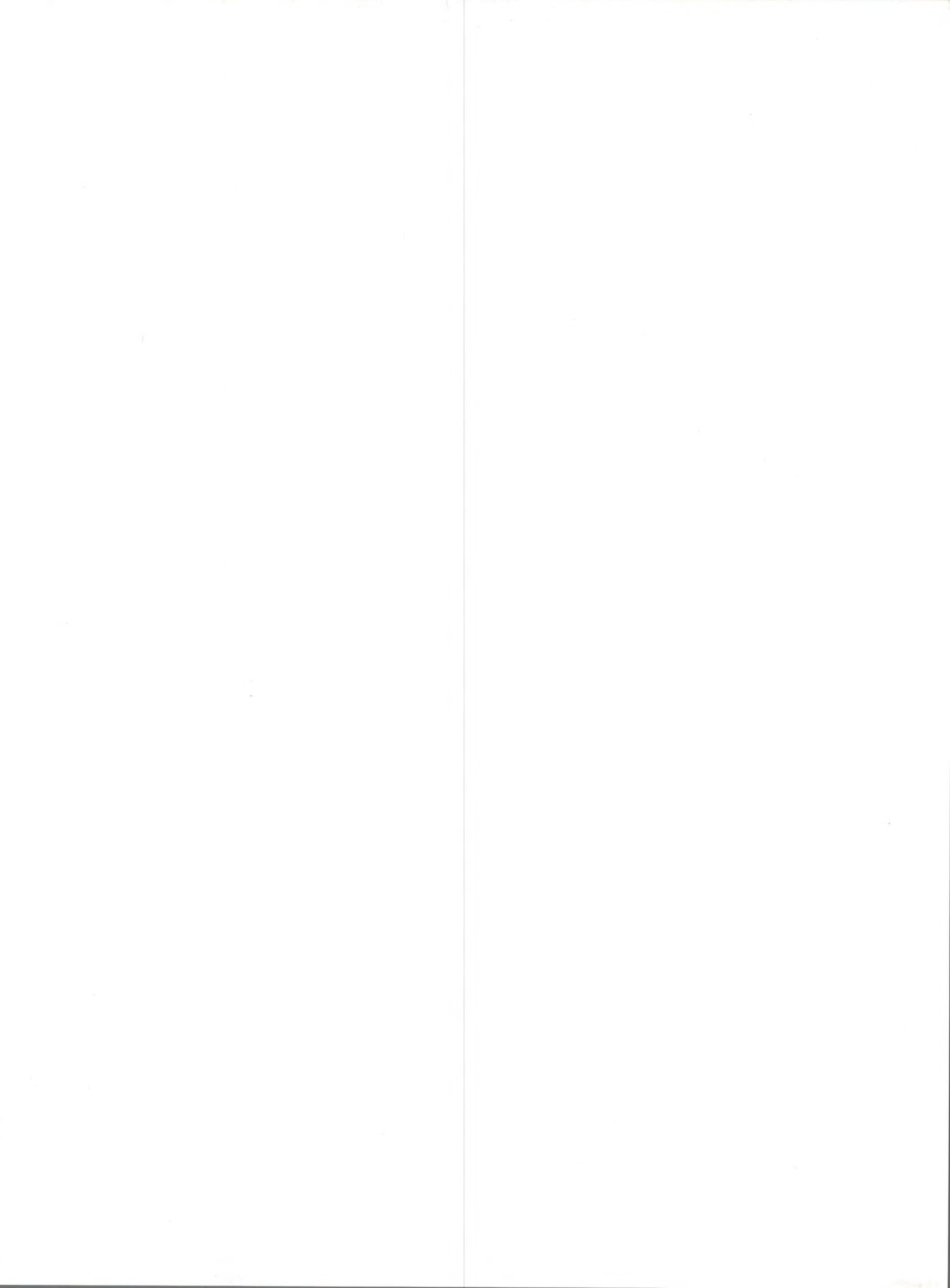William Ross Murison

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A Dissertation

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Doctor of Education

Grand Forks, North Dakota

August
1986

This Dissertation submitted by William Ross Murison in partial fulfillment of the requirements for the Degree of Doctor of Education from the University of North Dakota has been read by the Faculty Advisory Committee under whom the work has been done, and is hereby approved.

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(Chairperson)

This Dissertation meets the standards for appearance and conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

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Dean of the Graduate School

<u>Permission</u>

Title <u>A Study of School District Administrative Computer Functions</u>

Department <u>Educational Administration</u>

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Signature ___*w.R. Murison*___

Date ___*July 14, 1986*___

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ABSTRACT

The purpose of this study was to identify information to assist school district administrators in the development of a systems approach to the automation of district-level management. Research data included initial and current computer system(s), level of training, implementation procedures, problems encountered, information sources, future plans for upgrading, and general recommendations.

State education department personnel from Iowa, Minnesota, Nebraska, North Dakota, and South Dakota were contacted to identify seven school districts that used computers for administration in each of four student enrollment categories. The study was limited to districts which used IBM or Apple microcomputers and/or any brand of larger computer system. A questionnaire was sent to each district contact person identified.

Some of the most important findings were:

1. With one exception, all districts with less than 1,499 students used only microcomputers or time-share systems.

2. Consultants from outside the district were not often used. These consultants primarily assisted with staff training, recommended hardware/software, helped identify district needs, and/or determined initial district computer functions.

3. The greatest number of physical office changes involved electrical, furniture, and telephone line improvements followed by data storage changes, air conditioner installation, and structural

alterations.

4. Major start-up problems were software complexities, lack of training, staff resistance, and hardware malfunctions.

5. Major start-up recommendations involved importance of staff training, staff commitment, and good planning.

6. Apple was the most frequently used brand of microcomputer, but there was an increasing number of IBM microcomputers. Other popular equipment included Burroughs and IBM minicomputers and mainframe computers; Okidata, Epson, and Apple printers; Corvus hard disks for microcomputers; and Hayes micromodems.

7. The most popular software packages for the Apple computer were Appleworks, VisiCalc, and PFS File and for the IBM were Lotus 1-2-3 and Negotia Pak.

8. Respondents believed that microcomputers could manage files for approximately 1,500 students. This figure would vary with the types of data being processed and the types of peripherals used.

The data were used to develop a computer systems profile for each of the four enrollment categories.

CHAPTER I

INTRODUCTION

Background of the Problem

The time has come to accept the presence of computers in educational administration. At the 1965 convention of the Association for Educational Data Systems it was reported that future generations no longer would be discussing the importance or feasibility of using computer technology in educational administration but instead would be using it effectively (Anderson 1967). The primary question is not to determine whether computer technology can be applied to educational administration, but rather to determine the best method(s) for achieving the desired outcomes with computerized data in an educational environment. Business and industry have crossed the threshold of technology and it no longer seems practical nor desirable for these organizations to return to former practices. Progress in educational circles has not been as rapid although many of the administrative needs appear to be similar.

Educational administrators who are interested in and knowledgeable about computer applications for educational administration should, in the writer's opinion, be working toward improved systems design. Systems design is the working relationship between equipment, skills, techniques, and information used to achieve specific management

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objectives (Rosenberg 1984; Spencer 1980). It evolves from discussions by building-, district-, and state-level personnel. One outcome would be to reduce duplication of services within each school district and to take advantage of the immediate access to and coordination of information across district and state levels. Coordination might extend to the federal level since there are numerous programs in which the states and/or districts are accountable for the disbursement of federal funds.

As technical advances continue, there are increasingly fewer significant differences between microcomputers, minicomputers, and mainframe computers in terms of their advantages for meeting educational needs. Memory size and processing speeds on the smaller computers have been increasing relatively faster than for the larger computers and, simultaneously, prices for the newer and increasingly more technically advanced personal computer models are declining. Consequently, microcomputers are more appealing to educational administrators in smaller school districts with smaller student enrollments and can be used to perform meaningful administrative functions in all school districts. The greatest advantage for the larger systems seems to be the multi-user capabilities--a limitation for microcomputers that seems unlikely to be of importance in smaller school districts.

A factor equally important to hardware considerations in the successful application of computers in educational administration is the quality of available software. Quality software should generate meaningful information from the inputed data and take full advantage of the computer's technical capabilities. Many district administrators have employed qualified staff, capable of writing software packages

specifically designed for local district applications, but this has
been a tremendously expensive enterprise and often has had little
general applicability to other districts. Consequently, this approach
is virtually impossible for small school districts and somewhat
impracticable for most other districts.

In the writer's view, the most effective approach would be for
state officials to accept a leadership role in the development of
statewide systems standards to reduce the redundant efforts of local
school district personnel acting alone. This is currently happening
in some states such as Minnesota, New Mexico, Indiana, and Florida and
is being considered in other states. Unfortunately, as the writer sees
it, in most states individual school district personnel are experimenting
with little or no coordination or collaboration between other school
systems or state agencies.

Another concern is the need for technically qualified personnel
in school districts capable of fully utilizing district hardware and
software. This concern has become increasingly apparent as school
district administrators computerize a greater number of administrative
functions and gradually become dependent upon the proper and efficient
operation of the computerized system. School district administrators
should be cautious when considering the employment of such persons.
It is the writer's view that these persons should be educators and not
strictly technicians and they should be certified as school
administrators. Such persons responsible for the processing of student
and employee data should be sympathetic to the use of such data.
Rosenberg (1984) referred to such people as systems administrators.

There are additional concerns held by certain school district administrators in regard to the use of computers about which many other district administrators may not be aware. These include questions regarding legal and ethical considerations in the processing of data which often go unanswered until someone challenges an apparent violation. Unauthorized external access to stored data by such means as modems is a new and growing concern for some administrators. This may be a serious problem in the future as more students improve their technical computer skills and attempt to access and/or alter educational data for reasons of spite or challenge. The rapidly developing knowledge of computer technology and the ease with which voluminous amounts of information can be quickly accessed greatly increase the opportunities for abuse. Old file-handling attitudes where paper files have remained relatively secure using "filing cabinet" technology are no longer suitable with computer information storage requirements in the "electronic" office. As a result of the ease of access by computer-curious enthusiasts or the careless handling of information by district office staff, the need for new security techniques has increased manifold.

The task of transition will not be easy. In a report presented to the sixteenth annual convention of the Association for Educational Data Systems in 1978, Hanson, Klassen, and Lindsay (1978) reported that the use of computers does not automatically improve the quality of management in school districts. They can be extremely effective in school- or district-level management for those who view their use as a "means to an end and not as an end in itself" (pp. 43-44).

Need for the Study

Many school district administrators have sought information regarding the establishment of computer applications to meet their administrative needs. They have been frustrated by the lack of available information. Numerous research studies focused upon instructional applications and journals were replete with articles expounding the latest technology or application, but only a few research studies or journal articles focused on educational administrative needs. Research that focused upon administration generally centered upon unique hardware and/or software applications such as statewide systems of accounting or upon single-district applications. Only a limited number of studies appeared to the writer to be useful in providing district administrators with meaningful information on school district administrative computer operations.

Another limitation of many studies for educational administrators was the lack of distinction between demographic variables such as student enrollment and district wealth and discussion of computerized administrative practices. Individuals looking for more information from research studies wanted to find something that could be applied to their own district with reasonable modifications when necessary. Too often research results have not appeared to be applicable to other school district situations because no consideration was made of the volume of data that needed to be processed, nor the districts' ability to afford particular computer systems as might be determined by per pupil expenditure. Without enough detail to distinguish between different school district sizes and wealth, the information from many studies has not been helpful to district officials

who are looking for information from district experiences similar to their own.

Sporadic development of applications software, combined with the increased proliferation of computers, added to the confusion and fear of those who were already uncomfortable with the technology. At times this fear may have been reflected by educational administrators through negative attitudes about computers and their value to educational administration. Administrators needed information detailing complete organizational structures of systems hardware, software functions, and personnel requirements in order to provide increased understanding of the potential value of computers.

Financial considerations have forced school district officials to be prudent in their spending. Changing established and generally satisfactory accounting, payroll, personnel, or other office procedures over to a computerized system was not often a priority item. These officials needed to be fairly certain of what they were doing and aware of the types of problems they would encounter.

Many state departments of education personnel have refrained from exercising any leadership in this area. As state officials demanded greater amounts of data from local school districts, and the trend appeared for even more local data to be submitted, it only seemed reasonable to expect them to help simplify the process by providing assistance in finding more efficient methods of resolving the information burden. This had just begun to happen in some states as state data systems people attempted to establish uniform accounting procedures which could be utilized through statewide computer networks.

Towards this purpose, some states have local district personnel submit data electronically to regional centers previously established throughout the state. To date, the most established means of data transmission has been via district terminals connected to regional service agencies or state education department host computers; but recent innovations have included the mailing of floppy diskettes or the direct transmission of data via modems.

More information regarding computerized administrative practices is necessary before local administrators can commence to adopt automated methods. A study of these practices in school districts that have been in the vanguard of administrative computer applications will help to fill a portion of this information void.

Purpose

The initial purposes of the study were to identify the following: (1) problems and influences initially experienced by school district administrators during the introduction of computerized administrative applications, (2) sources of information and support for school district administrators during the initial stages of planning for the implementation of computerized administrative functions, (3) initial computer hardware purchased and general types of software used by school district administrators, (4) training provided for administrators and support staff in the use of computers and associated software, (5) perceived strengths and weaknesses of the implementation process used by district officials, (6) computer system or systems selected in school districts, (7) future plans for upgrading the current school district computer system, and (8) recommendations regarding the planning and implementation of district computer systems.

Another purpose of this study was to utilize the preceding information to develop a computer systems profile for each of four school district enrollment categories: less than 300 students; 300 to 1,499 students; 1,500 to 2,999 students; and 3,000 to 10,000 students. These profiles included a basic set of criteria for school district personnel to consider when deciding whether or not to become involved in using computers to carry out administrative applications on a first-time basis or to revise the computer system currently in use. The profiles were also designed to account for the different computer needs in school districts with various student enrollments.

Delimitations

The following delimitations have been recognized:

1. All references to instructional uses have been omitted other than the occasional reference to the meaningful unity of administrative and instructional applications.

2. There were several specialized but administratively related functions in the use of computers at both school and district levels that have been omitted in this study. Examples of areas excluded were special education and specific school functions such as library and student council.

3. Where districts were using only microcomputers, the decision was made to limit the study to those districts using only Apple and International Business Machines (IBM) microcomputers. The Minnesota Education Computing Consortium (MECC), an influential organization in the production of software in this region, has supported both Apple and IBM microcomputers for administrative purposes.

4. The study was delimited to the five north central states of Iowa, Minnesota, Nebraska, North Dakota, and South Dakota because of the proximity of these states within the region and their primary dependence upon Apple and/or IBM microcomputers.

5. Hardware and software technology has changed so rapidly that systems capabilities may have been further enhanced by the time this study was completed and the information would not, therefore, truly reflect what would be technically possible at that time.

6. The results of this study were limited in application to the northern plains region of the United States and may not have been applicable to other regions of the country because of hardware preferences and/or state and/or district organizational structures.

7. Since this study was designed to provide information to those administrators who may have felt somewhat uncertain about computer applications to educational administration, the general approach to the study has been nontechnical and may not have been detailed enough for the more sophisticated user.

8. The survey instrument was designed for this study and has not been tested for reliability in any other study, although it was tested by a microcomputer class for readability and by a panel of computer-user educators for face validity and content validity.

9. Due to the need for brevity in the length of the questionnaire, it was necessary to limit the number of questions which, in turn, limited the comprehensiveness of the data collected.

10. Because the persons completing the questionnaire were from districts identified as more advanced in the use of computers, certain individuals may have been more enthusiastic about computer applications

in educational administration than other administrators and may have had a tendency to bias their results in support of the procedures, equipment, and software used in their districts.

Assumptions

The following assumptions have been made regarding the study:

1. State agency officials carefully and appropriately selected school districts that met the criteria established for the purposes of the study.

2. District personnel completing the questionnaire gave accurate and candid responses to the questions being asked.

Definition of Terms

Bit. A binary digit (0 or 1). The basic element of any binary code, including the binary number system.

Compatible. A characteristic of a computer system that enables it to handle both data and programs devised for other computer systems.

Computer Managed Instruction (CMI). A process by which computer technology is used to record, analyze, and report information concerning the performance of students working in an educational environment.

Computer system. A functional unit, consisting of one or more computers and associated software, that uses common storage for all or part of a program and all or part of the data necessary for execution of the program.

Computer systems profile. A description of the characteristics of computer systems (including hardware and software), personnel, and

facilities in each of four enrollment categories used in this study. These characteristics were judged to be of importance based on the literature, the findings, and the judgment of the writer.

Data base management. A system that provides the necessary procedures and programs to collect, organize, update, and maintain the data required by the information system. It is usually a software program from which several users may access large data bases.

Disk Operating System (DOS). A software program that enables a computer to read data from and write data out to a disk controller.

Distributive (data) processing. A concept whereby regional or state officials supplement their main computer system with district office terminals. The district office terminals can be used to do local data-processing operations without constantly accessing the central computer. Limited data communications can occur between the central computer and the district office terminals, thus providing for a broad communication system. When loosely defined the term means multiprocessing.

Electronic Data Processing (EDP). A general term used to define a data processing system by using electronic circuitry as opposed to electromechanical equipment. This process is commonly referred to today as data processing.

Ergonomics. The concept of matching humans and machines in the work place for more effective and efficient functioning. Examples included improved office design permitting better interconnection of various components, better physical comfort, and greater ease of equipment use.

Floppy disk. A flexible disk (diskette) of oxide-coated mylar that is contained in a paper or plastic envelope which is inserted into the disk drive unit. They come in an eight-inch diameter size (usually for minicomputers) and in five and one-quarter inch or three and one-half inch diameter sizes for microcomputers.

Hard disk. A hard disk is made of rigid materials and can generally store more information and access it faster than floppy diskettes. Until recently its use has usually been restricted to medium- and large-scale computers. However, small hard disk peripherals are now available for most microcomputer systems.

Integrated software. A trend to have some programs such as word processing, data base, and spreadsheet (1) use one set of commands, (2) switch easily from any one application to another without having to change program disks, and (3) move information from one application to any other through the use of a memory storage device known as a buffer.

Mainframe. A high-speed computer that is larger, faster, and more expensive than the high-end minicomputers.

Management Information System (MIS). A concept in which management may monitor and retrieve data from the work environment. Data from transactions and operations within a school district or region are filtered and organized; and selected data are presented in such a fashion to help managers plan, organize, staff, direct, and control operations. Recently, the use of computers has been incorporated into the process.

Microcomputer. A small desktop computer, typically serving one user at a time. The distinction between small minicomputers and

large microcomputers is often minimal. The microprocessors most commonly have an eight-bit processing system, but sixteen-bit and even thirty-two bit microprocessors are found in some of the more expensive machines. With hard disk storage capabilities, memory storage can be greatly enhanced.

Microprocessor. The central processing unit of a microcomputer. It contains one or more integrated circuit(s) that perform a variety of operations in accordance with a set of instructions.

Minicomputer. A digital computer that is characterized by higher performance, a more powerful instruction set, greater multiple access capabilities, higher prices, and a wider selection of programming languages and operating systems than a microcomputer. The processors are at least sixteen bits, which make them generally faster and contain more memory storage than most microcomputers.

Mylar. A polyester film often used as a base for magnetically coated computer media (a DuPont trademark).

On-line. An operation performed on or by a peripheral unit such as a terminal or printer when connected to and controlled by a computer.

Password. A password is a unique set of digits or alphanumeric characters assigned to each user and to which only authorized persons are privy in time-sharing and multi-user environments. It serves as a protection against unauthorized access to files.

Peripheral (device). The input and/or output units and auxiliary memory storage units of a computer system but not considered part of the digital computer itself. Examples include a printer, paper-tape reader, floppy disk drive, and video terminal.

System. A composite of computer equipment, personnel, skills, methods, and information used to attain specified management objectives. "A complete system includes related facilities, equipment, material, services, personnel, and information required for its operation to the degree that it can be considered a self-sufficient unit in its intended operational and/or support environment" (Spencer 1980, p. 168).

Terminal. An input/output peripheral device that is connected on-line to the computer and is often remotely located in another room, city, or region.

Time-sharing. A computer service that uses a large computer to serve many clients almost simultaneously. The user accesses the computer (often in a different city) using voice-quality telephone lines and a compatible terminal. "Although the computer actually services each user in sequence, the high speed of the computer makes it appear that the users are all processed simultaneously" (Spencer 1980, p. 174).

Research Questions

The writer attempted to answer the following questions for each of the four school district enrollment categories: less than 300 students; 300 to 1,499 students; 1,500 to 2,999 students; and 3,000 to 10,000 students. The questions were grouped under general headings as outlined:

A. Planning Considerations for Implementation of Computer Systems:

1. What factors were influential in encouraging district administrators to introduce computer technology into district office administration?

2.   What services were obtained from consultants or consulting firms during the planning stage?

3.   What basic steps or procedures were established by district officials during the initial planning stage in order to ensure a successful transition from traditional office practices to computerized methods?

4.   What were the general means of access to computer technology during the initial stages of computer use? Did district personnel tend to purchase hardware, purchase services, or lease equipment?

5.   What were the initial types of programs used on the computer by district administrators?

6.   What facility changes or improvements were necessary?

7.   Which district personnel had training in the administrative use of computers and what training did they receive?

8.   What problems were incurred and what recommendations did administrators involved in this study have for other district officials during these stages?

B.   Present District Office Situation:

1.   What were the current primary means of access to the use of a computer in district administration?

2.   What computer systems were presently used at the district level?

3.   What was the level of satisfaction with the hardware, software, and support factors such as staff training and vendor services as perceived by the person primarily responsible for district computer applications?

4. What major software programs were used in school district administration and what were the primary functions of and degrees of satisfaction with these software packages?

5. Were electronic data transmission procedures being used in any of the school districts surveyed and, if so, what methods of transmission were being used?

6. What safeguards were employed for the protection of privacy from unauthorized access to and security against loss or damage of the electronically stored information?

7. At what point, in terms of school district student enrollment, should a district seriously consider using a minicomputer or mainframe computer instead of a microcomputer for administrative functions?

8. What recommendations did surveyed administrators have regarding established computer systems?

C. Specific Future Plans:

1. What plans currently existed for upgrading or changing existing equipment?

2. What additional hardware was suggested to make the computer system(s) work more effectively?

D. Profiles of Four School Enrollment Categories:

1. What were the common characteristics of developing and implementing a computer system in each of the four student enrollment categories?

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

School administrators now say that "filling out reports is
their most time consuming activity" (Pogrow 1980, p. 345). Pogrow
continued by stating that information-handling capabilities could be
substantially improved by introducing new technological services and
training for administrators in data management and "such training
should recognize that data related issues are now an integral part of
administrator responsibility (even if technicians are available), since
they affect every aspect of school life" (p. 346). Often administrators
react either by attempting to learn everything there is to know about
automation or by leaving both the management and technical aspects to
the specialists (Harold 1971).

Although the need existed and the technology was available,
many administrative procedures have remained the same even today.

> Currently, most administrators have to rely on (1) hand
> recording, (2) metal file cabinets, (3) human retrieval,
> (4) hand counting and mechanical computation, and
> (5) manual recording of information for mailouts. These
> manual operations are no longer realistic. Computer-based
> information processing must be pressed into the service of
> educational administration. (MacPhail-Wilcox 1983, p. 20)

When educators are burdened with paperwork and dependent upon manual
record keeping the entire system is "fraught with opportunities for

human error" (Bolton 1982, p. 24). Boyle (1982) has stated that the use of computers in educational administration has lagged thirty years behind the business sector and, in a desperate move to close the gap, a number of mistakes in selecting an effective computerized system have been made. To this end, the literature that is relevant to the use of computers for educational administration has been reviewed in order to facilitate the transition process from the non-electronic era in educational administration to computerized office procedures.

Certain researchers such as Froese (1983) used the term non-instructional when referring to administrative activities. Dennis (1979) referred to the computerized process for handling information, including the equipment, as a data base management system. Other authors such as Brochtrup (1983), Davis (1974), and Murdick (1980) used the term management information system (MIS) when referring to the computerized aspects of administration. A management information system was defined by Spencer (1980) as a system designed to provide the necessary information to support the decision-making function of management and is an important concept in educational administration (Hanson, Klassen, and Lindsay 1978). It is a system in which data are collected, processed, and disseminated within an organization. A management information system has served as a systems framework for organizing administrative computer applications into an interrelated and integrated information system. When the computer was introduced into MIS procedures, the application was often referred to as a computer-based management information system which consisted of hardware, software, and personnel (Murdick 1980). Libonate and Hughes (1982) have suggested ten basic rules for effective use of management information which

administrators might contemplate when first considering the
implementation of automated office procedures:

1. Use timely, accurate data: Don't let today's reports
   use yesterday's data.
2. Employ adequate staffing of your computer center.
3. Learn about computing yourself: Good decisions are
   made by informed administrators.
4. Inform the community and board of any new informational
   processes that are being planned.
5. Promote staff development in computer literacy.
6. Use serious statistics for serious decisions.
7. Forge a direct linkage between generated information
   and administrative planning.
8. Choose reliable hardware and software with good
   maintenance agreements.
9. Be flexible in both outlook and thinking.
10. Have a vision: A computer is no panacea, but it can help
    in ways you haven't dreamed about yet. (p. 12)

The computer was more than a mechanical device for processing data when
utilized as a meaningful tool in this fashion.

The term, Information Resource Management, has been used in
recent years (Daniel 1981). Data become information at the moment they
are transformed into meaningful units that can be interpreted by
management (Knight and McDaniels 1979). Some authors believed that
information management is one aspect of a larger concept. Powers,
Adams, and Mills (1984) described organizations as having three basic
interrelated subsystems which included (1) data processing systems,
(2) management information systems, and (3) decision support systems.
These three subsystems have collectively constituted a Computer
Information System.

The review of literature has been organized under headings which
follow a sequence of logical developments in the introduction and the
use of computers in educational administration. The review beings with
preliminary considerations in developing limited computer applications
to administration in order to become familiar with simple but important

functions and goes on to look at more sophisticated applications which would likely be considered once initial systems hardware and software have been implemented. Following some notable examples of school district initiatives in computerized educational administration projects, the literature review addresses the topics of ethics and security. These issues appear to be glaring omissions in the literature, since it would appear that educators should and would be in the forefront of such human concerns. Such questions should be specifically addressed by district personnel before venturing too far and too fast with the transition process.

The search of the literature has been focused primarily upon post-1980 research because technology has changed so rapidly that pre-1980 computer capabilities were almost totally inadequate for meaningful educational administrative applications by today's standards. For this reason as well, much of the literature was cited from journals and periodicals. However, many of the nontechnical reviews such as the concept of management information date back to earlier literature but still remain relevant today.

<div align="center">

Introductory Ideas on Administrative
Computing

</div>

Pogrow (1983a) stated, "Office automation is to white collar work what robots are to blue collar work" (p. 33). Knezevich (1984) stated that by 1961 less than 5 percent of school districts used electronic data processing and believed that existing applications were a "solution searching for some problem" (p. 117). In 1967, the American Association of School Administrators' Committee on Electronic Data Processing stated that "one of the important professional talents

of the administrator today is proficiency in the use and direction of electronic data processing software and hardware" (American Association of School Administrators 1967, p. x). Since then there has been tremendous growth in computer technology, particularly beginning in the late 1970s with rapid growth of microcomputers, software, communications devices, new hardware applications, and publications to the point that there has been "almost an oversupply of information available to would-be users" (King 1982, p. 1.14).

There appeared to be some urgency to have district- or school-level personnel become competent in the use of computer hardware and software systems. Where it may have been wise for the experienced administrator to look at a total computer package, that approach may have been too overwhelming for the novice computer enthusiast. It has been generally recommended that administrators unfamiliar with computers start slowly and gradually add software as proficiency has developed with each package. Most administrative needs have been solved by using a limited number of general application programs for there are many similarities among different administrative functions (Creswell, Dembowski, Howes, and Purrington 1980; Pogrow 1983a). General application programs are widely available, relatively inexpensive, used for many applications, and some can be customized to meet specific needs (Pogrow 1982). Huntington (1983) suggested starting with a word processor and adding a spelling checker and mailing list as confidence increased. Next, he suggested considering an electronic spreadsheet such as VisiCalc, SuperCalc, Multiplan, or Lotus 1-2-3 for financial planning. More complex accounting procedures could be introduced with specialty commercial programs. Finally, he

indicated that inventory and data base programs could easily be used to keep track of student referrals, report cards, absences, and other important records. Dembowski (1983) also recommended general purpose programs because valuable functions such as merging addresses with letters, zip code sorting of bulk mailings, graph printing and plotting, and statistical analysis were relatively easy to learn. Handbooks, curriculum guides, and notices have been produced with minimal cost and training (Tushar 1983). Huntington (1983) cautioned administrators against developing high expectations of reducing workload when he stated that "many organizations that computerize often don't save work, they just get more information" (p. 92).

For many administrators new to the world of computers fear may have been the greatest obstacle preventing them from becoming reasonably computer literate (Rushinek 1983), while for others it may have been the lack of knowledge or naivete regarding computers in general (D. Marshall 1982; Sidman 1979) or mistrust of the technology (J. Marshall 1982) that have hampered their success. These problems have been generally more widespread and serious than many may think.

> Many school administrators seem perplexed by the micro-
> computer revolution and confused on how to cope with its
> opportunities and threats. Some would agree with the
> school official heard to say, "I don't even know the
> right questions to ask." (Kiser 1983, p. 177)

Increased use of computers, particularly microcomputers, has helped to overcome many of the reservations held by administrators through increased awareness of computer-processing capabilities (Haugo 1981). Computers simply are a tool, and, like any other tool, they have been used to accomplish tasks which would not have otherwise been possible, to reduce human effort, to multiply human abilities and

capabilities, and to reduce costs (Hanson 1984, p. 18). As more people learned to use computers within a district, the possibility existed for increasing their reliability upon computer-based activities. However, if this growth in computer interest proceeded independently as a result of poor planning, there may have been serious inconsistencies which may have also added to the confusion and loss of credibility of the computer in the minds of the users.

There was a need to establish a basic philosophy toward the operation and utilization of computers.

> The policy should include a statement delegating
> administrative responsibility to the superintendent
> and his or her administrative staff. The superintendent
> and staff should be responsible for development of a·
> comprehensive district-wide master plan by conducting
> an in-depth district-wide needs assessment. (Splittgerber
> and Stirzaker 1984b, p. 18)

Administrators must remember that managers have been decision makers (Spuck and Atkinson 1983). As such, there has been a degree of responsibility upon the administrator to provide the most useful information possible for selecting the best alternatives in any decision-making process. Since educational administrators have been subject to immense social pressure for the improvement of education, there has been increased necessity to reduce time spent in routine and mundane tasks to provide additional time for vital leadership functions.

> Improvements in administration efficiency are not likely to
> be significant . . . unless the computerized administrative
> system has been carefully built around a comprehensive and
> systematic plan which clearly establishes goals, alternative
> methods, costs, benefits, responsibilities, and schedules.
> As technical capabilities continue to increase, as costs
> continue to decline, and as humans improve their abilities
> to utilize the new technological tools, a new era in
> administrative computer applications seems imminent.
> (Spuck and Atkinson 1983, p. 90)

Considerations Prior to Selection of
Hardware and Software

The history of automation in educational administration has not been without problems for most educators (Dennis 1979). When beginning the process of computerization of office procedures, school district personnel must have clearly determined what it was they wished to accomplish. Moyer and Levin (1983) reported that the administrator should carefully analyze the present manual system in every aspect and seek input from other office personnel in order to fully understand current needs before proceeding to convert existing office procedures to a computerized system. Caution has been advised against hastily revising an established manual or semiautomated system that has been working well (Bock 1983). There have been situations where certain organizations have removed their computer equipment after investing large amounts of money on installations (Sidman 1979). Such reasons included:

> (1) Installation costs were higher than expected,
> (2) peripheral costs continued to exceed budget limits,
> (3) equipment complexity caused frequent and expensive breakdowns, (4) the computer was not doing the job for which is was purchased, (5) the amount of time that everything had to be done both manually and by computer until the system had been debugged (proved to work without problems) was too long, (6) difficulty in employing qualified computer personnel, (7) computer supplier sales representatives were too aggressive, (8) company supplied aids and training programs (when actually delivered) were too technical for the present personnel, (9) the changeover from manual systems to automated systems was not adequately planned, (1) the increased level of service cannot be properly cost accounted within the present strict budget, and (11) the initial successes were shallow and few. (Sidman 1979, p. 48)

Many of the reasons for disenchantment with computers have been attributed to such human factors as perceived complexity of the system,

additional time and effort requirements, demand for greater knowledge, and a need for a role change (Brown 1983). The National Association of State Directors of Special Education (1980) identified five additional problem areas in the implementation of management information systems. These included narrowly focusing on required reporting needs as opposed to general applications, overly rapid implementation, frequent systems revisions, promising too much, and avoidance and eventual disuse of the new system.

Once the decision was made to computerize, D. Marshall (1982) stressed that the first step in computerizing administrative tasks was to clearly define in as much detail as possible what ideally would be the intended products of computerized administrative process; and these desired outcomes would in turn permit the vendors to determine the necessary technical requirements of the proposed computer system. The five types of information that district officials generally required were school management, as well as program, student, financial, and personal information (D. Marshall 1982).

Dennis (1979) investigated computer applications in educational administration by determining sources, forms, and uses of information necessary for efficient educational management. In his research he also determined the purposes and volume of information and the frequency of the reports needed, which resulted in the identification of a list of computerizable tasks that fell under the headings of student, financial, and personnel information.

Under the heading of student information, Dennis (1979) determined the following tasks could be computerized:

1. Course request documents for students.
2. Course request tally list (used to build master class schedule).
3. Course request conflict list (duplicate, faulty, or conflicting choices).
4. Course conflict table (numbers of conflicts among each course).
5. Parent report of student selections.
6. Master schedule lists on classes, teachers, rooms, and periods.
7. Room, teacher, period conflict lists.
8. Class size reports.
9. Free-period summaries.
10. Unscheduled student list.
11. Student schedules.
12. Class lists and grade report lists.
13. Pupil attendance reporting documents.
14. Student grade forms.
15. Excessive absence reports.
16. Cumulative attendance lists.
17. Failure-incomplete notices.
18. Grade distribution lists by course.
19. Grade distribution lists by department.
20. Class rank lists.
21. Honor roll lists.
22. Permanent record labels.
23. District enrollment information.
24. Transportation reports.
25. Student-fee statement.
26. Student-fee summary report.
27. Student-fee delinquent report.
28. Graduation credit check. (pp. 20-21)

Tasks able to be computerized under financial information were

as follows:

1. Payroll checks and stubs.
2. Taxing-body treasurer's report.
3. District check register.
4. Accounts summary list of wage distributions.
5. Accounts item lists of wage distributions.
6. Fund summary of wages and deductions.
7. Pension fund reports (monthly and accumulated).
8. Social Security quarterly report.
9. Payroll deductions summary list.
10. Monthly W-2 data balancing.
11. Bank's reconciliation documents.
12. Employee identification verification list.
13. State and federal W-2 forms.
14. Employee roster.
15. Salary range publication list.
16. Employee sick leave accumulation list.

17. Employee vacation accumulation list.
18. Verifying lists of salary data base changes.
19. Account list paid invoices.
20. Vendor checks and stubs.
21. Vendor check register.
22. Vendor ledger reports.
23. Vendor file labels.
24. Accumulated purchases by vendor list.
25. Chart of accounts report (in sequence).
26. Chart of accounts report (by school or program).
27. Partial chart of accounts report (for government agencies).
28. Summarized chart of accounts.
29. Program specific account activity ledger.
30. School specific account activity ledger.
31. School activity ledger (in sequence).
32. Open order request.
33. Budget preparation work report.
34. School specific program summary reports.
35. School activity fund reports.
36. Equipment inventory reports.
37. Equipment depreciation reports. (Dennis 1979, pp. 22-23)

Following an analysis of personnel information forms, it was

determined that the following administrative personnel-related tasks

could be computerized:

1. Teacher contract information list.
2. Teacher professional growth status list.
3. First-year teacher's status list.
4. Second-year teachers' status list.
5. Teacher probation list.
6. Individual contract verification forms.
7. Teacher service record.
8. New employee list.
9. Teacher certification report.
10. Personnel directory.
11. Staff mailing labels.
12. Salary matrix.
13. Equal-employment-opportunity report.
14. Teacher retirement list.
15. Staff statistical reports.
16. School recognition reports.
17. Staff reimbursement claims reports.
18. Staff age matrix.
19. Employee's earnings report.
20. Specialized staff lists. (Dennis 1979, p. 24)

Pogrow (1978) emphasized a very different application of

educational administration--simulation (the abstract equivalent of

statistical techniques in controlled experimentation). Introducing
hypothetical conditions or parameter values as input data, complex
models to represent the real world could be realized when direct
experimentation was possible. "The capability of simulation to quickly
explore a wide range of alternatives is particularly important for
fostering creative decision making in the present environment of
contradiction in which the administrator must function" (Pogrow 1978,
pp. 57-58).

Once it has been determined what functions are possible to be
performed on a computer and the district officials have decided what
functions they would want to have computerized, a decision has to be
made regarding the size of computer system that will efficiently process
the necessary workload. An Iowa study (Schiller 1983) determined that
95 percent of the time it was more cost efficient for school districts
with more than five thousand students to subscribe to mainframe
computing services as opposed to utilizing microcomputers for financial
accounting. The Alabama Center for Evaluation (1982) prepared a report
suggesting factors to consider when planning the purchase of computer
equipment. One major concern expressed by the Center's staff was the
impact of "creep costs" or unexpected expenses for small, incidental
items such as paper trays, additional disks and software, and other
supplies that quickly added to the total cost.

Checklists have been helpful in developing awareness of
potentially necessary capabilities of computer systems. Bennett (1980)
developed an extensive list of features for the computer keyboard,
video display, printer, computer control aspects, software, word
processing, service, training, and miscellaneous needs.

Established Computer Systems
or Projects

There were a number of examples of school district computer applications to educational administration in the literature. It seemed that many of these programs had been individually created by school district personnel or had been adapted from commercial programs as local circumstances required. Although most of the reports suggested that district officials, in the projects described, were meeting their objectives, there must have been many other projects in which all was not well; but these situations were rarely publicized in the literature. The intent of this section is to cite examples of applications that were working well according to the authors.

The following list is a sample of three typical computer packages provided by Educational Computer Services of the New Mexico Research and Study Council (NMRSC - ECS) which reflect what has been used in local school districts in New Mexico. The capabilities and typical reports generated by each package were:

I. Example Financial Package:

    A. Capabilities
        1. Maintains budgets for all revenue and expenditure accounts.
        2. Maintains records of encumberances, expenditures and revenues against budgets.
        3. Controls budget through end-of-period reconciliations.
        4. Processes and validates transactions.
        5. Provides access to current and historical information.
        6. Provides source document reference for audit and control.
        7. Provides automatic interfacing between functions.
        8. Provides security for district's data.

B. Records and Reports
1. Fund Account Level Register
2. Fund Account Number Register
3. Fund Account/General Ledger Cross Reference
4. Budget Status Report
5. Detail Statement of Fund Accounts
6. Statement of Actual Versus Estimated Revenue
7. Statement of Expenditures Versus Revenue
8. Statement of Expenditures Versus Appropriations
9. Summary of Expenditures by Object
10. Daily Budget Change Audit
11. Daily Audit of Expenditures and Revenue
Transactions
12. Vendor Register
13. Purchase Order Register
14. Invoice, Credit/Debit Memo Register
15. Revenue Transaction Register
16. Aged Obligation Report
17. Statement of Items Released for Payment
18. Check Register
19. Check Reconciliation Report
20. Statement of Change in Financial Position
21. Trial Balance
22. History/Budget Listing
23. Comparative Balance Sheet
24. Income/Expense Report
25. Comparative Income/Expense Report
26. Chart of Accounts Listing
27. Master File Listing
28. Transaction Journal
29. Account Activity/Journal Report
30. Maintenance Audit Trial

II. Sample Payroll Package:

A. Capabilities
1. Processes payroll.
2. Processes hourly, salary, etc.
3. Processes weekly, semi-monthly, monthly payrolls
concurrently, separately, or in any combination.
4. Produces quarterly Social Security reports.
5. Produces year-end W-2 statements.
6. Automatically calculates overtime.
7. Interfaces with financial package to distribute
costs to appropriate line items, departments,
cost centers, etc.
8. Provides security for district's data.

B. Records and Reports
1. Earnings Transaction Audit List
2. Payroll Register
3. Payroll Checks
4. Check Register

       5. Earnings Distribution List
       6. Bond Eligibility
       7. Deductions
       8. Employee Status
       9. General Ledger Distribution
      10. Rate Change
      11. Inactive Employees
      12. Minimum Wage List
      13. Employee Deduction Status
      14. Vacation/Sick Hours
      15. Outstanding Checks
      16. Reconciliation Activity List

III. Sample Student Scheduling Package:

    A. Capabilities
       1. Assigns student to courses and sections of
         courses.
       2. Provides for balancing in scheduling along sex,
         ethnic, etc. variables.
       3. Analyzes scheduling conflicts.
       4. Interfaces with student records, grade reporting,
         etc.
       5. Provides security for district's data.

    B. Records and Reports
       1. Student Request List
       2. Courses Matrixes [sic]
       3. Room Utilization Report
       4. Teacher Utilization Report
       5. Student Schedule
       6. Study Hall Requirements Report
       7. Master Schedule Report
       8. Class Rosters
       9. Course Rosters
      10. Grade Sheets
      11. Conflict Lists
      12. Course Request Analysis and Tally
      13. Enrollment Tallies and Summaries. (New Mexico
Research and Study Council – Educational Computer Services
1980, pp. 16-18)

A system called the Educational Computing Network of Ontario

(ECNO) provided batch and on-line processing and included the following

services (Noonan 1983):

1. Student scheduling provided teacher, room, and student

timetables, master student lists, and summaries of available student

seats per course.

2. Student services provided report cards, class lists, registers, and record sheets.

3. Student guidance information offered career and training information.

4. Personnel payroll provided paychecks and bank deposit slips.

5. Personnel employee management information provided school boards with information regarding status and seniority of staff members.

6. Audiovisual service produced a catalog to facilitate the ordering of films and other media from the school board.

7. Route management and update service assisted in transportation problems.

8. Financial accounting system supported the accounting, purchasing, and budgeting control of the board.

Noonan (1983) also described the Metropolitan Separate School Board of Ontario's use of computers for the following administrative purposes:

1. Financial computer services were used for preparation and printing payroll slips and recording operating expenses.

2. Personnel files.

3. Computerized word processing was used to produce the original curriculum document copies which the printers used as a master copy.

4. Communications via modems were used to work with computers from remote locations or private homes. The professional library was used to access information banks such as ERIC.

5. The planning department used the computer to assist with projection of required school sites and cost-effectiveness studies of different planning schemes.

6. High school on-line student records and files was a service that was to be expanded to include the elementary schools.

7. Student data cards were maintained for every student by means of batch processing. Each school received a student data card for every student which could be updated by the secretary using a light pen and sent to the board office for updating. The computerized data were used to generate class lists; alpha lists of students; family lists by grade level; address labels by school, family, or class; and lists of street names for the planning department.

8. Parent forms and school staff rosters were stored and printed.

9. The September Report for the Minister of Education was prepared which included the previous year's enrollment, transfers out (demits), transfers in (admits), and new totals as of September 30 of the present year.

10. Audiovisual bookings provided assistance for media services.

Also in Ontario, the Etobico Board of Education, through a series of summer projects, developed a standardized system for cataloging computer-based materials (McKye 1983).

A system by Donohue and Company of Hannibal, New York, provided the beginnings for a data-based system for the handicapped (Jones and Carmen 1984). Once the initial requirements of the program were met the system provided:

1. An expandable curriculum file.
2. Demographic and health files capable of producing programmatic, legal, and cost documentation.
3. A student scheduling system.
4. Student data required by governmental agencies (e.g., individual educational programs and state reports).
5. Long term data storage and retrieval capabilities.
6. Reporting features with rate of student change (charts, graphs, and lists).
7. Administrative reports providing costs by class, service, student, and school.
8. Reports providing documentation of time spent by teachers in such management activities as toilet training, feeding, and physically protecting handicapped students during seizures or aggression. (p. 27)

According to the authors, the system resulted in the reduction of time required to prepare individual education programs, curriculum, charts and graphs useful in planning, statistical analysis, and staff schedules, as well as a generally more enlightened approach in the provision of effective services for handicapped children.

Broward County, Florida, a large school district with approximately 124,000 students, used a distributed processing and computer networking system involving two IBM mainframe computers and a number of Northern Telecom minicomputers (Kauffman 1983). The function of this network was to:

1. Interactively create and retrieve student data resident in the minicomputer.
2. Interactively retrieve student data resident in a central site computer.
3. Scan and score tests.
4. Print out reports locally both scheduled and ad hoc.
5. Perform word processing.
6. Transmit summary data to central site computer.
7. Submit computer runs requiring heavy resources to central site computer for execution (i.e., computer scheduling).
8. Interactively use a career guidance system.
9. Enter/validate data to be submitted to the central site computer. (p. 171)

In Florida, a microcomputer system was established to develop a more efficient delivery system for information transfer (Olkes 1983).

The system, referred to as the Florida Information Resource Network (FIRN), extended between school districts, regional centers, and the Department of Education. The information could have been transmitted on any type of information-processing hardware as long as it was compatible with the system. The information/application software necessary for the system to operate was developed by local technicians. Benefits of the system as perceived by the project planners were:

1. Reduction of teacher workload in student record keeping, grade reporting, and attendance.

2. Automated reporting enabled the transmission of information from the school district to the state and vice versa.

3. Student records could be transferred from one institution to another, e.g., from school to school, district to district, district to college, or district to university.

4. Accuracy and timeliness increased efficiency in handling student, program, staff, finance, facility, and community information.

5. Resource sharing provided a means of sharing data-processing resources (people, hardware, and software) among school districts, community colleges, and universities.

6. More equitable access to computer hardware, systems software, and applications software was realized, regardless of the size of the school district.

7. Costs were reduced in terms of conventional data communication methods.

8. Innovative creation of a prototype for other governmental agencies was developed.

9. Greater sharing of information regarding audiovisual resources, inservice training, and group purchases was realized.

10. Electronic mail reduced the time for transmitting data between centers.

In Davidson High School in Mobile, Alabama, an Apple II and a ten-megabyte Corvus hard disk system were combined to provide student scheduling and grade reporting. The program was developed in response to expressed needs of the school for (1) more efficient tracking of students at the beginning of the year, (2) automated and simplified grade reporting; (3) automated, simplifying, and updating permanent records; and (4) greater accuracy, integrity, and currency of student schedules. The software was expanded to include attendance accounting and support for scanning routines used during registration and grade reporting. School personnal appreciated some of the benefits: (1) Students who once had "slipped through" the old scheduling system were now accounted for, (2) the grade-reporting burden was reduced, and (3) appreciation of the increased accuracy and time saving in student record keeping (Moscow, Bolton, and Young 1982). The system appeared to simplify a "monumental" task and reduced the number of errors (Moscow, Bolton, and Young 1982).

For over ten years, the Cincinnati School District has collected the following information: average daily membership, average daily attendance, percentage of minority students, reading achievement test scores, math achievement test scores, per pupil expenditure, pupil-teacher ratio, percentage of low-income students, and average number of years of staff teaching experience. The School Profile Program allowed the district to compare individual schools to the district average and

to identify peculiar school characteristics according to any selected variable (Morgan 1982). Other applications being developed included programs for the Apple microcomputer such as a PERT (program evaluation and review technique) type program for planning and a Goal Management Report for updating school district goals.

An instruction management program known as Comprehensive Achievement Monitoring (CAM) has been used in parts of Minnesota for over ten years (Rodel 1982). The CAM model was a criterion-referenced evaluation system which focused on objective criteria to measure performance of instructional programs in the school district. The program operated on an Apple II and plans for improving the system included objective mastery recording, handling of individualized or group-paced reporting, and increased flexibility for test scoring and report printing.

The Association of School Business Officials (1981) described a number of apparently successful computer applications across the nation that have not often been reported in the literature. Some of these applications included (1) a theft-and-damage-loss monthly reporting system in Palm Beach, Florida; (2) a student transportation system based on student census data and a local system of maps in Minneapolis, Minnesota; (3) a "checkless" payroll system for electronic transfer of employee salaries in Utah which the program saved $35.54 per teacher per year; (4) a computerized cash-flow system in Louisville, Kentucky, which increased the school district's return on its investment by 14 percent annually; and (5) a thirty-six district Computerized Pupil Attendance Accounting Census System in which teachers only submitted student absences and provided the districts with a per pupil

annual saving of $3.12. Computerized transportation systems have also been described by Nygard, Summers, and Wagner (1982) and Gillett and Lawrence (1981). Similar services have been provided in the Portland, Oregon, Public School System; but extensions were made to provide information regarding student performance including scores, grades, attendance, and suspension/expulsion; student demographics including addresses, ethnic origin, and home language; and academic information including types of classes. This information was integrated with geographic indicators such as maps, census data, tax assessments, and voter turnout.

There have been other aspects of district operation. Bock (1983) has described one of these uses. Microprocessors have been used to monitor and control peak voltage and hourly consumption rates of school district heating and electrical systems which have, in turn, considerably reduced district operating expenses and provided printouts as required.

Microcomputers and Mainframe Computers

There have been many examples of microcomputers and mainframe computers networked together, but several examples have stood out because of the largeness of scale. One example is a micro-to-mainframe project called the Educational Telecommunications for Alaska (ETA) project which was developed for the Alaska Department of Education. It utilized a system of data storage and retrieval for small schools in evaluating and reporting their Title I programs. By using a microcomputer any official could send messages to a host minicomputer and check for messages when convenient. Eventually, it was intended to add a data base management system to allow for standard and ad hoc

reporting. Slowness in loading student data had been a problem which subsequently increased as the number of students involved grew larger. Plans were underway to improve this apparently annoying problem (Hazelton, Harris, and Deck 1981).

The Alaskan project inspired a technically similar project in Alberta known as Computer Assisted Distance Education Telecommunications or CADET (Kirman and Goldberg 1984), which was to be used for long-distance instruction, but the system could be used for any administrative application. A network of Apple microcomputers was established to connect with a mainframe to allow for multiple access with the following advantages: (1) programs down loaded by participants, (2) the development of backup files in case of accidental loss of data, (3) easier and faster monitoring of participant files by the instructor, (4) the use of a packet-switching option such as Datapack, (5) expanded participation by adapting the mainframe to acceptable protocols from several microprocessors for the network, and (6) the ability to allow more users to enter the network because of larger memory capacity.

Foster (1983) claimed that the use of microcomputers and mainframe computers in a network known as distributive processing was "not only desirable but inevitable" (p. 53). "The attraction of a system with the flexibility of the microcomputer and the raw computing power of the mainframe will insure that networks will be established using both these important tools" (p. 15). All we really needed was the leadership to make things happen in the various school districts.

There have been increased efforts of late to enhance microcomputer systems so as to perform major computer tasks without a larger computer. The current capabilities of microcomputers exceed

that of the minicomputers manufactured during the 1970s and that of the

mainframe computers manufactured during the 1950s (Dembowski 1983).

Networks can be established with a series of microcomputers and a hard

disk memory storage device (Rine 1983). For many school district

personnel, there was increased interest in microcomputers because of

the economic advantages achieved through increased memory capacity and

processing speed, better networking, increased ease of operation,

increased ease of purchase due to total computer systems being packaged

by vendors, and increased standardization (Kay 1983). Other factors

supporting the increased use of microcomputers, as compared to larger

mainframe computers, were:

1. They cost less.
2. They usually take up less space.
3. They do not require the operations, programming and
   systems support staff that larger machines require.
4. They are more portable.
5. They are less imposing.
6. Memory capacity is increasing and lessens the gap
   between micros and minis.
7. Voice synthesizers, joysticks, and the mouse are
   humanizing computing.
8. The microcomputer is more single task oriented whereas
   the larger computer can be doing everything from carrying
   out a statistical analysis to producing payroll checks.
9. Good software is increasing, and packages which were
   once available only on mainframe are now available on
   micros.
10. Specialization in both software and hardware by particular
    vendors is helping users target their application needs
    and enabling vendors to be more responsive to the needs
    of unique market segments. (Myers 1983, p. 197)

It was particularly the lower cost and the increasing

capabilities of microcomputers that reduced the resistance to their

implementation in school administration (Jones and Dukes 1983).

However, not all problems had been worked out and networking was one

of the potential problem areas still remaining when using a

microcomputer system. Various hard disk manufacturers as well as other manufacturers were developing or had developed limited-capacity capabilities on their network systems for microcomputers (Bonner 1983). The ability to transmit data from one center to another will have increasing importance as time progresses.

Need for an Integrated Approach

Integration in the use of computers could occur on many levels and between many applications. At the school level there were two major applications that could be integrated by school officials in decision making. They were administrative information (financial records, staff and personnel files, reporting, and pupil records at the district and building level) and instructional management. These two functions appeared distinctly different because traditional school routines have completely separated both functions.

> Typically, the two decision areas are looked at separately
> by school districts, but in order to obtain the best
> utilization of computer technology, the information and
> instructional management applications must be considered
> as an integrated approach. (Splittgerber and Stirzaker
> 1984a, p. 36)

Integrated management of the administrative and instructional systems would lead to better attainment of the school objectives by using a management information system as a support system for decision making (Telem 1984).

There was also a move towards integration occurring within the software industry. Until recently each software program virtually operated as a separate entity and required separate entries of data despite the fact that the data base was the same. This was because of the restrictions regarding the amount of information that could be

stored on disks and in the computer memory. Recent innovations have significantly reduced these difficulties and have stimulated the industry to develop even more sophisticated integration of programs (Jones and Dukes 1983).

Integration with microcomputers was initially typified by mailing lists applied to text editors; but now the industry has been able to integrate data base, spreadsheet, and word processing so that information can be moved from one program to another without having to restart each program and losing all the information stored in computer memory. Such integrated packages as Appleworks, Symphony, Ovation, and Magic Office System use the same commands for similar operations, thus simplifying the learning of necessary commands and making it possible for relatively inexperienced people to perform somewhat sophisticated operations.

According to some authors, there should be integration between the school, district, state, and federal levels as well. "The school is embedded in a neighborhood, a community, a state, and a nation, all of which affect the organization of the school" (Telem 1982, p. 49). Processes such as computer managed instruction (CMI) were believed to be an integral part of the entire educational process and not solely a function within the individual school. With increased demands for more information compiled within shorter periods of time, there was an increased likelihood that similar information would be required at all three jurisdictions beyond the school (Splittgerber and Stirzaker 1984b).

The state of New Mexico developed a statewide system which met the reporting requirements of public school finance, state department

of education, federal programs, and local school districts (New Mexico

Research and Study Council - Educational Computer Services 1980). The

system had a voluntary district membership which provided comprehensive

computerized services to meet the needs of local districts, including

financial data, student data, and all other data.

Other Factors for Consideration

Persons contemplating the introduction of computers into the

district office should be cognizant of a number of problems that have

often been disregarded in the literature (Brown 1983). A summary of

his concerns included:

1. Computer illiteracy is generally defined as a lack of

knowledge regarding what functions can be performed on the computer

and as a lack of appreciation of the time and skill necessary to write

the program.

2. Computerphobia is a fear that computers will dehumanize

traditional human endeavors.

3. Technical problems exist where equipment occasionally

malfunctions.

4. The use of the electronic technology raises new questions

about how the information is to be protected.

5. People with programming skill and educational experience

are in short supply.

Currently, there exists a wave of technology to enhance the

processing capabilities of existing microcomputers. For example, one

of the innovative means often suggested to enhance microcomputer data

storage is the addition of a hard disk system. However, Huntington

(1986) warned that often this means having the knowledge of a new DOS

system to convert old diskettes. He has stated that the hard disk user is presently a "pioneer, experimenter, development subsidizer, and gambler" (p. 33).

The dehumanizing aspect of computer technology has been of great concern to many individuals in society. Russeau (1976) suggested a philosophy for large schools that could have been established in many school districts to negate these effects. He suggested, among other considerations, that the system should be supervised by a certified school administrator versus a technician with commensurate experience in the understanding of computer-processing procedures as well as the needs of students and district personnel. Sterling (1975) and Baum (1979) suggested procedures to further humanize aspects that dealt with the computer user, exceptional situations that did not fit the established procedures, use of information, and respect for privacy.

Ethical considerations in the collection and access to data collected at the school district level have not, at this point in time, received the attention they deserved. District administrators must consider this aspect of the information technology before beginning the process of implementation. Westin (1984) reviewed the recommendations made by the Younger Committee in Great Britain in regard to the respect for privacy of information. Although these points were developed at the national level for a nation where at that time no national privacy legislation existed, the items did appear to have merit for American school district officials. These recommendations stated that information should be collected and used for specific purposes and with appropriate authorization, confined to those

authorized to use it, and the minimum amount necessary for the
achievement of the specified purpose(s). The Younger Committee also
stated that individuals should be informed about personal information
affecting themselves, value judgments should be cautiously made when
using this information, and deadlines should be specified beyond which
the information should not be retained.

Martin (1973) suggested four different levels of defense to
help protect information from destruction or improper use: specific
designs within the computer system, physical security, administrative
procedures, and legal and environmental controls. Information can be
protected by limiting access to authorized persons, locking the
information away in a secure place, regularly updating files, and making
duplicate copies for safe storage (Dearden, McFarlan, and Zani 1971).
The most likely hazards are fire and theft but careless operators can
easily destroy information and not realize the problem for some time.

<center>Implementation</center>

Once school district personnel were prepared to computerize
administrative procedures and were aware of the many possible changes
that were likely to occur in current procedures, policies, attitudes,
and facilities, they could seriously begin planning for their own
needs.

For there to have been a purposeful direction to the
introduction of information systems into a school district, there had
to be a "master plan" that reflected the organizational structure to
be developed (Kanter 1981). The master plan for a system concept must
have addressed the issues of flexibility, security, documentation,
implementation, integration, maintenance, and evaluation (Herrin 1983).

An information system, as designed for any organization, must have allowed for organizational change (Brown 1984) and for expandability to meet future needs (Kanter 1981). Roberts (1978) viewed change as a three-stage process. A summary of these stages included (1) a mobilization stage emphasizing individual and institutional stimulus for change, generation of local support, and decisions made on the nature and scope of implementation including staff behavior; (2) an implementation stage involving the mutual adaptation between the innovation and the internal organization and dependent upon the collection of data; and (3) an institutionalization stage where the innovation is incorporated into the system. Documentation was necessary to insure that written descriptions of scope, proposed organizational flow components, and operating procedures were established (Murdick and Ross 1977). During this stage, four alternate methods of implementation had been suggested: (1) Implement the new system immediately, (2) change over to the new system in planned phases, (3) operate both systems simultaneously with a duplication of work until the new system is operating satisfactorily, or (4) gradually change over to the new system as progress continues (Brabb and McKean 1982; Murdick and Ross 1977). The term "maintenance phase" has been used to describe the introductory learning process followed by the "routine maintenance phase" to describe the part of the transition process in which unexpected problems needed correction, noncompliance of staff was detected, or the system was modified to meet changing needs (Murdick and Ross 1977).

J. Marshall (1982) suggested several actions that needed to be taken in order to establish parameters for data entry methods.

A summary of these actions included (1) decisions regarding the type of data desired; (2) decisions on the type, format, and timeliness of the data to be reported; (3) decisions regarding the benefits of interactive capabilities with data files or batch processing systems; and (4) determination of cost factors recognizing that if the data were important to the planning and maintenance process, it should be included as a priority budget item. J. Marshall (1982) went on to say that the reporting of large amounts of bulky, difficult-to-read information was a good way to destroy the confidence in the computer system and should the data provide no central purpose to the operation then they should be considered expendable.

Raucher (1976) made the following suggestions for the successful implementation of an information system:

1. Those who set policy are responsible for evaluation of goal attainment.
2. Information systems planning starts with executive perspective.
3. Information systems must be based on the needs of management and operational users, not conversely.
4. The informational systems plan must be in step with the institutional long range plan.
5. Information systems management is more important than any component subsystem.
6. Information systems should be designed around processes, not organizations.
7. Function and performance must be tempered by justification and benefit analysis.
8. Data are an institutional resource.
9. No amount of tuning can compensate for poor design.
10. Information systems do not insure good decisions. Information systems insure that decision makers have good information. (pp. 65-66)

With careful consideration of these points during what Brown (1983) referred to as the mobilization and implementation stages, the district person responsible for the innovative process would be more adequately prepared for the final stage of institutionalization.

Foster (1983) described additional considerations faced by school district officials. A summary of his concerns included:

1. Policy statements have been needed to determine responsibility for the sharing and maintenance of information between central and remote sites. The policy must also determine responsibility for collecting, maintaining, and updating the information and who has rights of access to the information.

2. Hardware, software, and communications standards needed to be established to support a true distributive processing system. A list of compatible computer hardware and systems software needed to be available to school personnel to use when considering the purchase of computerized systems. Centralized purchasing of hardware and software should help to maximize the flexibility of the system.

3. Shared programming standards have been needed for the microcomputer and central computer to support a truly distributive system. Existing data should be modified as soon as possible to accept electronic input from schools. A complementary microcomputer system should be developed to perform a major share of data entry at school level.

4. Resources should be allocated as necessary to the locations which assume the greatest responsibilities. The central site should assume the major responsibility for the coordination of computer systems.

Myers (1983) reminded systems personnel not to select the best computer. Instead, "select the computer that will do the best job on your application" (p. 197).

Summary

Meltzer (1981) reported that everyone in management has been a manager of information. The challenge to educational administrators has been to "strike a balance between inventiveness and inconsistency" (Hanson 1984, p. 19). Inventiveness has been necessary to provide for the identification of new ideas for handling information needs, while consistency has been necessary to protect us from the uncontrolled proliferation of information and the possible damaging consequences. For protection in this regard, J. Marshall (1982) reported that management information personnel must be able to distinguish between the best use and the maximum use of the technology, for they may not be synonymous. In a time of economic restraint it has been critical that management decisions be based upon relevant, timely, and accurate information (Somers 1982).

Information has been considered as a resource and has cost money to obtain, maintain, and improve. Some of the direct results of mismanaged information have been duplication of effort, decisions based on outdated or erroneous information, and decreased productivity (Meltzer 1981). The microcomputer, in particular, extended the use of computers to those who in the past would not have attempted to use, or have access to, such technology (Hanson 1984). However, problems have been encountered with computer technology as well; but these problems were generally due to "insufficient and proper planning, poor organizational structure, inadequate staffing, and improper hardware configurations" (Sidman 1979, p. 48). Development has progressed smoothly when computer personnel have had adequate knowledge of computer operations and potential causes of failure, preventative

maintenance, alternate sources of information regarding sales and service, software, expertise in high-level language programming, some instructional courseware design to assist in direct school management, and computer management skills (Dennis 1979).

Zafirau (1978) reminded administrators not to become so eager to develop the "electronic office" that they forget the related instructional computer needs of students. The two issues may be complementary. Teachers who have been comfortable using the computer as an instructional device might soon discover that there were many classroom management activities such as grade reporting, attendance, and other pupil-related requirements that could easily be performed (Hanson 1984).

Caution has been advised to be aware of the "five-minute" experts with all the free advice for some of the advice may have been good, but poor or misinformed advice has been disastrous when not verified first (D. Marshall 1982; Rine 1983). As well, the concern for the human element has been essential to insure the mechanization, automation, and staff fit together in deciding what the office requirements should be (Doswell 1983; McIsaac 1984; Rine 1983).

CHAPTER III

PROCEDURES

Introduction

The literature has revealed two general approaches to research
in the educational administrative use of computers: (1) random sampling
techniques of the entire school district populations in which no
distinction is made between model districts and districts with no
computer involvement, as well as no distinction between administrative
use of computers apart from academic applications although some
activities such as computer-managed instruction involve both aspects;
and (2) detailed studies of a specific computerized process pertinent
to a particular school district or state. Although both methods
provided a great deal of information, the information did not appear to
be in a form which may have been helpful to administrators seeking to
develop a sense of the problems encountered and the steps needed to
establish a district-wide computerized administration system.

The writer has attempted to address a portion of the void in
school district administrative computer research by investigating a
number of school district computer systems currently in operation.
By determining what steps were taken during the planning stages, what
computer systems were currently used, and what recommendations were
offered to other administrators, the writer attempted to provide a more

detailed description of initial, established, and projected stages of development in district computerized administrative applications.

Instrumentation

An instrument was developed to address concerns revealed in research studies, relevant journal articles, and discussions with school district administrators regarding the need for computer systems information and its application to educational administration. Questions of adequacy of microcomputers for district administrative needs, personnel training and attitudes, and facility improvements such as re-wiring and air-conditioning installations were seldom discussed in the literature.

To help narrow the focus of study, the writer discussed some of the research findings with several district administrators and state department officials to determine more precisely what information was needed. These discussions were fruitful in determining what information local administrators wanted most regarding (1) the planning and implementation process, (2) the problems encountered by district administrators who had experienced the transition, and (3) the equipment and computerized administrative functions employed in these districts. Several studies including the Educational Research Service study entitled School District Uses of Computer Technology (Protheroe, Carroll, and Zoltis 1982) were particularly helpful in refocusing the direction and intent of the questions selected for the questionnaire.

During the development stage of the instrument (appendix A) the writer first generated more than fifty questions that addressed the concerns identified by local and state officials by means of informal discussions as well as by means of issues identified in numerous

journal articles. After consultation with the writer's advisor and other individuals experienced in the writing of questionnaires, a number of items were eliminated or combined with other questions so that the questionnaire would not be excessive in length and possibly reduce the rate of response. The final number of questions was reduced to twenty. Originally, the survey was designed to seek data regarding school-level computer administrative applications within each of the school districts surveyed in addition to district-level administration; but the questionnaire was too lengthy and these items were removed. The literature revealed that there was often considerable overlap in the functions performed at each level. The remaining items were prioritized and the least essential items were removed.

Once the questions were selected the instrument was pretested by an administration microcomputer class for readability and by a panel of computer-user educators for face and content validity. Questions consisted of three major types: checklist, Likert-type scales, and open-ended questions. The checklists were used for those questions in which the writer wished to determine responses to predetermined variables such as consultant services, planning steps, facility changes, and significant problems. Provision was made for responses not included in each checklist. Likert-type scales were used to elicit responses where degrees of influence were observed on establishment of a computerized system and for degrees of satisfaction with various factors affecting the success of the process such as vendor support, staff satisfaction, and satisfaction with district data generated. Open-ended questions were used to provide the respondents with the opportunity to comment as they wished, particularly for the questions

requesting general recommendations. Secondly, open-ended questions were used in instances in which the number of possible responses was so vast that a checklist would have been inappropriate.

The instrument was divided into three main sections: (1) Planning Considerations for Implementation of Computer Systems, (2) Present District Office Situation, and (3) Specific Future Plans. In addition, respondents were asked to indicate district per pupil expenditure to provide some indication of district wealth and ability to afford certain computer systems.

Section A, Planning Considerations for Implementation of Computer Systems, was designed to identify a number of concerns commonly encountered before decisions were finalized and monies spent on a particular computer system. Such concerns included the identification of possible source(s) of information, necessary training or retraining of district staff, facility changes, initial equipment and/or services purchased/leased, and initial computerized administrative functions performed.

The purpose of Section B, Present District Office Situation, was to identify current computer system(s) including hardware and software used at the district level as well as the computerized functions performed. The writer also sought to determine the extent of the use of electronic data transmission through such means as modems, terminals, or the mailing of floppy diskettes for sending data to schools or state agencies and to identify the types of information sent.

Many school districts have had two and occasionally three virtually independent computer systems performing tasks of varying

degrees of sophistication. Thus, it was necessary that questions in the survey instrument made provision for all computer system(s) used. In addition to technical questions regarding the physical components of the computer system(s), the questionnaire contained questions about the degree of satisfaction that district officials had with such factors as maintenance service, availability of software, and technical assistance by vendors. Such factors were crucial because most district officials became substantially dependent upon these outside services following the purchase of systems hardware and software. The degrees of satisfaction with the computer system(s) capability of performance in terms of productivity and flexibility in generating useful information were also determined. Other questions were designed to identify specific safeguards for electronically processed information that differed from security measures in the non-electronic system. Based on their experience with their district needs and the capabilities of the various computer systems used, respondents were asked to give some indication of the size of school district enrollment at which microcomputers alone were deemed to be inadequate for district administrative use.

In Section C, Specific Future Plans, the respondents were asked to identify specific plans that have been approved or have been seriously considered for improving the district's systems capabilities. Particularly, responses to planned upgrading of hardware and software and to intended use or improved use of electronic data transmission were sought. With the rapidly changing capabilities in computer and related technology, the future plans of the district officials surveyed may form the bases for innovation in those districts presently

contemplating the introduction of computers because today's technology may be somewhat dated a year or two hence.

Finally, respondents were asked to provide general recommendations, based on their past experiences, that might help eliminate or alleviate some of the problems that other administrators might experience. In the covering letter sent to all district officials (appendices D or E depending on source of identification), a request was made to provide any district print materials that might be available and relevant to the study.

Population and Sample

School district personnel within each state often use similar brands of hardware and in some situations have been encouraged to do so by state policy in an attempt to coordinate growth and development in the use of computers. In the northern plains region it appeared from the preliminary research that Apple and International Business Machines (IBM) microcomputers were very popular. Although Apple microcomputers were well established and supported by the Minnesota Education Computing Consortium (MECC), there was a growing interest in the use of IBM microcomputers in school district administration and MECC recently decided to support the use of IBM microcomputers as well by creating administrative software for both systems. Improved IBM features such as greater processing speed, greater memory capacity, built-in hard disk storage, and the brand name itself have been suggested as advantages which have led to the increasing popularity of the IBM microcomputers. Therefore, the population for the study was limited to only those districts which used Apple or IBM microcomputers for their microcomputing needs.

The decision to focus upon those districts using Apple and IBM microcomputers and the regional influence of the Minnesota Education Computing Consortium strongly influenced the decision to restrict the study to the northern plains region of the United States where there appeared to be some existing as well as an increasing commonality in the use of these computer systems. Within the northern plains region there were smaller areas which used other microcomputers such as Radio Shack and Commodore that would not be included in the survey. Those northern plains states selected for the study were Iowa, Minnesota, Nebraska, North Dakota, and South Dakota.

Secondly, the writer's purpose was to investigate only those school districts in which district personnel were experienced in the use of computers so it was therefore necessary to have some means of identifying these districts. State education officials (regional officials in Minnesota) were asked to select the districts within their jurisdiction which they felt best exemplified sound, computerized educational practices and which also met the following criteria established for the study: (1) School district officials had to be using computers for at least some portion of their administrative needs; (2) Apple or IBM microcomputers had to be the primary microcomputer system used in those districts using microcomputers, although other brands of microcomputers could be used for less significant purposes; and (3) any brand of minicomputer, mainframe computer, or time-share system could be used for all or some of the district-level administrative needs in any of the districts selected for the study.

Thirdly, each state official was requested to select seven school districts representing each of the following four different student enrollment categories: (1) less than 300 students; (2) 300 to 1,499 students; (3) 1,500 to 2,999 students; and (4) 3,000 to 10,000 students. The choice of seven districts in each category was influenced by the fact that Minnesota had seven regions and each regional official could choose one district from each of the four enrollment categories where such districts existed. The concept of enrollment categories originated with the acknowledgement that district needs vary with enrollment size. There was a potential total of twenty-eight school districts in most of the five states. Since many of the school districts throughout the northern plains region had relatively small student enrollments, the category boundaries based on student enrollment were adjusted in order to select representative school districts from a relatively equal population base. Because of the varying natures of the density and sparsity of population centers within the five selected states, it was impossible to find seven representative school districts meeting the research criteria in each of the four categories in every state, no matter how the category boundaries were adjusted. Instead of the desired 140 school districts (seven districts in each of four categories in each of five states), 121 school districts were selected. School districts with greater than 10,000 students were omitted because (1) several states in this region had a limited number of possible districts that could have been selected in this category, and (2) very large school districts often had customized computer systems that would be very difficult and probably inappropriate for most other school districts to replicate.

Procedure

The writer had been concerned about the problems incurred by school district administrators in developing and implementing computerized administrative procedures in local district offices. Following a number of informal discussions with district superintendents and state data systems people, certain common needs were identified. There was a desire for more information regarding the procedures adopted by and the problems encountered by district officials experienced in the transition process from non-electronic data processing to computerized procedures. Local administrators also wanted to know the types of computer systems installed and the computer functions performed. This information would only be useful if school district enrollment size and ability to pay for computer systems were known.

A preliminary written inquiry was sent to state superintendents in forty-nine of the American states. Hawaii was not used because the entire state was one school district. The results of this inquiry were used to determine what possible information might be available at the state level and to determine whether it would be possible to identify school districts using computers for district-level administration. It was requested that the letter be forwarded to data systems people (or equivalent departmental personnel) for response. Although responses were received from over half of the states, much of the information included instructional data indistinguishable from administrative information. Based on the information received, the writer decided that a study of school district administrative practices would be valuable but that not all states could provide the necessary information at this time. Several states were in the process of

surveying their school districts to determine what was current practice.

It was originally planned to focus strictly upon the use of microcomputers, but the preliminary research seemed to indicate that there was a wider range of computer processing capacity being used. Alternatively, some districts used microcomputers or dedicated terminals to time-share on a host regional computer where this level of state organization existed such as that found in Minnesota.

Once approval for the research project was finalized, one state data systems department person in Iowa, Nebraska, North Dakota, and South Dakota was contacted by telephone to gain his/her cooperation and a letter was sent explaining the purpose of the study, the necessity of his/her cooperation, and a request that he/she identify twenty-eight school districts, if possible, according to the criteria enclosed in the letter (appendix B). In Minnesota the state organizational structure was different. The state was divided into seven regional service agencies in which some data were centrally collected on a host computer. In this situation all seven regional directors were contacted by telephone and their assistance for the project obtained. Similarly, a covering letter (appendix C) was sent afterwards explaining the details of the study. Because there were seven regions, each director was asked to contribute the name of one school district for each of the four categories thus keeping the numbers of school districts the same for all states. All officials contacted were encouraged to notify each local school district of the recommendation that they be included in the study and to encourage their participation in the study.

These state officials responded in different ways depending upon the amount and type of information at their disposal. The majority sent a list of names of contact people and their addresses while several others sent a computer printout of all the districts containing some indication of the type of computer equipment available. Others provided a list of names and addresses identified in a state handbook. On several occasions, school districts identified did not have the prerequisite Apple or IBM hardware.

Following the identification of the sample school districts within each state, a covering letter (appendix D or E depending on the source of identification) was sent to each district contact person explaining the purpose of the study and requesting his/her support. Enclosed with the letter was the survey instrument (appendix A) and a stamped, self-addressed envelope for the return of the survey instruments. Each district official who did not respond to the letter by the indicated time was contacted by telephone and a second questionnaire was sent if requested.

The responses to the survey were grouped according to the four district student enrollment categories. From this point forward, each of the four groups of data was treated individually and collectively throughout the remainder of the study as described in the following section, Treatment of Data, with the purpose of developing a composite profile for each of the four enrollment categories to be available for consideration by local administrators when considering the establishment of computerized procedures.

Treatment of Data

The data collected from the survey focused on the past,
present, and future stages of systems applications to educational
administration in selected school districts. Data were presented in
tabular form when statistically treated. Mean responses were calculated
for all questions in which respondents were asked to circle the most
appropriate answers on the Likert-type scales. Results from the
answers required in checklist responses were presented as frequencies
and percentages. Data collected from open-ended questions were
presented in narrative form using summarization and verbatim quotes.

Due to the variety of factors that may have influenced the
type of computer system(s) used in each school district, the data
were presented in such a way to account for (1) school district size
in terms of student enrollment, (2) type of computer system used,
and/or (3) district per pupil expenditure. When responses were
considered in relation to district enrollment, the four categories
used were (1) less than 300 students; (2) 300 to 1,499 students;
(3) 1,500 to 2,999 students; and (4) 3,000 to 10,000 students. When
responses were considered in relation to the type of computer system
used, data were included under the headings (1) microcomputers only,
(2) minicomputers only, (3) mainframe computers only, (4) micro and
minicomputers, (5) micro and mainframe computers, (6) mini and mainframe
computers, and (7) all three systems. Responses from district officials
were noted if they used a time-share system with a host mini or
mainframe computer located outside the school district. Distinctions
were made between Apple and IBM microcomputers when related equipment
and software were considered. District per pupil expenditure (based on

total budget) was accounted for under the following five categories:
(1) less than $1,300; (2) $1,300 to $1,799; (3) $1,800 to $2,099;
(4) $2,100 to $2,599; and (5) $2,600 or more.

Based on the number and type of responses received, a profile
was developed for each school district student enrollment category
that best reflected the results reported by the respondents within each
category. The set of criteria was intended to assist in the establish-
ment of a process for district administrators to consider when
beginning their planning for a transition to computerized office
procedures. The criteria described the most typical computer systems
(including hardware and software) currently used in the districts
surveyed in order to provide an indication of possible computer
system(s) to be considered in other school districts with similar
circumstances.

CHAPTER IV

PRESENTATION OF THE DATA

This chapter presents an analysis of the data received from questionnaires sent to selected school district officials throughout Iowa, Minnesota, Nebraska, North Dakota, and South Dakota. Much of the data including hardware, software, and concerns are identified according to the following four student enrollment categories established for the study: (1) less than 300; (2) 300 to 1,499; (3) 1,500 to 2,999; and (4) 3,000 to 10,000. Many responses have been analyzed collectively without regard to enrollment categories where it appeared that responses were similar throughout the four enrollment categories or equally important to all administrators regardless of school district size.

Persons completing the questionnaire included superintendents, school business officials, computer coordinators, and clerical/ secretarial staff. In all, seventy-eight or 64.5 percent of the possible number of questionnaires were considered usable. Returned questionnaires not included in the results were received from school district personnel that either did not actively use computers although state officials believed that they did, or they used only microcomputer system(s) other than IBM or Apple. The latter group of returns was received from districts which primarily used Radio Shack microcomputers

as the only administrative computer. Two districts were also omitted because they used only a Xerox-II or a Burroughs B-22 microcomputer.

The information provided in this chapter has been divided into four parts: (1) description of the population, (2) planning considerations for implementation of computer systems, (3) present district office situation, and (4) specific future plans. All data were presented as frequencies, ranked order responses, or mean responses.

Description of the Population

Initially, twenty-eight districts were to be selected from each of the five states of Iowa, Minnesota, Nebraska, North Dakota, and South Dakota. The research objective of twenty-eight districts per state was partially decided upon because of the organizational structure in Minnesota in which there were seven regions across the state, each somewhat independent with regard to their involvement in administrative use of computers at the district level. Secondly, twenty-eight districts seemed to be the largest number of school districts which could be identified in most states that would meet the research criteria.

Table 1 illustrates the number of usable returns from each state and from each of the four enrollment categories. Each selected school district was to have been one of the better examples of districts using computers for administrative purposes.

The percentage of responses increased with district enrollment size. There were 14 usable responses (43.8%) from districts with less than 300 students; 19 responses (59.4%) from districts with 300 to 1,499 students; 20 responses (69%) from districts with 1,500 to 2,999 students; and 25 responses (89.3%) from districts with 3,000 to 10,000

TABLE 1

NUMBER OF RESPONDENTS IN EACH OF THE FOUR
ENROLLMENT CATEGORIES

| State | N | Number of Usable Returns | | | | |
		Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000	Usable
Iowa	17	4	5	3	5	60.1
Minnesota	15	2	3	4	6	75.0
Nebraska	18	4	4	5	5	72.0
North Dakota	17	1	5	4	7	68.0
South Dakota	11	3	2	4	2	47.8

N = 78

students. Minnesota had the highest percentage of district responses but they were grouped into seven regions and regional directors made the district selections. These directors may have been better able to identify school districts that had equipment that met the criteria of this study. South Dakota had the lowest percentage of usable responses. Both North Dakota and South Dakota had four surveys rejected because district officials either used Radio Shack of Xerox microcomputers. Iowa was the only state that was able to potentially recommend seven school districts in each of the four enrollment categories. It was not possible to establish enrollment limits that would have permitted a full complement of seven districts in each of four district enrollment categories in the remaining four states.

Table 2 illustrates the average per pupil expenditure for each of the four enrollment categories.

TABLE 2

PER PUPIL DISTRICT EXPENDITURE

| | Number of Responses | | | | | |
Enrollment Categories	Less Than $1,300	$1,300 to $1,799	$1,800 to $2,099	$2,100 to $2,599	$2,600 or More	Average Expenditure
Less than 300	2	0	0	1	6	2,408.89
300- 1,499	0	0	3	5	6	2,604.14
1,500- 2,999	0	0	1	6	6	2,780.15
3,000-10,000	0	1	0	4	12	2,743.29
Overall	2	1	4	16	30	2,658.79

N = 53

The response rate to this question was low. Twenty-five districts did not respond appropriately to this question. Some respondents indicated the dollar value of computer expenditures per pupil in the district rather than the total per pupil expenditure thus reducing the number of usable responses. Per pupil expenditure was used as an indication of district potential to afford the purchase of computers and other expensive computer hardware. The widest per pupil district expenditure differential ($324.27) was between districts with less than 300 students and districts with 1,500 to 2,999 students. There were two respondents to this question who had district expenditures less than $1,300. The largest districts tended to have

the greatest per pupil district expenditure.

Table 3 compares the type of computer systems used by various school districts with their total per pupil district expenditure. The one district in the expenditure category of $1,300 to $1,799 used a microcomputer.

TABLE 3

PER PUPIL DISTRICT EXPENDITURE

Computer System(s)	Number of Responses					
	Less Than $1,300	$1,300 to $1,799	$1,800 to $2,099	$2,100 to $2,599	$2,600 or More	N
Microcomputer (only)	2	1	1	7	16	27
Minicomputer (only)	0	0	0	5	0	5
Mainframe (only)	0	0	0	1	2	3
Microcomputer-Minicomputer	0	0	1	2	3	5
Microcomputer-Mainframe	0	0	0	1	2	3
Time-Share (only)	0	0	1	0	0	1
Time-Share Plus Other System(s)	0	0	1	1	6	8
All Three Systems	0	0	0	0	1	1

N = 53

There were districts in all income categories which depended entirely on microcomputers despite their enrollment figures. Districts with greatest per pupil expenditure generally had the largest computer systems. With only one exception, no districts with a per pupil expenditure less than $2,100 (based on total budget) used a minicomputer

or mainframe computer. The one district exception in the $1,800 to $2,099 per pupil district expenditure category had 1,789 students.

Table 4 illustrates the type of computer system(s) used in each of the enrollment categories.

The "All Three" column referred to the combined use of micro, mini, and mainframe computers--it did not include time-share. There were twelve districts using time-share; however, all but three of the time-share users used at least one other computer system. The dual minicomputer and mainframe computer systems combination was omitted from table 4 because no respondents indicated that they used only those two systems. School districts with less than 300 students used only microcomputer systems. Districts with 300 to 1,499 students primarily used microcomputers as well. However, one district used an older-model minicomputer; two districts used time-share systems; and one district used its own microcomputer as well as being on a time-share arrangement. Eight districts with 1,500 to 2,999 students used only microcomputers but another five districts used microcomputers in addition to other computer systems. Six districts used minicomputers and one district had its own mainframe computer.

In the category of districts with 3,000 to 10,000 students, five districts (25%) solely depended upon microcomputers, although nine other districts (45%) used microcomputers to some extent. Three districts (15%) used only minicomputers and three districts (15%) used only mainframe computers.

The percentage of districts using a time-share arrangement increased with student enrollment. The size of the largest computer system used in the district also increased with student enrollment.

TABLE 4

NUMBER OF DISTRICTS USING PARTICULAR COMPUTER SYSTEM(S)

Categories	Micro Only	Mini Only	Main Only	Micro/ Mini	Micro/ Main	All Three	Time-Share Only	Time-Share Combination
Less than 300	14	0	0	0	0	0	0	0
300- 1,499	14	1	0	1	0	0	2	1
1,500- 2,999	8	4	2	2	1	0	0	3
3,000-10,000	5	3	3	2	2	1	1	8

N = 78

<u>Planning Considerations for Implementation</u>
<u>of Computer Systems</u>

The following set of research questions and accompanying tables addresses administrative concerns encountered prior to the establishment of a particular computer system within a school district.

<u>Question 1</u>. What factors were influential in encouraging district administrators to introduce computer technology into district office administration?

Table 5 illustrates the number of responses and the mean of these responses in the questionnaire regarding reasons why district personnel first began using computers for administrative purposes.

TABLE 5

REASONS WHY ADMINISTRATORS BEGAN USING COMPUTERS AND
THE IMPORTANCE OF EACH REASON

| | Responses | | | | | |
Reason	Low 1	2	3	4	High 5	Mean
Potential advantages offered by a computer system	1	1	9	19	47	4.43
Eagerness of one or two individuals	3	11	14	27	20	3.67
Decrease in overall cost of performing functions	10	16	23	14	10	2.97
General staff eagerness to try system	9	13	15	16	6	2.95
Other	0	2	2	3	2	3.56

N = 78

Respondents were given a list of alternatives with the option of adding other reasons. The primary reason that computers were installed in school district offices was for the potential advantages offered by a computer system. Cost saving was less of a factor and some respondents indicated that no cost savings were ever realized. The eagerness of a few district people to try using computers was the second greatest reason for the change to automated technology.

The questionnaire allowed respondents to provide additional comments regarding reasons why administrators began using computers. Some of the additional reasons included one "time-saver" response from each of the four enrollment categories; two responses to utilizing technology in place of increasing staff; and one response to each of (1) state requirement, (2) availability of microcomputer hardware and software, and (3) an efficient method of handling workload.

Table 6 illustrates the breakdown of these responses by enrollment categories. The "potential advantages of a computer system" was the leading reason for their introduction in all enrollment categories except for districts with less than 300 students in which the eagerness of one or two individuals was more often identified as the major reason. "Potential advantages of a computer system" was given as the second most important reason in this category. "Eagerness of one or two individuals" was the second most important reason given in districts with 300 to 1,499 and 3,000 to 10,000 students. "General staff eagerness to try system" was least important in all categories except in the category with less than 300 students. In this category it was ranked third and slightly above "decrease in overall performance costs." "Decrease in overall performance costs" was ranked as the third

TABLE 6

REASONS WHY ADMINISTRATORS BEGAN USING COMPUTERS IN EACH
OF THE FOUR ENROLLMENT CATEGORIES

| | Responses | | | | | |
| | Low | | | | High | |
Reason	1	2	3	4	5	Mean
Less Than 300 Students						
Eagerness of one or two individuals	0	0	2	7	5	4.21
Potential advantages of a computer system	0	1	3	4	6	4.07
General staff eagerness to try system	0	2	7	2	3	3.43
Decrease in overall performance costs	0	3	5	3	2	3.31
300 to 1,499 Students						
Potential advantages of a computer system	0	0	1	3	14	4.72
Eagerness of one or two individuals	1	4	3	6	4	3.44
Decrease in overall performance costs	2	3	6	4	3	3.17
General staff eagerness to try system	1	3	7	6	1	3.17
1,500 to 2,999 Students						
Potential advantages of a computer system	0	1	3	8	4	3.92
Decrease in overall performance costs	0	0	4	10	2	3.88
General staff eagerness to try system	0	3	5	3	6	3.71
Eagerness of one or two individuals	0	1	7	7	1	3.50
3,000 to 10,000 Students						
Potential advantages of a computer system	1	0	3	6	15	4.36
Eagerness of one or two individuals	1	4	3	7	9	3.46
Decrease in overall performance costs	5	6	8	1	4	3.42
General staff eagerness to try system	3	4	11	5	1	2.88

most important reason for introducing computers except in the category
with 1,500 to 2,999 students where it was rated as the second most
important reason and very nearly as important as the "potential
advantages of a computer system."

Question 2. What services have been obtained from consultants
or consulting firms during the planning stages?

A number of districts employed their own consultants or
coordinators. However, twenty-three respondents indicated that they
utilized the services of "outside" consultants or consulting firms as
shown in table 7. Approximately half (56.5%) of the districts using
consultants had the consultants provide at least some of the initial
training of staff. Less than half of the respondents (52.2%) had
consultants assist in making recommendations on such matters as
procedures, goals, hardware, or software. Only three districts involved
consultants in feasibility studies. A number of these consultants were
Educational Regional Service Agency personnel.

Data from table 7 were separated into the four enrollment
categories and illustrated in table 8. The percentage figures are
based on the total number of returns for each category.

School districts in the smallest category used consultant
services very little. When consultants were used, staff training was
the primary objective but they were asked to assist in recommending
hardware/software and to help in establishing district goals. Twenty
percent or more of the districts with 300 to 1,499 students received
advice on an "on call" basis, staff training assistance, hardware/
software recommendations, and assistance in planning initial functions.
The two largest categories tended to use a wider variety of services

TABLE 7

TYPES OF SERVICES RECEIVED FROM CONSULTANTS
AND/OR CONSULTING FIRMS

Services Provided	Respondents	
	N	%
Provided initial training	13	56.5
Recommended hardware	12	52.2
Identified district goals	11	47.8
Determined initial functions	10	43.5
Recommended software	10	43.5
Available on call for advice	10	43.5
Assisted in financial planning	5	21.7
Planned district goals	4	17.4
Conducted feasibility study	3	13.0
Other (developed specific software programs)	4	17.4

N = 23

TABLE 8

TYPES OF SERVICES RECEIVED FROM CONSULTANTS AND/OR CONSULTING FIRMS IN EACH ENROLLMENT CATEGORY

Services Provided	Total	Less Than 300		300 to 1,499		1,500 to 2,999		3,000 to 10,000	
		N	%	N	%	N	%	N	%
Provided initial training	13	2	14.3	5	26.3	3	15.0	3	12.0
Recommended hardware	12	1	7.1	4	21.1	4	20.0	3	12.0
Identified district needs	11	0	0.0	3	15.8	4	20.0	4	16.0
Determined initial functions	10	0	0.0	4	21.1	3	15.0	3	12.0
Recommended software	10	1	7.1	4	21.1	3	15.0	2	8.0
Available on call for advice	10	0	0.0	5	26.3	3	15.0	2	8.0
Assisted in financial planning	5	0	0.0	0	0.0	3	15.0	2	8.0
Planned district goals	4	1	7.1	0	0.0	2	10.0	1	4.0
Conducted feasibility study	3	0	0.0	1	5.3	2	10.0	0	0.0
Other (developed specific software programs)	4	0	0.0	1	5.3	1	5.3	2	8.0

Respondents

N = 23

and a reduced percentage of any given service. In the category of
school districts with 1,500 to 2,999 students, all listed services were
used by at least 15 percent of the districts except for district goal
planning and feasibility studies. School districts with 3,000 to 10,000
students used paid "outside" consultants less than the other categories
except for the smallest category. However, they used their own
personnel for many of these services. Their greatest need for "outside"
consultants was for identifying district needs. The larger school
districts also indicated that they used consultants to write programs
for local applications.

Five respondents indicated that they utilized methods other
than employing consultants for gaining some or all of their information
about computers and their administrative applications. These alternate
sources included inservice in districts with 300 to 1,499 students and
3,000 to 10,000 students (one response from each category); demonstra-
tion in a district with 300 to 1,499 students (one response); personal
reading in a district with 1,500 to 2,999 students (one response); and
assistance from salespersons in a district with less than 300 students
(one response).

Question 3. What basic steps or procedures were established by
district officials during the initial planning stages in order to ensure
a successful transition from traditional office practices to
computerized methods?

Table 9 illustrates the types of steps that district officials
took during the planning stage.

The list of responses illustrated in table 9 was provided in
the questionnaire with provision made for the respondent to indicate

TABLE 9

PLANNING STEPS TAKEN BY DISTRICT OFFICIALS

	Respondents	
Steps Taken	N	%
Sought board approval	65	83.3
Trained or inserviced staff	60	76.9
Consulted several vendors	56	71.8
Visited other district offices	49	62.8
Consulted district employees	41	52.6
Reviewed journals/magazines	39	50.0
Developed a time line	35	44.9
Reviewed research	26	33.3
Consulted state officials	26	33.3
Sought tenders for equipment	23	29.5
Established planning committee	20	25.6
Established philosophy and policy	19	24.4
Implemented on trial basis	19	24.4
Hired coordinator or consultant	16	30.8
Consulted university faculty	14	17.9

N = 78

what other steps may have been taken but there were no other planning steps taken. Board approval was sought in 65 (83.3%) districts. Staff training was conducted in 60 (76.9%) of the districts and its importance was reinforced by the comments in table 9. The number of responses to other important steps were 56 (71.8%) to consultation with

several vendors, 49 (62.8%) to other district office visitations, 41 (52.6%) to consulted district employees, and 39 (50%) to the review of journals and magazines. Only 16 (30.8%) districts hired a computer coordinator or consultant and least utilized was the knowledge of university people with only 14 (17.9%) districts responding affirmatively.

Table 10 separates the information from table 9 into four enrollment categories. The two largest categories primarily followed the pattern established in the overall study. Districts with less than 300 students and 300 to 1,499 students tended not to inservice staff as much as the larger districts. Districts with less than 300 students also tended not to participate in as many planning steps as did districts in the other categories. On the average, districts with less than 300 students practiced 31.9 percent of the planning steps listed in table 9 while districts with 300 to 1,499 students averaged approximately 40 percent of the listed steps; districts with 1,500 to 2,999 students performed 38.7 percent of the steps; and districts with 3,000 to 10,000 students practiced over half (51.5%) of the steps. Generally, the number of planning steps increased with the size of the school district enrollment category.

Larger districts tended to employ "in-house" consultants/ coordinators more than smaller districts. None of the district respondents with less than 300 students hired "in-house" consultants/coordinators.

One respondent in a district with 300 to 1,499 students hired two secretaries with computer experience while two respondents in the largest category responded once to consulting the Minnesota Education

TABLE 10

PLANNING STEPS TAKEN BY SCHOOL DISTRICT OFFICIALS
IN EACH ENROLLMENT CATEGORY

| | Respondents | | | | | | | |
| | Less Than 300 | | 300 to 1,499 | | 1,500 to 2,999 | | 3,000 to 10,000 | |
Steps Taken	N	%	N	%	N	%	N	%
Sought board approval	12	85.7	15	78.9	18	90.0	20	80.0
Trained or inserviced staff	7	50.0	14	73.7	16	80.0	23	92.0
Consulted several vendors	8	57.1	15	78.9	14	70.0	19	76.0
Visited other district offices	5	35.7	14	73.7	14	70.0	16	64.0
Consulted district employees	5	35.7	11	57.9	10	50.0	15	60.0
Reviewed journals/magazines	5	35.7	9	47.4	10	50.0	15	60.0
Developed a time line	3	21.4	9	47.4	9	45.0	14	56.0
Reviewed research	3	21.4	7	36.8	3	15.0	13	42.0
Consulted state officials	4	28.6	6	31.6	7	35.0	9	36.0
Sought tenders for equipment	4	28.6	4	21.1	7	35.0	8	32.0
Established planning committee	1	7.1	1	5.3	7	35.0	9	36.0
Established philosophy and policy	4	28.6	2	10.6	3	15.0	10	40.0
Implemented on trial basis	4	28.6	2	10.6	3	15.0	10	40.0
Hired coordinator or consultant	0	0.0	3	15.8	6	30.0	7	28.0
Consulted university people	4	28.6	2	10.6	3	15.0	5	20.0

N = 78

Computing Consortium and once to conducting a feasibility study.

Question 4. What were the general means of access to computer technology during the initial stages of computer use? Did district personnel tend to purchase hardware, purchase services, or lease equipment?

Table 11 illustrates the initial means of district access to computer technology at the administrative level.

TABLE 11

INITIAL ACCESS TO COMPUTER TECHNOLOGY

Source	Respondents	
	N	%
Purchased some or all equipment	68	87.2
Purchased services	44	56.2
Used time-sharing arrangement	17	21.8
Rented/leased equipment	9	11.5

N = 78

Sixty-eight (87.2%) district officials indicated that they had purchased all of their computer equipment while only 9 (11.5%) districts rented or leased equipment. Forty-four (56.2%) districts purchased certain computer services when they first began using automated technology and 17 (21.8%) districts accessed computer programs through time-sharing. The figures in table 11 exceeded 100 percent because many districts used more than one means to access computer services.

Table 12 separates the data from table 11 into enrollment categories.

TABLE 12

INITIAL ACCESS TO COMPUTER TECHNOLOGY IN
EACH ENROLLMENT CATEGORY

| | Respondents | | | | | | | |
| | Less Than 300 | | 300 to 1,499 | | 1,500 to 2,999 | | 3,000 to 10,000 | |
Source	N	%	N	%	N	%	N	%
Purchased some or all equipment	14	100.0	16	84.2	15	75.0	23	92.0
Purchased services	8	57.1	10	52.6	9	45.0	17	68.0
Used time-sharing arrangement	4	28.6	2	10.5	2	10.0	9	36.0
Rented/leased equipment	1	7.1	2	10.5	3	15.0	2	8.0

N = 78

The trend of responses from all four categories in table 12 was consistent with the trend for the entire group of responses shown in table 11. Most districts owned their own equipment with districts in the largest category using time-sharing more often than districts in the other categories.

Table 13 illustrates the number of districts renting computers and peripheral equipment.

All 9 (100%) districts renting and/or leasing equipment rented and/or leased computers. Only 6 (67%) of the districts renting computers also rented and/or leased peripheral equipment as shown in table 11.

TABLE 13

TYPES OF RENTED/LEASED EQUIPMENT

Equipment	Respondents	
	N	%
Computers	9	100.0
Peripherals	6	66.7

N = 9

Table 14 illustrates the preceding information as it pertains to each of the four student enrollment categories.

TABLE 14

TYPES OF RENTED/LEASED EQUIPMENT IN EACH
ENROLLMENT CATEGORY

	Respondents							
	Less Than 300		300 to 1,499		1,500 to 2,999		3,000 to 10,000	
Equipment	N	%	N	%	N	%	N	%
Computers	1	7.1	1	5.3	4	20.0	3	12.0
Peripherals	0	0.0	2	10.6	3	15.0	1	4.0

N = 9

It can be seen that the greatest percentage of computer rentals were in the larger categories with 4 (20%) in districts with 1,500 to 2,999 students and 3 (12%) in the category with enrollments of 3,000

to 10,000. All 3 districts renting computers in the category with 1,500 to 2,999 students rented minicomputers. All 3 districts renting computers in the category with 3,000 to 10,000 students rented mainframe computers.

Table 15 illustrates the agencies utilized to provide computer services.

TABLE 15

AGENCIES UTILIZED TO PROVIDE SERVICES

| | Respondents | |
Equipment	N	%
Educational Regional Service Agency	31	70.5
Commercial Agency	8	18.2
Several Agencies	3	6.8
College/University	2	4.5

N = 44

Forty-four (56.4%) districts utilized computer services provided by outside agencies. The most commonly utilized agency was the Educational Regional Service Agency with 31 (70.5%) districts indicating that they had used their services at the beginning.

The data presented in table 15 were separated into enrollment categories and are illustrated in table 16.

As shown in table 16, the Educational Regional Service Agency was the most popular means of obtaining outside computer services for districts in all categories. It was only some of the larger school

TABLE 16

AGENCIES UTILIZED TO PROVIDE SERVICES IN
EACH ENROLLMENT CATEGORY

	Respondents							
	Less Than 300		300 to 1,499		1,500 to 2,999		3,000 to 10,000	
Equipment	N	%	N	%	N	%	N	%
Educational Regional Service Agency	6	42.9	6	31.6	6	30.0	13	42.0
Commercial Agency	1	7.1	4	21.1	2	10.0	1	4.0
Several Agencies	0	0.0	0	0.0	1	5.0	2	8.0
College/University	1	7.1	0	0.0	0	0.0	1	4.0

N = 44

districts that utilized outside computer services from several agencies.

Question 6. What were the initial types of programs used on the computer by district administrators?

Table 17 illustrates the type of software programs first used by district administrators.

As shown in table 17, the greatest number of respondents (43 districts [56.5%]) began by using a combination of both general-purpose programs and job-specific programs designed for one specific task. Least used at the beginning were only the general-purpose programs.

Table 18 illustrates the breakdown of these data into enrollment categories.

TABLE 17

TYPES OF SOFTWARE FIRST USED

Software	Respondents	
	N	%
Used combination of general-purpose and job-specific programs	43	56.6
Used only job-specific programs	19	25.0
Used only general word processing, data base, or spreadsheet programs	14	18.4

N = 78

TABLE 18

TYPES OF SOFTWARE FIRST USED IN EACH OF
THE ENROLLMENT CATEGORIES

Software	Respondents							
	Less Than 300		300 to 1,499		1,500 to 2,999		3,000 to 10,000	
	N	%	N	%	N	%	N	%
Used combination of general-purpose and job-specific programs	7	50.0	12	63.2	10	40.0	14	42.0
Used only job-specific programs	1	7.1	6	31.6	4	20.0	8	32.0
Used only general word processing, data base, or spreadsheet programs	6	42.9	0	0.0	5	25.0	3	12.0

N = 78

Most of the districts in each category used a combination of various job-specific as well as general word processing, data base, and spreadsheet programs when first beginning with the use of computers. In districts with 300 to 1,499 students and 3,000 to 10,000 students, job-specific programs were the second most popular type of software used for administration. In districts with 1,500 to 2,999 students, and particularly in districts with less than 300 students, general-purpose programs were more often used than job-specific programs.

Table 19 illustrates the type of facility changes considered necessary for efficient computer operations.

TABLE 19

TYPES OF FACILITY CHANGES FOR COMPUTER
INSTALLATIONS IN DISTRICT OFFICE

Changes	Respondents	
	N	%
Electrical changes	53	67.9
New furniture	46	59.0
Telephone-wiring changes	38	48.7
Data storage facilities	21	26.9
Install air conditioner	13	16.7
Structural changes	13	16.7
Lighting	11	14.1
Reflooring	6	7.7
Other	8	10.3

N = 78

When first beginning with automation, 53 (67.9%) school districts had to resolve the problem of more adequate electrical wiring. Over one-half (59%) of the districts also indicated that existing office furniture was inadequate. Additional important changes for many districts were telephone-wiring improvements with 38 (48.7%) and data storage facilities with 21 (26.9%) responses, respectively.

Other changes found to be necessary in school district offices included two responses of having built new, specially designed offices and one response each to the installation of a static-free rug, the removal of a base radio, and the installation of a humidifier in the microcomputer-only districts. One respondent stated that he should have added new furniture, resurfaced the floor, and provided data storage facilities. Another respondent had just recently had a totally new facility designed and built to accommodate the use of a minicomputer system.

Table 20 redistributes the information on district changes from table 19 into groups based upon the type of computer system(s) used in the office.

Electrical changes, new furniture, and telephone-wiring changes were generally common improvements in most districts using all types of computer system(s).

Question 7. What district personnel had training in the administrative use of computers and what training did they receive?

Table 21 illustrates the training source utilized by district personnel and the average number of days of training received.

As shown in table 21, most district personnel utilized several sources to gain knowledge regarding the administrative use of computers.

TABLE 20

TYPES OF FACILITY CHANGES MADE TO ACCOMMODATE COMPUTER
INSTALLATIONS IN DISTRICT OFFICES

| | Respondents | | | | | | | |
Changes	Micro Only N=41	Mini Only N=8	Main Only N=5	Micro/ Mini N=5	Micro/ Main N=3	All Three N=1	Time-Share Only N=3	Time-Share Combination N=12
Electrical changes	25	7	3	4	2	1	1	10
New furniture	24	5	2	2	2	1	3	8
Telephone-wiring changes	11	4	4	1	2	1	3	1
Data storage facilities	9	2	1	2	2	1	1	3
Install air conditioner	0	2	2	3	2	1	0	3
Structural changes	3	3	1	0	2	0	1	3
Lighting	2	2	1	1	1	0	1	3
Reflooring	1	1	1	1	1	1	0	0

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TABLE 21

TYPE OF TRAINING RECEIVED BY VARIOUS DISTRICT PERSONNEL

Responses Indicating Source of Training

Position	Vendor Only	Computer Company Only	University/ College Only	District Visitation Only	On-the-Job Only	Self Only	Ongoing Only	Other	Multiple Sources	Average Number of Days
Computer Coordinator	2	4	2	0	1	3	10	1	23	22.7
Business Administrator	8	5	1	0	4	2	5	2	22	13.0
Office Secretarial Staff	7	5	0	0	14	5	4	4	29	9.8
Superintendent	5	5	2	6	2	6	3	2	22	9.0

N = 78

Based on the survey information, superintendents tended to emphasize district visitations and visits to vendors. Coordinators and business administrators, on the other hand, tended to have invested more of their time in more formal training such as that provided through university/college courses as well as a variety of other sources. Secretarial staff gained most of their expertise through on-the-job training. Although most respondents indicated whether or not district personnel had some training, they did not always indicate the amount of training time due in part to the difficulty in being precise in recalling the number of days involved. No amount of training days under the "Ongoing" heading had been included in the average number of training days. Several respondents either stated that training was ongoing and did not state the number of days, or they indicated large numbers of days that probably were imprecise and would skew the overall average. These numbers generally ranged from 150 to 300 days. Finally, it was not possible to tell from the results whether responses were omitted for certain personnel or whether the personnel position(s) did not exist.

Other staff receiving some degree of training that was mentioned by respondents included an accountant (30 days); clerks (average of 6 days); custodian (1 day); bookkeeper (10 days); building administrator (3 days); and principals, directors, and assistant superintendents for unspecified numbers of days. Other training sources included the Educational Regional Service Agency, regional computer center, district and regional workshops, monthly meetings, and sessions of the American Association of School Administrators.

Table 22 illustrates the amount and type of training received by personnel in each enrollment category.

Only 2 districts in the enrollment category with less than 300 students had personnel identified as business administrators, and the amount of training was negligible with an average of 2 days training in total. No personnel in this category received, on the average, more than 7.1 days of training. One of the most distinguishing characteristics of this category was the fact that superintendents received more training than other personnel in their districts, while in the remaining three categories the superintendents received the least or nearly the least amount of training. Superintendents in categories with enrollments of 300 to 1,499 students and 1,500 to 2,999 students received more training than superintendents in the smallest or largest enrollment categories. The computer coordinators/"in-house" consultants had the greatest average amount of training in the three largest enrollment categories. The amount of secretarial training increased as the size of each enrollment category increased.

Question 8. What problems were incurred by administrators involved in the study during this stage?

Table 23 lists the types of problems encountered by district officials at the beginning of the process to automate district office procedures.

As shown in table 23, the leading problem encountered was difficulties in understanding and fully utilizing the software packages as indicated by 45 (57.7%) of the respondents acknowledging software complexity problems. Insufficient training was a major concern for 30 (38.5%) respondents. A number of other problems

TABLE 22

TYPE OF TRAINING RECEIVED BY VARIOUS DISTRICT PERSONNEL IN EACH ENROLLMENT CATEGORY

Responses Indicating Source of Training

Position	Vendor Only	Computer Company Only	University/ College Only	District Visitation Only	On-the-Job Only	Self Only	Ongoing Only	Other	Multiple Sources	Average Number of Days
Less Than 300 Students										
Business										
Administrator	0	0	1	0	0	1	0	0	1	2.0
Computer										
Coordinator	0	1	0	0	1	1	0	0	1	5.5
Office Secretarial										
Staff	1	1	0	0	1	2	1	0	5	6.9
Superintendent	1	1	1	1	0	2	0	0	6	7.1
300 to 1,499 Students										
Business										
Administrator	2	1	0	0	1	0	0	1	3	12.3
Computer										
Coordinator	0	2	1	0	0	1	0	0	4	27.7
Office Secretarial										
Staff	1	2	0	0	3	1	0	1	8	8.1
Superintendent	2	0	0	2	1	1	0	0	8	9.8
1,500 to 2,999 Students										
Business										
Administrator	4	3	0	0	2	0	2	0	6	9.8
Computer										
Coordinator	0	0	1	0	0	0	2	0	5	17.0
Office Secretarial										
Staff	2	1	0	0	5	0	1	1	8	12.4
Superintendent	2	2	1	1	0	2	1	0	4	11.0
3,000 to 10,000 Students										
Business										
Administrator	2	1	0	0	1	6	3	1	12	18.2
Computer										
Coordinator	2	1	0	0	0	1	8	1	13	23.6
Office Secretarial										
Staff	3	1	0	0	5	2	2	2	8	15.2
Superintendent	0	2	0	2	1	1	2	2	4	5.1

TABLE 23

TYPES OF SIGNIFICANT PROBLEMS ENCOUNTERED DURING
THE TRANSITION TO AN AUTOMATED PROCESS

	Respondents	
Problems Encountered	N	%
Software complexities	45	57.7
Lack of training	30	38.5
Staff resistance	25	32.1
Hardware malfunction	20	25.6
Installation problems	18	23.1
Unexpected costs	16	20.5
Vendor delays in delivery	15	19.2
Poor technical support	11	17.9
Instituted changes too quickly	7	9.0
Job description problems	5	6.4
Major office renovation	3	3.8
Other	6	7.8

N = 78

including staff resistance (25 or 32.1% of the respondents), hardware

problems (20 or 25.6% of the respondents), installation problems (18 or

23.1% of the respondents), unexpected costs (16 or 20.5% of the

respondents), vendor delays (15 or 19.2% of the respondents), and poor

technical support (11 or 17.9% of the respondents) were also relatively

important.

Other problems suggested by respondents included two responses to software/hardware problems and one response each to telephone line problems, lack of available district models using automated procedures, printer problems, and lack of free time to implement.

Question 9. What recommendations did surveyed administrators have regarding personnel, facilities, or planning during the implementation stage?

Respondents were given the opportunity to make any recommendations which they believed were important. Many comments appeared to have a number of similar themes and have been summarized accordingly. Other responses might have easily been placed in several categories. Certain recommendations may be in conflict with one another. For a complete listing of the responses see appendix G.

Twelve respondents believed that careful planning was an essential ingredient in making the transition to automation. Staff involvement, adequate budgeting, and thorough testing of the entire system before implementation were perceived to be essential in order to reduce problems later.

Ten respondents indicated that good training was essential. Released time, quality instruction, and confidence building were judged to contribute to positive staff development.

Six respondents stated that there was a need for positive staff reaction and commitment. It was viewed as essential that administrators take deliberate action to create an atmosphere which enhanced staff enthusiasm and involvement.

Six respondents suggested sources of information which might be helpful. District visitations; presence of a knowledgeable staff

member; use of a commercial firm rather than "in-house" advisement; and use of a qualified programmer, computer expert, or consultant on an "as need basis" are all means of obtaining this assistance.

Two respondents emphasized the need for good vendor support in terms of products, service, and advice. Two respondents indicated that certain physical changes such as appropriate furniture should be purchased and adjusted to ensure a proper environment for computers and users.

Other implementation suggestions included allowing a longer time to shift over than appeared to be necessary, beginning slowly, installing the system all at one time rather than gradually, buying programs that were "complete and ready to go," hiring additional help to set up new or additional computerized record keeping, promising staff only what could be delivered, continually reevaluating expectations, and being prepared for problems.

Present District Office Situation

Question 1. What were the current primary means of access to the use of a computer in district administration?

The data shown in table 24 total more than 100 percent because many of the districts depended upon two and occasionally three separate computer systems for their computer needs.

The results listed in table 24 changed considerably from the initial stage as shown previously in table 11. The rental/lease of equipment declined from 11.5 percent to 6.4 percent as a means of access to computer equipment although ownership of some or all equipment remained constant. Most districts (69 or 88.5%) continued to own their own equipment as compared to 68 (87.2%) districts in the beginning.

TABLE 24

CURRENT ACCESS TO COMPUTER TECHNOLOGY

	Respondents	
Source	N	%
Owned all equipment	69	88.5
Purchased services	34	43.6
Rented/leased some equipment	5	6.4
Time-share (plus other equipment)	12	15.4
Time-shared (only)	2	2.6

N = 78

Time-sharing declined from 21.8 percent of the districts which used
this method when first beginning to use computers in administration to
15.4 percent of the districts that time-shared at the time of this
study. The number of districts (34 or 43.6%) which purchased services
declined from 44 (56%), and districts solely dependent upon
time-sharing dropped to 2 (2.6%) from 17 (21.8%) districts when they
first began using automated equipment.

Table 25 illustrates the current means of access to computers
in the districts surveyed.

As shown in table 25, most districts in all enrollment
categories owned most of their equipment. Only 1 district in each
enrollment category continued to rent hardware with the exception of
2 districts with enrollments of 3,000 to 10,000. Time-sharing continued
to be most popular with larger districts with 36 percent of districts
with 3,000 to 10,000 students using time-share only or time-share with

TABLE 25

CURRENT ACCESS TO COMPUTER TECHNOLOGY FOR
EACH ENROLLMENT CATEGORY

| | Respondents | | | | | | | |
| | Less Than 300 | | 300 to 1,499 | | 1,500 to 2,999 | | 3,000 to 10,000 | |
Source	N	%	N	%	N	%	N	%
Owned all equipment	14	100.0	16	84.2	15	75.0	24	96.0
Purchased services	5	35.7	8	42.1	6	30.0	15	60.0
Rented/leased some equipment	1	7.1	1	5.3	1	5.0	2	8.0
Time-share (plus other equipment)	0	0.0	1	5.3	3	15.0	8	32.0
Time-shared (only)	0	0.0	2	10.6	0	0.0	1	4.0

N = 78

another computer system, while no districts with less than 300 students
used any time-share system. The percentages of districts that
purchased services were relatively consistent across all enrollment
categories.

Table 26 illustrates the number of districts renting computers
or peripherals.

Five districts currently rented/leased equipment at the time
of the study as shown by the number of responses (N = 5) in table 26.
Four districts rented computers and 3 districts rented peripherals.
Two of the districts rented/leased both computers and peripherals.

TABLE 26

TYPES OF RENTED/LEASED EQUIPMENT

Equipment	N	%	Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000
				Respondents		
Computers	4	80.0	1	0	1	2
Peripherals	3	60.0	0	1	1	1

N = 5

Table 27 illustrates the number of districts currently purchasing computer services and the agency from which these services were purchased.

TABLE 27

AGENCY CURRENTLY UTILIZED TO PROVIDE SERVICES
TO SCHOOL DISTRICTS

Agency	Respondents	
	N	%
Educational Regional Service Agency	28	82.4
Commercial Agency	5	14.7
Several Agencies	1	2.9
College/University	0	0.0

N = 34

At the time of the survey, those districts using these
services only worked with 1 agency with the exception of 1 district.
This was not the case when these districts first began using computers.
The overall number of districts continuing to purchase services had
declined to 34 (43.6%) from 44 (56.2% as shown in table 15) from the
time they first began computerized administrative applications.
Educational Regional Service Agencies continued to be the leading source
of "outside" computer services by a wide margin over commercial agencies.

Table 28 illustrates how these outside agencies were utilized
by school districts in each enrollment category.

Multiple agencies and colleges/universities were essentially
not utilized by districts in any enrollment category and, in
particular, they were not used at all by the small- and medium-sized
school districts. Commercial agencies were used only rarely in each
enrollment category. The Educational Regional Service Agency was the
major agency utilized by districts in all enrollment categories where
such agencies existed.

Question 2. What computer systems were presently used at the
school district level?

The computer systems were separated into four major types of
computer systems: major microcomputer (some districts used several
different brands of microcomputers), minicomputer, mainframe, and
time-share (by means of a terminal connected to some outside service
agency). Appendix F presents a cumulative table describing the
equipment used in all districts throughout the study. Some districts
used two and occasionally three separate computer systems. In
situations where district officials used a computer system larger than

TABLE 28

AGENCIES UTILIZED TO PROVIDE COMPUTER SERVICES TO SCHOOL
DISTRICTS IN EACH OF THE ENROLLMENT CATEGORIES

	Respondents							
	Less Than 300		300 to 1,499		1,500 to 2,999		3,000 to 10,000	
Agency	N	%	N	%	N	%	N	%
Educational Regional Service Agency	4	28.6	6	31.6	5	25.0	13	42.0
Commercial Agency	1	7.1	2	10.5	1	5.0	1	4.0
Several Agencies	0	0.0	0	0.0	0	0.0	1	4.0
College/University	0	0.0	0	0.0	0	0.0	0	0.0

N = 34

a microcomputer in addition to a microcomputer, and the microcomputer system was not Apple or IBM, the microcomputer system was not considered in the results. This eliminated the inclusion of a Burroughs B 22 and a Xerox 820-II microcomputer system in districts using minicomputers in addition to these microcomputers. When surveys were received from districts that only used microcomputers and the brands were not Apple or IBM, the entire survey was eliminated. This necessitated the removal of a number of district surveys using Radio Shack microcomputer systems.

Tables 29 through 35 list the types of computer hardware found in each of the enrollment categories. Each table has been designed to separate the information according to the following district computer usage criteria: microcomputers only, minicomputers only, mainframe

computers only, micro and minicomputers, micro and mainframe computers, time-share with one or more other computer systems, and time-share alone. The number of computers often exceeds the number of responding school districts. This is a result of a number of districts owning more than one brand or model of microcomputer.

Disk drive options have been omitted because customarily the disk drive is packaged to sell with the computer or built into the computer itself and, with rate exception, both units were the same system. The most common exception was the Apple IIe system in which consumers had an option between the Disk II and the Duo disk floppy disk drives.

Table 29 presents a list of computer hardware used in each of the four enrollment categories.

As shown in table 29, there were 41 districts in the study which depended solely upon microcomputers for all of their computing needs. Using only microcomputers were 14 (100%) of the districts with less than 300 students; 13 (68.4%) of the districts with 300 to 1,499 students; 9 (45%) of the districts with 1,500 to 2,999 students; and 5 (20%) of the districts with 3,000 to 10,000 students. The Apple brand of microcomputer was the system most often found in these district offices with the Apple IIe being the most frequent model (24 computers). There were 3 MacIntosh microcomputers identified in the microcomputer-only group. At the time of the study, only 10 IBM microcomputer systems were found in the districts using only microcomputers.

Table 30 presents a list of printer hardware used in each of the four enrollment categories.

TABLE 29

COMPUTER HARDWARE FOUND IN SCHOOL DISTRICTS
USING ONLY MICROCOMPUTERS

	Responses by Enrollment Categories			
	Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000
Equipment	(N=14)	(N=13)	(N=9)	(N=5)
Apple				
IIe	12	7	2	3
IIc	1	1	0	2
III	0	0	1	0
MacIntosh	1	0	1	1
Lisa	0	0	1	0
IBM				
PC	2	3	1	1
XT	0	2	0	1
5110	0	0	1	0
5323	0	0	1	0

N = 41

TABLE 30

PRINTER HARDWARE FOUND IN SCHOOL DISTRICTS USING ONLY MICROCOMPUTERS

| Equipment | Responses by Enrollment Categories | | | | |
	Less Than 300 (N=14)	300 to 1,499 (N=13)	1,500 to 2,999 (N=9)	3,000 to 10,000 (N=5)	Total
Okidata					6
U-80	1	0	0	0	1
83-A	1	1	0	0	2
U-92	0	2	0	0	2
U-93	0	0	0	1	1
Epson					14
FX 80	1	0	1	0	2
MX 80	2	4	0	1	7
RX 80	0	0	0	1	1
MX 100	0	3	0	0	3
LQ 1500	0	0	1	0	1
Apple					10
Imagewriter	2	1	1	3	7
Applewriter	1	0	0	0	1
Laserwriter	0	0	0	1	1
LQP	0	1	0	0	1
IBM					7
PC Graphics	1	1	0	0	2
Quietwriter	0	0	1	0	1
Wheelwriter	0	1	1	0	2
5103	0	0	1	0	1
5242	0	0	1	0	1
Diablo					2
620	1	0	0	0	1
630	0	1	0	0	1
Silver Reed					3
500	3	0	0	0	3
Brother					2
Dynar DX15	1	0	0	0	1
HB Series	1	0	0	0	1
Prowriter					1
8510	1	0	1	0	1
Star					1
Delta 15	0	1	0	0	1
Qume					1
Sprint 5	0	1	0	0	1
NEC					2
3515	0	0	1	0	1
3530	0	0	0	1	1
Panasonic					1
1091	0	0	0	1	1

As shown in table 30, the Epson brand printers were used most often in districts using only microcomputers. The most popular Epson model was the MX 80, followed by the MX 100. The next most popular brand of printers were Apple printers with the Imagewriter model being found in 50 percent of districts using Apple printers. There was a total of 7 IBM printers and 6 Okidata printers in districts using only microcomputers. As well, there was a wide variety of other printer models such as Diablo, Silver Reed, Brother, Prowriter, Star, Qume, NEC, and Panasonic; but there were only 1 or 2 of each of these found in the study.

Table 31 presents a list of other peripheral hardware used in each of the four enrollment categories.

The data in table 31 illustrated the type of other peripheral equipment found in school districts using only microcomputers. When larger memory storage needs were addressed by hard disk drives, Corvus and Apple Profile hard disk systems were most often used. Other types of peripherals used in these districts included Hayes 1200 band modems, Apple IIe mouses, and several card readers.

Table 32 lists the type of hardware used in school districts using only minicomputers.

As shown in table 32, no districts with enrollments less than 300 students were using a computer system larger than a microcomputer. One district with an enrollment of 300 to 1,499; 4 districts with enrollments of 1,500 to 2,999; and 3 districts with enrollments of 3,000 to 10,000 used only minicomputer system(s). The minicomputer used in the district with 300 to 1,499 students was a BRD Dolphin system with no printer being mentioned. One of the districts with an

TABLE 31

OTHER PERIPHERAL HARDWARE FOUND IN SCHOOL DISTRICTS
USING ONLY MICROCOMPUTERS

	Responses by Enrollment Categories			
Equipment	Less Than 300 (N=14)	300 to 1,499 (N=13)	1,500 to 2,999 (N=9)	3,000 to 10,000 (N=5)
	Hard Disk			
Corvus				
6 MB	1	2	0	0
10 MB	0	1	0	0
20 MB	0	0	1	0
Apple				
Profile	0	1	1	0
IBM				
XT	0	1	0	1
Televideo				
4016	0	0	0	1
Swintec				
1146	0	0	1	0
Tec Mar				
Mac Drive	1	0	0	0
	Modems			
Hayes				
1200	4	2	0	1
Apple				
300/1200	0	0	1	0
1200	0	0	2	1
Jacob Anderson				
AT1234A	1	0	0	0
	Mouse			
Apple				
Mac	1	0	0	1
Apple IIe	0	1	2	0
	Card Reader			
Chatsworth				
OMR 1000	1	0	0	0
2000	0	0	0	1
NCS				
Sentry	0	0	0	1
	Other			
Apple Keypad AZM2003	1	0	0	0
SAFT Surge protector	0	1	0	0

N = 41

TABLE 32

COMPUTER HARDWARE FOUND IN SCHOOL DISTRICTS
USING ONLY MINICOMPUTERS

	Responses by Enrollment Categories			
Equipment	Less Than 300 (N=0)	300 to 1,499 (N=1)	1,500 to 2,999 (N=4)	3,000 to 10,000 (N=3)
	Computers			
BRD Dolphin	0	1	0	0
IBM System 36	0	0	1	1
Burroughs				
B-80	0	0	1	0
B-90	0	0	1	0
B-91	0	0	1	0
B-93	0	0	1	0
B 920	0	0	0	1
B 930	0	0	0	1
	Terminals			
BRD Dolphin	0	1	0	0
Burroughs				
1100	0	0	2	2
SR110	0	0	0	1
MP985	0	0	0	1
B-80	0	0	1	0
B-90	0	0	1	0
B-91	0	0	1	1
IBM				
5251	0	0	1	1
3180	0	0	0	1
	Printers			
IBM				
5219	0	0	1	1
5225	0	0	0	1
Burroughs				
9246-6	0	0	1	1
9249	0	0	1	1
9251	0	0	0	1
TP313	0	0	0	1
BRD (no model stated)	0	1	0	0
	Disk Drives			
Burroughs B9493-80	0	0	0	1
	Tape Drives			
Burroughs B9498	0	0	0	1
	Other			
NCS Scanner 3000	0	0	0	1
Line Purifier PD-130 500 (no brand stated)	0	0	0	1

N = 8

enrollment of 1,500 to 2,999 students indicated using two minicomputers--
a B-90 and a B-91 system. In the enrollment category with districts
containing 3,000 to 10,000 students, there was an IBM System 36 and 2
Burroughs minicomputers (B 920 and a B 930) being used. For the
Burroughs system, the model 1100 terminal was most frequently used while
the IBM 5251 terminal was used most often on the IBM systems.

Table 33 illustrates the type of mainframe computer equipment
found in school districts that used only mainframe computers. No
districts with enrollments less than 300 or with 300 to 1,499 students
used mainframe hardware in their districts. Some of these districts used
a mainframe or minicomputer on a time-share basis through an Educational
Regional Service Agency. A Burroughs mainframe system and a Digital
11/23 were used in the 2 districts which had enrollments of 1,500 to
2,999. There were 3 districts with enrollments of 3,000 to 10,000
students that used mainframe computers and 1 district each had a Burroughs
CP 1955, an IBM 360, and a Digital 11/44. The district with the Digital
computer used an Ergo 301 microcomputer as a terminal.

Table 34 presents a list of hardware used in school districts
that purchased both a microcomputer and minicomputer system.

In 3 school districts an IBM microcomputer was purchased with
an IBM minicomputer, and in 2 districts an Apple microcomputer was
purchased to be used in conjunction with a Burroughs minicomputer.
Okidata, Epson, and Apple printers were used as the microcomputer
printers; while IBM 5211, IBM 5242, and Burroughs 9249 printers were used
with the minicomputers.

As shown in table 35, only 3 districts used the combination of
a microcomputer and a mainframe system. The only respondent with a

TABLE 33

COMPUTER HARDWARE FOUND IN SCHOOL DISTRICTS
USING ONLY MAINFRAME COMPUTERS

Equipment	Responses by Enrollment Categories			
	Less Than 300 (N=0)	300 to 1,499 (N=0)	1,500 to 2,999 (N=2)	3,000 to 10,000 (N=3)
Computers				
Burroughs				
No model	0	0	1	0
CP 1955	0	0	0	1
IBM 360	0	0	0	1
Digital/DEC				
11/23	0	0	1	0
11/44	0	0	0	1
Terminal				
Burroughs				
No model	0	0	1	0
ET1100	0	0	0	1
Digital				
VT101	0	0	1	0
VT102	0	0	1	0
Ergo (micro) 301	0	0	0	1
Printer				
Data 100	0	0	1	0
NEC 3515	0	0	0	1
Burroughs 9246-6	0	0	0	1
Disk Drive				
Digital RL02	0	0	1	0
Dec 11/44	0	0	0	1
IBM 360	0	0	0	1
Burroughs 9494-41	0	0	0	1
Other				
Digital DF03 (modem)	0	0	1	0
Burroughs tape drive 9491-41	0	0	0	1
DEC tape drive 11/44	0	0	0	1

N = 5

TABLE 34

HARDWARE FOUND IN SCHOOL DISTRICTS USING A COMBINATION
OF MICROCOMPUTER AND MINICOMPUTERS

Responses by Enrollment Categories			
Less Than 300 (N=0)	300 to 1,499 (N=1)	1,500 to 2,999 (N=2)	3,000 to 10,000 (N=2)

Micro/Mini Computer Combinations

0	AT/System 23	1	PC/Sys 34	1	Apple IIc B920	1
			PC/Sys 36	1	Apple IIe B-80	1

Terminals

0	System 23	1	System 36	1	Bur. ET 1210	1
			IBM 5251	1	Bur. Console	1

Minicomputer Printers

0	IBM 5242	1	IBM 5211	1	Bur. 9249	1
			IBM System 36	1	Bur. (no model)	1

Microcomputer Printers

0	Okidata U-93	1	Epson LQ 1500	1	Imagewriter	1
					Apple(no model)	1

Other

0	IBM Micro disk 5170	1	IBM System 36 disk drive	1	Apple II mouse	1
					Burroughs	
					Disk B-80	1
					Disk B 920	1
					Tape (n/m)	1
					Tape B 920	1
					Scanner (n/m)	1

N = 5

TABLE 35

COMPUTER HARDWARE FOUND IN SCHOOL DISTRICTS USING A COMBINATION
OF MICROCOMPUTER AND MAINFRAME COMPUTERS

Responses by Enrollment Categories			
Less Than 300 (N=0)	300 to 1,499 (N=0)	1,500 to 2,999 (N=1)	3,000 to 10,000 (N=2)

Micro/Mainframe Computer Combinations

0	0	XT/B 7900	1	PC/IBM 5360	1
				Bur./Digital Vax	1

Terminals

0	0	Cumrac (n/m)	1	IBM 5292	1
				Digital (n/m)	1

Micro Printers

0	0	Okidata U-84	1	No printers	
		NEC 3530	1		

Mainframe Printers

0	0	Okidata U-24	1	IBM 5225	1

Hard Disks

0	0	Corvus 20 MB	1	Corvus 20 MB	1
		IBM		IBM	
		XT (micro)	0	XT (micro)	1
		200 MB	0	200 MB	1

Other

		UDS Modem 202LP	1	NCR Scanner (no model)	1
		Corvus hard disk 20 MB	1	IBM Modem 3864	1
				IBM Tape Drive 8809-1C	1

N = 3

district enrollment of 1,500 to 2,999 students used an IBM XT microcomputer with a Burroughs B 7900 mainframe. In the 3,000 to 10,000 student enrollment category, 1 respondent used an IBM PC with an IBM 5360 and the other respondent used a Burroughs microcomputer with a Digital Vax system. The printers used with the mainframe computers were not unique to those systems and could have been used on a microcomputer or minicomputer system.

Table 36 presents the types of computers and terminals used by district personnel who utilized a time-share system in addition to some other computer system(s).

As shown in table 36, IBM PC microcomputers were the most popular microcomputers, followed by the MacIntosh. The 2 minicomputers used were a Data 100 Model 88 and an IBM System 34. There was a wide variety of terminals used and 3 of these terminals were IBM PC microcomputers.

Table 37 presents a list of other computer hardware found in school districts using time-share in addition to their own "in-house" computer system.

The data in table 37 illustrated the wide variety of equipment used in many of the school districts. There was no more than 1 example of each item except for 3 Imagewriter printers, 2 Apple 1200 band modems, 2 Hayes 1200 band modems, 2 Epson FX 80 printers, and 2 Mac Mouses.

Twelve respondents indicated using time-share systems in the computer systems listed in table 37, and none of the districts had less than 300 students. Eight of the time-share with other computer system(s) responses were from districts with 3,000 to 10,000 students. They used a variety of hardware and the terminals ranged from "stand alone" microcomputers to specialized communications terminals. Terminal

TABLE 36

COMPUTER AND TERMINAL HARDWARE FOUND IN SCHOOL DISTRICTS USING
TIME-SHARE WITH OTHER COMPUTER SYSTEM(S)

Responses by Enrollment Categories

Less Than 300 (N=0)	300 to 1,499 (N=1)		1,500 to 2,999 (N=3)		3,000 to 10,000 (N=8)	
			Terminal			
0	IBM PC	1	CAI (n/m)	1	IBM PC	2
			Bur. TD 830	2	Bur. TD 831	1
					IBM 3276-78	1
					IBM Terminal emulator	1
					Wyse 75	1
					Apple IIe	1
					ADDS T/A	1
					Texas Instruments 745	1
					Teletype 43	1
			Microcomputers			
0	IBM PC	1	MacIntosh	3	MacIntosh	1
					IBM PC	5
					Apple IIe	2
			Minicomputers			
0			Data 100 88	1	IBM System 34	1

N = 12

TABLE 37

OTHER COMPUTER HARDWARE FOUND IN SCHOOL DISTRICTS USING
TIME-SHARE WITH OTHER COMPUTER SYSTEM(S)

Responses by Enrollment Categories			
Less Than 300 (N=0)	300 to 1,499 (N=1)	1,500 to 2,999 (N=3)	3,000 to 10,000 (N=8)
Terminal Printers			
0	No printers	Diablo 630 1	Bur. 9249 1
			Okidata (n/m) 1
			IBM 3287 1
			Epson FX 80 1
			Imagewriter 1
			Decwriter IV 1
Microcomputer Printers			
0	Epson MX 80 1	Apple	IBM Quietwriter 1
		Laserwriter 1	TI 855 1
		Imagewriter 1	Okidata U-92 1
			(no model) 1
			Epson FX 1
			FX 80 1
			Imagewriter 2
Modems			
0		Mitzuba Smart 1	Hayes Smart 300 1
		Apple 1200 2	1200 2
			NEC DSP 9600 1
Other			
		Mac Mouse 1	Mac Mouse 1
		Data 100 Mini	Chatsworth Card
		terminal (n/m) 1	Reader OMR
		Data 100 (for mini)	500 1
		Printer (n/m) 1	IBM XT Hard
			disk drive 1
Disk (n/m) 1			
		Drive (n/m) 1	
		Data 100 Card	
		Reader (n/m) 1	

N = 12

printers were models that were often found interfaced to any

microcomputer system.

Table 38 illustrates the type of hardware used in school

districts that had only time-share systems.

TABLE 38

COMPUTER HARDWARE FOUND IN SCHOOL DISTRICTS USING
ONLY A TIME-SHARE SYSTEM

Responses by Enrollment Categories			
Less Than 300 (N=0)	300 to 1,499 (N=2)	1,500 to 2,999 (N=0)	3,000 to 10,000 (N=1)
Terminal			
0	Burroughs TD 830 2	0	Digital VT 102 1
Printer			
0	No printers	0	Digital Decwriter III 1 LA120 1
Other			
0		0	Comdata Modem 212 1

N = 3

As shown in table 38, only 3 school districts used a time-share

arrangement without any "in-house" computer. Two districts with 300 to

1,499 students had Burroughs terminals and listed no other equipment,

while the district respondent with 3,000 to 10,000 students used Digital

terminals, 2 Digital printers, and a Comdata 212 modem.

One school district owned a microcomputer, minicomputer, and a

mainframe computer system. A description of the microcomputer system

omitted from the study because it was not an Apple or IBM computer.
The minicomputer and mainframe computer hardware were Burroughs
equipment. The minicomputer system included a Burroughs CP 1955
minicomputer with Burroughs ET 110, TD 830, and MT 983 terminals; a
Burroughs 9246-6 printer; and a 65-megabyte disk drive. The mainframe
computer system was a B6800 with TD 830 and ET1100 terminals, a 2000
lpm printer, a B 207 disk drive (500 MB), a Burroughs card reader (no
model stated), a NCS OCR scanner, and a Burroughs keypunch.

Question 3. What was the level of satisfaction with hardware,
software, and support factors such as staff training and vendor services
as perceived by the person primarily responsible for district computer
applications?

Table 39 illustrates the general level of satisfaction that
respondents felt with various items/concerns to most computer users.
Most satisfaction seemed to be realized with items controlled by the
vendor, such as vendor service/repair (4.10) and vendor support (4.07).
Capability of selected hardware to perform tasks (4.04) and staff
satisfaction with the computer system (3.94) were positive as well.
Time provided to switch from established practices to automated practices
was found to be least satisfactory (3.14).

Other less satisfactory elements were ability of computer
programs to interact between data bases (3.25), readability of
hardware/software manuals (3.27), and the degree of flexibility to meet
established needs (3.41). One "Other" response indicated that staff
satisfaction rated 5 as a factor affecting the success of their
automated administrative operations.

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TABLE 39

SATISFACTION WITH VARIOUS CONCERNS AFFECTING THE SUCCESS
OF DISTRICT ADMINISTRATIVE COMPUTER APPLICATIONS

Concerns	N	Low 1	2	3	4	High 5	Mean Responses
Satisfaction with repair/maintenance	70	1	0	13	33	23	4.10
Vendor support after service	67	1	6	12	32	16	4.07
Ability of hardware to handle the workload	72	1	1	16	30	24	4.04
General district staff satisfaction with system	72	1	1	16	37	17	3.94
Technical compatibility of hardware and software	68	3	1	14	34	16	3.87
Reduction in time spent on routine administrative tasks	71	1	6	19	24	21	3.82
System response time to information requested	70	0	2	20	35	13	3.81
Ease of generating information	70	0	4	19	33	14	3.81
Quality of software available	64	2	8	10	32	12	3.69
Amount of software available	71	2	12	13	32	12	3.56
General district office staff understanding of computer capabilities	73	2	9	21	29	12	3.55
Adequateness of your district's training program	73	4	8	25	23	13	3.45
Realization of cost benefits	70	1	10	26	23	10	3.44
System flexibility (degree of computer imposed restraints)	71	0	9	31	24	7	3.41
Readability of hardware/software manuals	70	3	12	23	27	5	3.27
Increased interaction with data bases such as class schedules and bus routes with student lists)	60	5	12	16	17	10	3.25
Sufficient district staff time to switch over to computerized system	72	6	13	24	23	6	3.14
Other (staff satisfaction)	1	0	0	0	0	1	5.00

Question 4. What major software programs were used in school district administration and what were the primary functions of and degrees of satisfaction with these software packages?

Respondents were asked to identify some of the programs which they felt best suited their needs and to rate them on a Likert-type scale. A number of programs were only used by 1 or 2 individual districts, while other programs were evaluated by a number of district officials. The software listing in table 40 is ranked according to the number of users rather than the average degree of satisfaction.

In table 40, where there was an equal number of program users, the programs were then ranked according to the average level of satisfaction. This was done because so many of the software programs listed were used in only 1 or 2 districts. The most popular software packages for IBM microcomputers were spreadsheet-type programs. IBM microcomputers seemed to be used more for negotiations, payroll, and other financial operations than was the case with Apple microcomputers. Word processing and data base packages were mentioned less frequently.

Table 41 lists the most popular software used on minicomputer systems.

The Burroughs Government Scholastic program was the most used software package, followed by Budgetary Payroll. No single program for the IBM minicomputers was used more popular than any other. There were a number of locally designed programs found to be satisfactory in addition to those listed in table 41.

Table 42 lists the most popular programs used on the Burroughs and Digital/DEC systems.

TABLE 40

MICROCOMPUTER PROGRAMS RANKED BY FREQUENCY AND SATISFACTION

	Number of Respondents in Each Enrollment Category					Average Level of Satisfaction
Programs	Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000	Total N	Likert Scale (5 High)
Apple Software						
VisiCalc	3	5	1	1	10	4.2
Apple Works	3	2	1	4	7	4.6
PFS File	2	2	1	1	6	4.5
Multiplan (MacIntosh)	0	0	3	1	4	4.0
Mac Write (MacIntosh)	0	1	2	0	3	4.5
Apple Writer	0	1	0	1	2	4.5
Word (MacIntosh)	0	0	1	1	2	4.5
PFS Write	0	0	0	2	2	4.5
DB Master	0	0	0	3	3	4.3
Micro Budget	0	1	1	0	2	5.0
Jazz	0	0	0	2	2	5.0
Print Shop	2	0	0	0	2	4.0
Classifier	1	1	0	0	2	3.0
Mac Paint	0	0	0	1	1	5.0
Lisa Write (Lisa)	0	0	1	0	1	5.0
Super Text	1	0	0	0	1	5.0
Word Juggler	0	1	0	0	1	5.0
Q-Card	0	0	0	1	1	5.0
MECC Payroll	1	0	0	0	1	5.0
Superbase	1	0	0	0	1	5.0
3-Easy Pieces	0	0	1	0	1	5.0
Information Master	0	0	0	1	1	4.0
RDA Systems	0	0	0	1	1	4.0
Format II	1	0	0	0	1	4.0
Bank Street Writer	0	0	0	1	1	4.0
The Scheduler	0	0	1	0	1	4.0
Mac Project (MacIntosh)	0	0	1	0	1	4.0
Word Handler	0	0	1	0	1	3.0
PFS Graph	0	0	0	1	1	3.0
IBM Software						
Lotus 1-2-3	0	1	3	6	10	4.6
Multimate	0	1	3	1	5	3.8
Negotia Pak	0	1	2	0	3	4.3
The Spreadsheet	0	0	0	1	1	5.0
Payroll	1	0	0	0	1	5.0
PFS File	0	0	1	0	1	5.0
Word Star	0	1	0	0	1	5.0

TABLE 40--Continued

Programs	Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000	Total N	Average Level of Satisfaction Likert Scale (5 High)
Data Factory	0	1	0	0	1	5.0
Symphony	0	0	0	1	1	4.0
J & K School Package	0	0	0	1	1	4.0
Smart System	0	1	0	0	1	4.0
PFS Write	0	0	0	1	1	4.0
Finance	0	1	0	0	1	4.0
Word Plus	0	0	0	1	1	4.0
Data	0	0	0	1	1	4.0
AD-Aid	0	0	0	1	1	4.0
Negotiations	0	0	1	0	1	4.0
Easy Calc	0	0	1	0	1	4.0
Versa Inventory	0	0	0	1	1	3.0
DBM II	0	0	1	0	1	*
D Base	0	0	0	1	1	*
D Base	0	0	1	0	1	*

The header "Number of Respondents in Each Enrollment Category" spans the four enrollment columns.

N = 48

*Not rated by respondent but were believed to be useful.

TABLE 41

MINICOMPUTER PROGRAMS RANKED BY FREQUENCY AND SATISFACTION

| Programs | Number of Respondents in Each Enrollment Category | | | | | Average Level of Satisfaction |
	Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000	Total N	Likert Scale (5 High)
Burroughs						
Government Scholastic	0	0	0	3	3	3.0
Budgetary Payroll	0	0	0	0	2	5.0
OMS	0	0	0	1	1	5.0
CMS Domain Report	0	0	0	1	1	5.0
MO635	0	0	0	1	1	5.0
Fixed Assets	0	0	0	1	1	4.0
SGP400	0	0	0	1	1	4.0
SCT	0	0	0	1	1	3.0
SCR	0	0	0	1	1	3.0
SCS310	0	0	0	1	1	3.0
IBM						
SAS	0	0	0	1	1	4.0
EMS by J & K	0	0	0	1	1	4.0
FMS by J & K	0	0	0	1	1	4.0
ATIN	0	0	1	0	1	4.0
Retrieval	0	0	0	1	1	4.0

N = 13

TABLE 42

MAINFRAME COMPUTER PROGRAMS RANKED BY
FREQUENCY AND SATISFACTION

| | Number of Respondents in Each Enrollment Category | | | | | Average Level of Satisfaction |
Programs	Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000	Total N	Likert Scale (5 High)
Burroughs						
Budgetary	0	0	0	3	3	4.3
Student Schedule	0	0	1	1	2	4.0
Reporter	0	0	1	1	2	2.5
Student Records	0	0	0	1	1	4.0
Digital/DEC						
Payroll	0	0	1	1	3	4.7
Accounts Receivable	0	0	1	1	2	5.0
Accounts Payable	0	0	1	1	2	5.0
General Ledger	0	0	0	1	1	5.0
Fixed Assets	0	0	0	1	1	5.0

N = 8

As with the minicomputer programs listed in table 41,
accounting software packages for mainframe computers (in table 42) were
considered most satisfactory. Particularly, the Budgetary program for
the Burroughs mainframe was used by 3 districts and rated highest in
satisfaction for Burroughs programs. The Student Schedule package for
the Burroughs system was used in 2 districts and had an average
satisfaction rating of 4.0.

The Payroll program was considered most satisfactory on IBM
mainframe computer systems. Accounts Receivable and Accounts Payable
were used in 2 districts and rated 5.0, while General Ledger and Fixed
Assets also rated 5.0 but were used by only 1 district each.

Question 5. Were electronic data transmission procedures
being used in any of the school districts surveyed and, if so, what
methods of transmission were being used?

Few respondents indicated using any form of electronic data
transmission at the present time. In certain districts both interest
and intent were expressed to establish some procedures. Table 43 lists
the type of information that was transmitted locally either by
telephone or by the mailing of diskettes and tapes.

TABLE 43

TYPES OF DATA TRANSMITTED LOCALLY BY TELEPHONE OR BY MAIL

Data	Responses			
	Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000
Types of Data Sent by Modem/Terminal				
Student and financial	0	0	1	0
Student records	0	1	1	2
Student/financial/payroll	0	0	0	1
All financial data	0	0	0	1
All data	0	1	0	2
Financial "look-up"	0	1	0	0
Business and student data	0	0	0	1
Student attendance information	0	0	0	1
General data	1	0	1	0
Budget and payroll	0	0	1	0
Demographic information	0	0	0	1
Student and staff data	0	0	0	1
Types of Data Sent by the Mailing of Diskettes or Tapes				
All data sent daily	0	1	0	0
Data by disk and tape	0	0	1	0

N = 20

Student records were the most common data transmitted locally by terminal/modem technology. Some districts were capable of sending most data via telephone service. No districts with less than 300 students were involved in this practice, as were few districts with 300 to 1,499 students. Only 2 districts sent data via mail at the local level. One district with less than 300 students; 1 district with 1,500 to 2,999 students; and 3 districts with 3,000 to 10,000 students indicated that data were sent electronically in addition to the preceding responses but did not state the type of data sent.

Table 44 provides similar types of information about data that were transmitted outside the district.

Financial and student data were most often transmitted outside the district via modem/terminal. In addition to financial and student data being transmitted by the mailing of diskettes, payroll and census information were also transmitted.

Question 6. What safeguards were employed for the protection of privacy from unauthorized access and security against loss or damage of the information stored electronically.

Table 45 indicates the number of respondents using various types of safeguards to protect electronic data.

As shown in table 45, the most frequent method of protection for electronically stored data (63 districts or 82.9%) was the backup tapes or disks used for all systems of computers. Fifty-one (67.1%) districts used log-on (password/I.D.) procedures before access. As well, over half (52.6%) of the responding districts used off-site or vault storage to protect their electronically stored data. Other security techniques included 1 example each of limited physical access

TABLE 44

DATA TRANSMITTED OUTSIDE THE DISTRICT BY
TELEPHONE OR BY MAIL

	Responses			
Data	Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000
Types of Data Sent by Modem/Terminal				
Student and financial	0	0	1	0
Payroll/financial/student	0	1	0	1
All financial data	0	0	0	1
Student records	0	0	0	1
General data	0	0	1	0
Information required by legislation	0	0	1	0
Demographic and scheduling	0	0	0	1
Types of Data Sent by the Mailing of Diskettes or Tapes				
Financial and payroll	0	1	0	0
Financial	1	0	0	0
Student/financial/payroll	0	0	0	1
Budget and payroll	0	1	0	0
Census, attendance/financial	0	1	0	0
Student and staff data	0	0	0	1

N = 14

TABLE 45

SAFEGUARDS USED TO PROTECT ELECTRONICALLY STORED DATA

Method	Respondents	
	N	%
Backup tape/disk storage	63	82.9
Log on (password/I.D. before access)	51	67.1
Physical security (off-site or vault)	40	52.6
Password/I.D. after access	35	46.1
Routine password changes	23	30.3
Call backs (for verification)	4	5.3
Other	3	3.9

N = 78

by locating hardware in secured areas, only access by school phones and password privileges, and a terminal address.

Question 7. At what point, in terms of school district enrollment, should a district seriously consider using a minicomputer or mainframe computer instead of a microcomputer for administrative functions?

Table 46 illustrates the average number of student files which respondents in the four student enrollment categories believed was the maximum capacity that a microcomputer could adequately process. Fifty responses were received with the answers ranging from 0 to 10,000.

As shown in table 46, the average response for the overall study was 1,447.7 students. Eighteen respondents did not answer the

TABLE 46

MAXIMUM STUDENT ENROLLMENT CAPABILITIES
OF A MICROCOMPUTER

Enrollment Categories	N	Average Number of Students
Less than 300 students	11	585
300 to 1,499 students	11	455
1,500 to 2,999 students	15	1,343
3,000 to 10,000 students	13	2,481
Overall average	50	1,447.7

question. A number of these persons indicated that they either did

not know the maximum limits of microcomputers or indicated that the

maximum limits depended upon the capabilities of the peripherals,

such as hard disks and upon such add-ons as memory expansion cards.

One respondent from a district with 300 to 1,499 students replied

that there was no limit to the number of students that a school

district was able to process on a computer.

Question 8. What recommendations did surveyed administrators

have regarding established computer systems?

The recommendations (see appendix H) provided by the respondents

have been paraphrased and combined according to major themes of

hardware, software, and general recommendations. Hardware

recommendations included planning big enough at the beginning while

considering expansion capabilities; purchasing brand-name equipment,

peripherals such as hard disk drives and network facilities; and

choosing hardware with a wide variety of software.

Software recommendations included thoroughly testing software, choosing software before selecting hardware, budgeting adequately for software, listing potential output, planning for integrated data bases, buying complete programs at the beginning, and trying to establish a software-update service.

General recommendations included visiting other school districts that were using similar systems and applications; defining needs and tasks carefully; choosing a reliable vendor with good support; having a local staff person or "expert" designated to review and recommend hardware and software; projecting time lines and adding a 15 percent margin; discussing and coordinating with all parties outside of the district who were involved (e.g., regional or state persons) to plan for compatibility; talking to individuals actually using the system--not the ones who purchased the equipment; setting up guidelines for electronic usage; reading journals/research; choosing one computer systems model for district-wide administration; developing a master plan; evaluating the total system; and standardizing district equipment.

Specific Future Plans

Since technology has changed so rapidly and computer capabilities are steadily improving, current district hardware and software can easily be replaced by more sophisticated equipment and programs if the district financial capacity exists. District officials were asked what additional hardware or software was seriously being considered for purchase and what hardware would they like to purchase if they could afford it.

Question 1. What plans currently existed for upgrading or changing existing equipment?

Question 2. What additional hardware was suggested to make the computer system(s) work more effectively?

Table 47 illustrates the number of responses to both research questions 1 and 2.

The greatest priority in terms of planned purchases for district respondents was the need for a means of electronic communications as indicated by the 11 responses for modems or networks and 2 responses for electronic bulletin boards/electronic mail. There was also a need for more microcomputers/terminals as indicated by 10 responses. The majority of these respondents indicated a preference for IBM models.

Since there were many similarities between both lists, the items identified have been combined in table 48.

Officials of smaller school districts tended to want to purchase Apple microcomputers, while administrators of larger districts had apparently opted for IBM microcomputers or terminals for their minicomputers or mainframe computers. Other respondents indicated only a desire to purchase additional microcomputers. Four districts in the 1,500 to 2,999 student enrollment category were interested in purchasing minicomputers, as was 1 official in the 3,000 to 10,000 student enrollment category.

Summary

The data from school districts in five states throughout the northern plains region were reported to determine what factors might be helpful to school district administrators in their endeavor to automate their administrative requirements. Three phases of the development of

TABLE 47

EQUIPMENT IDENTIFIED AS PRIORITY ITEMS FOR FUTURE PURCHASES AND EQUIPMENT
THAT WOULD BE IDEALLY SUITABLE FOR DISTRICT NEEDS

| | Enrollment Categories | | | | | | | | | |
| | Planned Purchases | | | | | Additional Preferred Items | | | | |
Equipment	Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000	Total	Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000	Total
Communications										
Modem/networking	2	3	2	4	11	0	1	1	3	5
Electronic mail/										
bulletin boards	0	0	0	2	2	0	0	0	0	0
Dedicated phone lines	0	0	0	0	0	0	0	0	3	3
Microcomputers/Terminals										
More microcomputers	0	0	0	0	0	2	1	0	1	4
More Apple computers	2	0	0	0	2	0	0	0	0	0
More IBM computers	1	1	2	2	6	0	1	0	0	1
IBM PC/Mac	0	0	0	1	1	0	0	0	0	0
B-25 terminal	0	0	0	1	1	0	0	0	0	0
More terminals	0	0	0	0	0	0	2	1	2	5
Minicomputer/Mainframe										
A mini system	0	0	0	0	0	0	0	0	1	1
An IBM system	0	1	1	1	3	0	0	0	0	0
Increased mini										
processor capacity	0	0	0	0	0	0	0	0	1	1
IBM System 34	0	0	0	0	0	0	0	1	0	1
IBM System 36	0	0	0	1	1	0	0	1	0	1
A mainframe	0	0	0	0	0	0	0	1	0	1
Additional memory	0	0	0	0	0	0	0	1	0	1
Hewlett Packard 3000-37	0	0	0	0	0	0	0	0	1	1

N = 42

TABLE 48

COMBINED LIST OF PRIORITY ITEMS FOR FUTURE PURCHASES AND EQUIPMENT
THAT WOULD BE IDEALLY SUITABLE FOR DISTRICT NEEDS

Combined Items/Equipment	Planned Purchases N	Additional Preferred Items N	Less Than 300	300 to 1,499	1,500 to 2,999	3,000 to 10,000	Total N
Communications							
Modem/networking	11	5	2	4	3	7	16
Electronic mail/ bulletin boards	2	0	0	0	0	2	2
Dedicated phone lines	0	3	0	0	0	3	3
Microcomputers/Terminals							
More microcomputers	0	4	2	1	0	1	4
More Apple computers	2	0	2	0	0	0	2
More IBM computers	6	1	1	2	2	2	7
IBM PC/Mac	1	0	0	0	0	1	1
B-25 terminal	1	0	0	0	0	1	1
More terminals	0	5	0	2	1	2	5
Minicomputer/Mainframe							
A mini system	0	1	0	0	0	1	1
An IBM system	3	0	0	1	1	1	3
Increased mini processor capacity	0	1	0	0	0	1	1
IBM System 34	0	1	0	0	1	0	1
IBM System 36	1	1	0	0	1	1	2
A mainframe	0	1	0	0	1	0	1
Additional memory	0	1	0	0	1	0	1
Hewlett Packard 3000-37	0	1	0	0	0	1	1

N = 42

the computerization process were considered: the initial planning,
current practice, and future plans. Administrative concerns which
formed the bases for the survey questions were considered primarily in
terms of the overall study or in terms of student enrollment categories
and occasionally by the type of computer system used in the school
district.

The following chapter contains a summary of the findings which
pertains to the entire study as well as a separation of specific
findings into four school district profiles when the information
appeared to be uniquely characteristic to one of the enrollment
categories. As well, recommendations for practice and further research
have been provided.

CHAPTER V

SUMMARY, OBSERVATIONS/CONCLUSIONS,
AND RECOMMENDATIONS

The primary purpose of this study was to develop a profile
or composite assessment of automated computer technology utilized in
various school districts to assist in their administrative operations.
School districts were selected on the bases of being representative of
four different student enrollment categories: (1) less than 300
students; (2) 300 to 1,499 students; (3) 1,500 to 2,999 students; and
(4) 3,000 to 10,000 students. Districts with enrollments greater than
10,000 were omitted by the writer because there were few of these
districts in many of the states surveyed, and very large districts
might have also been able to operate somewhat independently from
general regional trends.

Specifically the study attempted to find (1) problems and
influences initially experienced during the introduction of computer
administrative applications, (2) sources of information and support
available to district personnel during the initial planning stages,
(3) initial computer hardware purchases and the general types of
software used, (4) final computer systems selected, (5) future plans
for upgrading current district computer systems, and (6) recommendations
from district officials as to the planning and successful operation
of an automated school district office.

Questions designed to address these areas of concern or interest were formulated into a questionnaire and distributed to 121 school district superintendents in Iowa, Minnesota, Nebraska, North Dakota, and South Dakota. The specific research questions were:

A. Planning Considerations for Implementation of Computer Systems:

1. What factors were influential in encouraging district administrators to introduce computer technology into district office administration?

2. What services have been obtained from consultants or consulting firms during the planning stages?

3. What basic steps or procedures were established by district officials during the initial planning stage in order to ensure a successful transition from traditional office practices to computerized methods?

4. What were the general means of access to computer technology during the initial stages of computer use? Did district personnel tend to purchase hardware, purchase services, or lease the equipment?

5. What were the initial types of programs used on the computer by district administrators?

6. What facility changes or improvements were necessary?

7. Which district personnel had training in the administrative use of computers and what training did they receive?

8. What problems were incurred by district administrators involved in this study during this stage?

9. What recommendations did surveyed administrators have regarding personnel, facilities, or planning during the implementation stage?

B. Present District Situation:

1. What were the current means of access to the use of a computer in district administration?

2. What computer systems were presently used at the district level?

3. What was the level of satisfaction with the hardware, software, and support factors such as staff training and vendor services as perceived by the person primarily responsible for district computer applications?

4. What major software programs were used in school district administration and what were the primary functions and degrees of satisfaction with these software packages?

5. Were electronic data transmission procedures being used in any of the school districts surveyed and, if so, what methods of transmission were being used?

6. What safeguards were employed for the protection of privacy from unauthorized access to and security against loss or damage of electronically stored information?

7. At what point, in terms of school district enrollment, should a district seriously consider using a minicomputer or mainframe computer instead of a microcomputer for administrative functions?

8. What recommendations did surveyed administrators have regarding established computer systems and practices?

C.   Specific Future Plans:

1.   What plans currently existed for upgrading or changing existing equipment?

2.   What additional hardware was suggested to make the computer systems work more effectively?

Ninety surveys were returned from district officials of which seventy-eight were usable. The nonusable surveys were discarded because some school districts depended solely upon a microcomputer system other than IBM or Apple or, in the case of one district administrator, a computer was located in the district office but it was not being used. Apple and IBM microcomputers were selected because they were understood by the writer to be the most widely used brands in the northern plains region during the time of the study. The microcomputer information from another returned questionnaire was omitted from the study since the computer was not Apple or IBM, but the remainder of the survey information was included because the district administrators utilized both a minicomputer and a mainframe computer for their primary computer needs.

The data in the survey were ranked according to the number of overall responses received for each research question or according to the mean response. When it was determined that this information might vary between enrollment categories and such differences would be useful in developing district profiles, the data were separated accordingly. Occasionally, the information was considered in relation to the type of computer systems used in school districts and responses were grouped as follows: (1) microcomputers only, (2) minicomputers only, (3) mainframe computers only, (4) microcomputer and minicomputer,

(5) microcomputer and mainframe computer, (6) all three of these systems, (7) time-share only, and (8) time-share in combination with any other computer system or systems.

Summary

With the exception of one district, all school districts surveyed with less than 1,500 students were using microcomputers. However, there was interest expressed from one respondent in a district with less than 1,500 students to introduce a minicomputer into the district. For most administrators this decision would likely rest upon the extensiveness to which the computer will be utilized to assist in district office administrative functions. At the time of writing this study, the Apple computer was the predominant microcomputer used but a number of respondents indicated that they would like to purchase IBM microcomputers for their offices. These persons were looking for "new generation" microcomputers which function more efficiently. Rapid technological advances in the microcomputer industry have made some microcomputers more functional as memory capacity and processing speed have increased. There were a number of systems between the basic microcomputer and minicomputer used in certain school districts that were created through the purchase of hard disk peripherals or special "high-end" microcomputers. Such devices blurred the distinctions between mini-computer and microcomputer systems and, consequently, the capabilities and limitations of microcomputers were also less defined. This may have increased the upper limits of the range of responses for some individuals as to the maximum capacity of microcomputers in terms of district student enrollment. Microcomputers were considered on average by all the respondents to be adequate for district needs for enrollments

up to 1,590 students.

Most school districts with student populations less than 1,500 relied solely upon microcomputers. Several of the larger districts in this group with higher per pupil expenditures had minicomputers. All districts with less than 300 students used only microcomputers. Less than half of the group of school districts in the enrollment category of 1,500 to approximately 3,000 students and only one-fifth of the districts with 3,000 to 10,000 students depended solely upon microcomputers. Larger districts tended to use larger computer systems although there was some range in the capacity of these minicomputers and mainframe computers. Manufacturers of these computers have generally created small, medium, and large systems much as exists with microcomputers. There was a tendency for larger districts to use microcomputers in some supporting capacity in addition to minicomputer, mainframe computer, or time-share systems.

The survey initially focused upon the beginning steps taken by district personnel and the types of problems that they experienced. Most school districts adopted automated practices because of the potential advantages they perceived would accrue from using the technology. Many respondents from smaller school districts indicated that the influence of one or two persons was the leading factor persuading them to introduce computers.

Initial training of staff, recommending hardware, identifying district goals, determining initial functions, recommending software, and being available on call were the leading consultant services requested by district administrators. Assistance in financial planning, establishment of district goals, and conducting of feasibility studies

were consultant services least used. Larger districts tended to employ their own consultants/coordinators which reduced their dependence on outside assistance.

Over half of the district officials throughout the total study typically sought school board approval, inserviced staff, consulted several vendors, visited other district offices, consulted district employees about the transition, and reviewed journals and magazines prior to introducing computers into the district office. Steps much less employed were consultation of university personnel, employment of consultants (especially in the smallest and largest districts), trial implementation periods, establishment of philosophy and policy, and the tendering of equipment. Officials of smaller school districts favored consultation with their school boards on computer issues and utilized the other steps to a lesser extent.

At the beginning, over half of the districts purchased at least some of their computer services but this figure declined to approximately 44 percent of districts as their automated routine became established. This point, coupled with the declining percent of districts renting equipment, led the writer to believe that the increased capabilities of microcomputers combined with their declining cost have probably made microcomputers more effective, efficient, and affordable. Rented hardware declined slightly and the number of rented peripherals remained less than the number of rented computers.

The number of districts using time-share systems at the time of the study remained fairly constant with the number of districts which first began using time-share. Only three districts in this study solely depended upon time-share services. Most districts had a microcomputer

in the office although some larger districts also had larger computer systems.

Most district officials began by using several software packages that included general-purpose programs such as word processing and data bases combined with job-specific programs designed for specialized purposes. However, officials from smaller districts indicated a greater reliance upon general-purpose programs than did officials from larger districts.

A number of physical changes were required in the district offices. Electrical changes were most common in all districts regardless of the computer system employed. This was followed by new furniture requirements and telephone-wiring improvements. Electrical changes were most often required in the majority of minicomputer installations. Other important changes included installation of a humidifier, creation of a special facility room, and the removal of a base radio. One microcomputer user also built an entirely new facility. One respondent mentioned that the district should have purchased appropriate furniture, refloored the office work space, and built a proper data storage facility. Over half of the respondents using minicomputers or mainframe computers indicated that air conditioners were installed.

There was a definite difference in the type of training or source of knowledge gained between various district personnel. Computer coordinators spent more time learning about computers or their operation than any other district employee with the exception of the smallest districts in which the position seldom existed. Much of their training consisted of university courses combined with other sources

such as on-the-job training, workshops, and self training. Similar training was received by business administrators but the amount of learning time invested was less. Officials of smaller school districts had few responses to this portion of the questionnaire because not many of these positions existed in their districts. Superintendents in smaller districts had received less training than the aforementioned officials but slightly more than their office secretarial staff. The experiences of these superintendents were primarily visitations to other district offices, whereas the secretarial staff learned on the job. Secretarial staff training exceeded that of the superintendents in the largest two enrollment categories and was equal or nearly equal in the smallest two categories in terms of mean responses to the number of training days. The sources of training experiences for both groups were similar. Many respondents from all categories indicated that training was ongoing.

When start-up problems were considered, the most frequent difficulties were the complexities of the software followed by insufficient training and staff resistance to the transition to automated procedures. All problems suggested in the questionnaire were considered important by at least some of the respondents. These included, in decreasing frequencies, hardware malfunctions, installation problems, unexpected costs, vendor delivery delays, poor technical support, instituted changes too quickly, job description problems, and the necessity for major office renovations. As well, respondents also mentioned telephone line problems and a lack of district models from which to develop an office model.

Respondents were then asked to offer suggestions to other
administrators beginning the computerization process and the responses
were grouped into eight categories which seemed to reflect basic themes
(appendix G). The greatest number of recommendations were in the area
of careful planning. It was suggested that many people be involved in
the planning process, adequate money be alloted to cover unforeseen
expenses, a coordinated plan be developed for the integration of
hardware and software with the selection of software made before the
final decision on hardware, and that software and hardware be ordered
well enough in advance before actual need. The second group of
responses centered around the need for adequate training. Related
suggestions included the use of "follow-up" conferences after workshops,
need for more time in order to build staff confidence, and the need for
staff release time in on-the-job training. The third group of
recommendations involved implementation suggestions such as allowing a
longer time to automate procedures, beginning slowly, installing a
complete system at once rather than installing portions of the system
over a period of time, allowing plenty of lead time, and hiring
additional help to convert office practices rather than having current
staff take on an extra workload. A fourth group of responses focused
upon possible sources of information to determine direction. The
leading response in this area was the need for firsthand observations
of automated procedures in other school districts, followed by the use
of professional consultants rather than local people, the need for
contracting quality programmers, and having at least one very
knowledgeable person on staff. The fifth group of responses stressed
the need for staff commitment which must be developed by positive

actions rather than negative steps such as expecting staff to take on extra transition activities as well as continuing with regular workloads. The sixth group included two responses related to the need for good vendor support for software and hardware and consequently the need for finding a reputable vendor. The seventh group included two responses expressing the need for purchasing proper furniture and the need for facility improvements when necessary for efficient computer use. The miscellaneous group of responses included one each of "promise those involved only what you can deliver," be prepared for problems, automate if you believe in it--do not wait, and remember that automation is not cheaper but more efficient and effective.

The study then focused upon the present school district situation. A major portion of the data reported in the "Current Situation" section of chapter 4 listed the hardware that was presently being used. There were slight increases in the percentage of districts owning their own equipment and a resultant decrease in rentals. Four districts rented computers and three rented peripherals at the time of the study. Presently, one of the districts rented peripherals but not a computer; whereas at the beginning all districts renting peripherals also rented computers. The number of districts purchasing computer services declined from the number of districts initially doing so and the number of districts totally dependent upon time-sharing also decreased. Regional service agencies continued to predominate as the source of outside service while the use of college faculty and multiple sources declined as district enrollment increased.

Although the microcomputer brands were limited in this study to IBM and Apple, the variety of larger computer systems was also

limited in this region. Primarily, Burroughs and IBM brand name
minicomputers were used. The only two minicomputer exceptions were a
BRD Dolphin and a Data 100 Model 88. Burroughs and IBM computers were
the most common mainframe computers used in the districts surveyed but
there were two DEC systems and one Digital Vax system used as well.

On the other hand, there was a wide range of manufacturer brands
and models of peripheral equipment. Seldom were there more than two
similar hardware items used in the same enrollment category or within
any one of the computer systems groups as devised for this study. The
single, most popular printer was the Apple Imagewriter although there
were nearly an equal number of Epson, IBM, and Apple printers followed
by Okidata printers. Other printer manufacturers included NEC, Silver
Reed, Brother, Burroughs, Panasonic, Digital, Texas Instruments, Diablo,
Qume, Star, and Teletype. Other popular peripherals used in districts
using only microcomputers were Corvus and Apple Profile hard disk
drives and Hayes and Apple micromodems.

The peripherals that accompanied minicomputers and mainframe
computers were primarily hard disk systems that were packaged with the
computer itself, although there was some variety within both the
Burroughs and IBM computer systems. There was more variety with
terminals, most of which could be used on either in-house systems or on
time-share systems. The most widely used Burroughs terminal was the
ET 1100 with a number of TD 830s and TD 831s while the IBM terminals
were most often matched to the system. For example, the IBM terminals
were most often System 23, 34, or 36 terminals. There was a great
variety of printers and many districts used printers that could also be
used with any microcomputer system. There were not many backup tape

drive systems used with the larger computer systems.

When district officials were asked to reflect upon the factors that have enhanced the successful operations of their automated district office procedures, respondents indicated that service and repair was the most satisfactory of the list of suggestions presented to them. In declining order of satisfaction were vendor support after sales, ability of the hardware to handle the district office workload, general office staff satisfaction with system, technical compatibility of software with hardware, and reduction in time spent with routine administrative tasks. Several respondents commented that they believed little or no office staff time or money were saved with the use of a computer, but rather specific information was more quickly accessible and in the form desired if programs existed to provide the information. The least amount of satisfaction existed with the readability of both hardware and software manuals, with the lack of interaction between data bases, and the amount of time allotted to switch over to a computerized system.

Several specialized software programs were written for the mainframe and minicomputer users in a number of the larger districts. The reviews seemed mixed as to the level of satisfaction with some of these programs. However, these programs did receive a number of positive ratings. There was a limited number of programs being written by regional/local area programmers for two of the larger districts. By and large, this practice was not evident in the study. The greatest number and variety of commercial programs were purchased for microcomputers. There were few programs that were used by more than two or three districts and seldom were the most highly rated programs

used in many districts. The most highly rated (mean greater than or equal to 4.0 on a scale from 1 to 5) and most used programs (by at least three respondents) on the Apple microcomputer were Appleworks, VisiCalc, PFS File, DB Master, and Multiplan. For the IBM microsystems, the most popular programs (with the same criteria) were Lotus 1-2-3 and Negotia Pak. Other highly rated software packages used by only two districts on the Apple system were Apple Writer, Word (for the MacIntosh), Mac Write, PFS Write, Micro Budget, Jazz, and Print Shop. Multimate was used on IBM microcomputers in five districts but the mean rating of satisfaction was 3.8.

Electronic transmission of data at any level still appears to be in its infancy. Several respondents indicated that plans were in progress to institute such methods or that it was a serious intent to do so in the near future. Certain regions, particularly in Iowa and Minnesota at the time of the study, transmitted data by modem or terminal to regional centers. The most frequent types of data transmitted were student records and financial data although some districts claimed to transmit all types of general data. The same types of data were generally transmitted between centers within the school district and to regional centers outside the district. Not always did the districts transmit the same data both within and outside their district boundaries.

Recommendations received from respondents were grouped under the following headings: Hardware, Software, and General Recommendations. In descending order of frequency, hardware recommendations included plan big enough at the beginning to reduce upgrading and retraining later, consider expansion capabilities, purchase only name-brand

equipment, choose good-quality hardware with a wide variety of software, consider hard disk drive peripherals and networking capabilities at the beginning, and have adequate memory capacity to meet needs. Software recommendations included the need to thoroughly test software to personal satisfaction, select software before buying the hardware, be cautious of software/hardware compatibility, list potential software output, test software in "hands-on" situation or at least preview software, plan for integrated data bases where possible, budget adequately for software--do not try to save money on software, software need not be expensive to be effective, buy complete programs--do not leave associated software to a later date, try to establish a software update service, and "canned" programs generally reduce the need for locally created programs. General recommendations included finding other school districts with similar needs using similar computer system(s) which might be used as models, defining district needs and tasks carefully, choosing a reliable vendor who will be available in the future, adequate staff training, having a local staff person (coordinator) available for assistance with computer system(s), "going slowly," projecting time lines and add 15 percent margin, discussing and coordinating plans with all parties involved with or affected by plans to automate, discussing with current users, planning carefully, buying what is needed to handle all applications, "forcing" employees to use a microcomputer by giving them the time to practice and to attend workshops, talk to individuals using the system--not the ones who purchased the equipment, set up guidelines for electronic usage, select a coordinator first, do homework first and research thoroughly, be careful, choose one model for computer implementation throughout the

district (district-wide plan), maintain state-of-the-art hardware, ask for demonstrations, be aware of sales representatives, look at all possible alternatives, use a committee to determine needs, plan on spending inservice and consulting funds, do not be afraid to experiment, do not wait until you are completely satisfied, develop a master plan and evaluate the total system, and standardize district equipment.

Since computer technology has advanced so rapidly in the past decade, it was decided to ask the respondents what computer hardware they would like to purchase or had already ordered for their district. An increased awareness of computer capabilities was noted by the writer because the respondents "wished for" selection was rather sophisticated. Leading the list was electronic communications equipment such as modems, networks, terminals, and electronic mail/bulletin boards. As well, there was interest in purchasing more microcomputers--primarily IBM models. IBM minicomputers were being considered by several respondents in districts with 1,500 to 2,999 students. Two respondents indicated their desire to purchase mainframe computers. One mainframe model mentioned was the Hewlett Packard 3000-37.

Observations/Conclusions

The following profiles have been based upon the data received from respondents in four student enrollment categories. Based upon the characteristics of each category, a number of suggestions have been offered to administrators to help them begin planning for some degree of automation. Additional comments were included when respondents voluntarily provided such information. There were many similarities between all categories and most particularly between categories closest in student population. Many of these similar characteristics in

administrative use of computers may have been due in part to influences other than just a need for computer-processing capacity. However, this study primarily focused on administrative workload determined by student enrollment as the criterion in which to group school districts. The motivation and interest of the chief school officers in the use of computers was not measured but seemed likely to be a significant influence in the decision to use computers and in the choice of computers selected. The characteristics similar to all categories include those outlined as follows.

For all districts the trend will be for outright ownership of hardware with the occasional computer or peripheral being rented or leased. Most, if not all, districts will likely have a microcomputer system used for some part of their administrative needs. As well, administrators will increasingly be able to interface with a host regional or state minicomputer or mainframe computer system as regional or state agencies coordinate and develop the means to communicate and transmit data electronically.

All district administrators responsible for the planning and installation of an automated computer system should be knowledgeable in the use, problems, benefits, hardware selection, and compatibility of computers and have carefully researched implementation procedures before beginning any phase of automation. Important steps to be taken include discussion with more than one vendor; district office vistations; consultation with district employees; careful and thorough reading of journals, magazines, and research; close consultation with state and/or regional officials; mandatory tendering of equipment; establishment of planning committees; and establishment of a philosophy

covering collection, analysis, reporting, and security of data. School district visitations from which to observe firsthand school district computerized administrative operations were deemed to be of great value by a number of respondents as a means of quickly gleaning much of this information.

There was strong emphasis on the need for proper staff training. Such training must be more than a post-installation exercise in how to operate a computer or utilize a software package. It must begin at the pre-implementation consultation stage where staff input and cooperation are sought. Confidence building and staff enthusiasm are essential for successful implementation and a satisfactory rate of progress. Whether districts implement automated procedures (1) quickly with records converted and old procedures abandoned, (2) gradually in planned stages, or (3) gradually by using parallel manual and automated practices will depend largely on staff commitment and training. There was mixed response as to whether the transition to an automated process should be phased in gradually or be instituted immediately. Recommendations from respondents were mostly in favor of proceeding slowly, and several regrets were expressed that more time had not been spent in the transition process. Particularly, adequate time spent in staff preparation was seen as vital.

Administrators can expect to make a number of changes in office facilities no matter what computer system they select. The more individualistic characteristics of each enrollment category were determined to be as follows.

Profile of Districts with
Less Than 300 Students

All districts in this category owned their equipment with only
one district renting an additional computer. Ownership of all or most
of the district's computer equipment may continue, particularly as
technical performance of hardware increases and comparable prices
(performance/cost) decline. Small school districts will continue to
depend on microcomputers entirely unless they are able to interface
with a host regional or state minicomputer or mainframe computer.

Administrators in small school districts were strongly
influenced by one or two individuals, perhaps even themselves being
the primary influence. Factors such as potential benefits of automation
may be used as arguments for using the technology but in small school
districts individual eagerness of a few persons will be most influential.
Once all interested educators have introduced automation to some extent
in their school district offices, the rate of growth or development
will likely continue but at a slower rate due to the small number of
students and the limited needs for a computer. For example,
computerized school scheduling in very small schools will not likely be
necessary because manual methods will likely be more efficient.

Most district officials in this category used outside
consultants very little, perhaps because of prohibitive costs of such
services or the fact that single microcomputer systems were not
extremely expensive and some experimentation could be afforded. The
most common use of consultants was assistance in training, followed by
assistance in recommendations on hardware/software and planning district
goals. Planning was generally less extensive than for other enrollment

categories and increased assistance in planning from state or regional departments may be helpful and even necessary.

Officials of small districts most often conferred with their school boards and spent far less time planning, consulting, researching, or implementing. This might be explained by the fact that often only one salaried official was responsible for the entire implementation process, whereas larger districts had other persons on staff with which to confer or share in the planning. Although visitations to other districts were not often conducted, the time spent might have been worthwhile.

A number of district administrators began by using general purpose data base/word processing/spreadsheet programs while a nearly equal number of administrators began by using a combination of both general purpose and specific purpose programs. A great deal of time can be spent in reading manuals and learning how to use various software packages. "Integrated" software may be the immediate solution for some administrators. However, general purpose programs do not adapt well to the many varied administrative needs and administrators may need to learn to use more specialized programs which have been written for specific tasks.

In some of the smallest school districts, superintendents were the only administrators in the entire district and were also the most well trained persons in the use of computers within the school district. These people will need to be or become the most knowledgeable persons in computer use unless assistance can be obtained from a district computer coordinator or secretary. Secretaries who are interested and literate in computer operations may be the best answer to improve

office automated administrative processing. Other superintendents in
this enrollment category should perhaps become equally well informed.

A microcomputer system appears warranted for administrators
who are beginning to use computers. Apple IIe and IIc microcomputers
would be sufficient for many smaller districts, but an IBM microcomputer
system would potentially be more beneficial for larger districts in
this category because of the greater processing speed and memory
capability necessary for larger districts. Due to the extensive amount
of time generally required to understand how each new software package
functions, general-purpose software seems to be the most time-efficient
means of utilizing software.

Profile of Districts with
300 to 1,499 Students

Reduced dependence upon purchased services and upon rented
equipment will likely continue. Administrators will be able to manage
most administrative functions on a microcomputer. Some very
sophisticated computerized operations would have to be processed on a
regional- or state-operated time-share system or have the data sent by
mail to be processed if districts depended solely upon microcomputers.
Hard disk peripherals and memory expansion cards may be used to enhance
the power of the microcomputers. The average response from respondents
indicated a belief that microcomputers were capable of processing
information for nearly 1,500 students which, if correct, would be
sufficient to assist most districts with a range of student enrollments
up to this limit.

Decisions regarding the use of computers for administration will
be more influenced by the potential advantage of a computer and much
less by the eagerness of a few individuals. Outside consultants may be

used most often for staff training as was the case in this study; but other needs such as being "on call" for advice, recommending hardware/software, and helping to determine initial computer functions will remain important. In addition to conferring with school boards, some administrators consulted vendors, inserviced staff, and visited other school districts.

Primarily, administrators began by using a combination of general-purpose (data base, word processing, and spreadsheet) and job-specific software. In all likelihood, administrators could use a microcomputer system in districts with enrollments up to 1,500 students to meet most and probably all of their computing needs. Currently, hardware is available to enhance microcomputer memory and memory storage so that the microcomputer's ability to handle large amounts of data is substantially improved. As well, hard disk data storage systems and large-capacity random access memory cards are faster and reduce annoying, unwanted waiting periods thus allowing microcomputers to perform on or near par with 1970 minicomputer technology and 1950 mainframe technology.

Superintendents will need to be fairly knowledgeable with regards to computers and automated administrative practices. However, they will likely be able to depend more upon a business administrator or computer coordinator to assist with administrative data processing than would administrators in smaller school districts.

Profile of Districts with 1,500 to 2,999 Students

There will be a reduced dependence upon purchased services and equipment rentals in districts with 1,500 to 2,999 students.

Administrators in school districts of this size have a more difficult
decision than administrators in the other enrollment categories with
regard to the size of computer system necessary because enrollments are
such that the upper limits of a microcomputer's capacity would be
tested and a minicomputer may be necessary. A number of districts
have purchased minicomputers to meet their needs while other districts
have managed with microcomputers. The difference in computer needs is
primarily due to the number and type of functions performed by
computer. To date, minicomputers are generally much more expensive
than microcomputers but there are different models with varying
capacities and prices. Many minicomputers and mainframe computers can
be upgraded at a future date as needs arise, thus reducing the initial
cash outlay. If district officials are considering the purchase of
several "high-end" microcomputers with hard disk storage and plan on
doing considerable "in-house" processing, then a minicomputer might
best suit their needs.

Potential advantages of a computerized system will be the most
influential factor in the decision to computerize. Cost-saving
benefits and staff considerations will also be important.

Outside consultants were used more often for a variety of
reasons in this enrollment category than in any other category.
Computer needs may have been fairly sophisticated but many school
districts did not have trained district personnel to make many of the
necessary decisions. Consultant costs might be recovered quickly
because the necessary equipment would be more expensive and compatibility
of hardware is difficult for a novice to understand, thus making
mistakes very costly. Major consultant functions were assistance in

making recommendations on hardware/software, identification of district

needs and initial functions, and assistance in financial planning.

Cooperation with school boards, vendors, district visitations,

and staff inservicing were the most prominent activities during the

planning and implementation stage. Most administrators began by using

a combination of both job-specific and general-purpose programs, but

several respondents used only general-purpose programs.

School districts in this category with greater student

enrollments were generally large enough to have specialized central

office employees such as business administrators, computer coordinators,

or secretarial staff that could be responsible for computer operations.

However, superintendents should strive to be relatively knowledgeable

in the area of computers. This is important because school district

data must be utilized in the best interests of students, employees,

and academic performance and not solely for the expediency of office

management.

Profile of Districts with
3,000 to 10,000 Students

Larger school districts have the student base to justify the

use of a minicomputer or even a mainframe computer. Varying capacities

of computers can be matched to district size, needs, and ability to

afford equipment. Regional or state directives and initiatives will

affect the amount of independence that these districts will have with

regard to local decisions on automation. If some of the necessary

administrative functions can be performed at regional or state levels,

the "in-house" computer workload at the local district level can be

reduced. However, the processing capacity necessary in administration

to process student, personnel, and financial data at the district
level in this category appears to necessitate the use of computers
with larger capacity than currently available on microcomputer systems.
Districts in this category which used minicomputers or the occasional
mainframe computer system were mostly in the wealthier categories as
measured by per pupil expenditure.

Benefits of a computer system will likely be the most important
reason in deciding to use a computer. This reason has obviously been
somewhat important for all administrators in all districts. District
officials will be less likely to be pursuaded by a few enthusiasts.
Notable in the responses from this category was the apparent lack of
office staff eagerness to try new automated procedures.

This category demonstrated less dependence upon outside
consultants than the next smaller two categories and respondents
indicated more reliance upon their own personnel to assist with many
of these functions. The leading consultant service was identifying
district needs and several recommendations were made to the effect that
outside consultants should be used.

The greatest number of planning activities during the
implementation stage were noted in this category. Activities mentioned
in the previous categories were all important with greater emphasis on
planning and research.

An approximately equal number of administrators first began by
using either a combination of both general-purpose and job-specific
software packages or job-specific programs alone. Administrators also
endeavored to use other specialized programs such as those used for
printing newsletters and thank-you notes on a microcomputer system.

Very few administrators used only general-purpose data base, word processing, or spreadsheet programs initially.

School districts were large enough that specially trained employees could be responsible for basic administrative computer operations. Superintendents would then be able to focus on other responsibilities. However, it is essential that superintendents remain primarily responsible for the use and security of district data so that educational objectives are safeguarded.

Districts were also large enough to make it economically feasible for local development of specialized software programs and for some individual experimentation with hardware or automated administrative practices. Because of a large school district's capacity to be able to develop automated practices often independently of surrounding school district or state/regional developments, district officials have a responsibility to either provide some leadership in computerized administrative functions or to work cooperatively with other school districts towards this purpose.

Recommendations

The recommendations that follow are based on the results of this study and from the information obtained from the review of the literature. The recommendations are divided into two sections: Recommendations for Future Practice and Recommendations for Further Study.

Recommendations for Future Practice

1. Careful planning cannot be overemphasized. It must begin well in advance of the purchase of any equipment or software and it

must involve all interested or affected persons involved in the
innovation. Planning should include needs assessment(s), district
financial capabilities assessments, enticement of staff to participate
and to develop new skills, qualified-staff training programs with
ample opportunity to practice skills, establishment of criteria for
the selection of hardware and software, evaluation of hard copy,
evaluation processes to monitor each implementation phase, and
continuation of planning for future changes and improvements.

2. Computerization of traditional administrative practices
means more than buying a computer and some software. There is a
tremendous need for adequate staff training sessions which enhance
confidence building as well as knowledge building. This training must
begin at the pre-automation stage to gain staff acceptance for the
introduction of computers. Staff support is essential for the
computerization transition process to be effective.

3. Careful consideration should be given to the concept of
ergonomics or quality working environment for the well-being of
employees. Ergonomics will be an increasingly important consideration
in studies of future office practices.

4. Concern for the security of electronically stored data
was rarely mentioned by the respondents as an important factor but
increased public concern for limited access to this information and
increased tampering by curious computer enthusiasts make this need for
security even more critical.

5. Consideration should be given to the improvement of various
office needs such as types of flooring, electrical improvements, data
storage facilities, and improved telephone line communication.

6. There must be an increased awareness for the need of greater cooperation between neighboring school district officials so that they can assist each other when questions arise and so that no district becomes isolated and lags behind the general level of progress for the region. This cooperation might also help to standardize the hardware configurations in each of the districts within a region or at least reduce the tremendous variety of computer hardware brand names and models. This is especially true with peripherals. If interdistrict cooperation is to be meaningful, similar computer hardware would be an asset and local hardware/software inservices would be easier to establish.

7. There must be more assistance from state and regional officials as indicated in the literature to help district administrators become better acquainted with the technology and to provide more direction toward common statewide goals for data collection and electronic transmission of these data.

8. State or regional communication networks/bulletin boards are being established in many areas and this practice is certain to expand. There needs to be some regional/state assistance in facilitating this development. Some larger school districts may wish to proceed independently in this matter.

9. There must be a significant improvement in the knowledge base that district administrators have regarding computers and their operations. There currently exists much uncertainty about types of computer hardware possessed by school districts as demonstrated by the number of responses in this survey that confused microcomputer hardware with minicomputer hardware. There is also an immediate need on behalf

of district administrators to know more about software programs and the tasks which these programs are capable of performing. Efficient and effective use of software depends upon knowledgeable persons operating the system and having the proper hardware to support software capabilities. Regional/state/university-sponsored workshops must be encouraged to reduce this information void.

10. Fifteen hundred students seems to be the benchmark in terms of student enrollment to indicate the maximum capacity of a microcomputer for administrative workload. The addition of more technologically advanced peripherals such as memory expansion cards and hard disk drives will increase the limit to the number of student files able to be processed. Minicomputers still appear to be superior to microcomputers at the present time for fast processing of large amounts of data, for multiprocessing or multi-tasking, and for local time-sharing.

Recommendations for Further Study

1. An in-depth study of school districts that use automated administrative operations is needed to provide models for other administrators to develop their own district computerized office system(s). This is particularly important at this time because currently there appears to be few school district offices which could serve as models for exemplary use of automated educational administrative functions, thus making it difficult to establish interdistrict visitations by school district personnel.

2. Model statewide or Educational Regional Service Agency data collection systems should be studied with the intention of identifying the most successful methods of centralized data collection,

especially as the trend in this direction is likely to increase.

3. Extensive research should be done to identify quality educational administration software programs for district office use. Several studies have been completed in this area but such information does not remain current for long.

4. Regional and/or state networking and bulletin board systems should be investigated and the technique of electronic mail and data transmission further developed to promote improved communication between school-, district-, and state-level agencies.

5. It was reported in the literature that the production of reports had increased in districts which had used computers for this purpose. Electronically stored data combined with extremely high-speed printers make lengthy and detailed reports possible. A study to determine the need for this additional information and to assess the quality of both the content and printed format of this additional information would make a valuable contribution to effective use of computers in school district administration. Associated with this study might be an effort to determine how much of this additionally processed and printed information is read by its intended audience.

6. No respondent indicated that automation reduced costs and, in fact, several indicated that there were many additional costs which were not perceived at the beginning. Research into the monetary considerations and resultant improved effectiveness would help to determine whether or not automation is an efficient means of processing school district data.

7. The identification and analysis of interesting, unique, and special computer applications could be important in increasing the

knowledge and benefits of automation by making these processes known
to a greater number of administrators.

APPENDICES

APPENDIX A

SCHOOL DISTRICT LEVEL ADMINISTRATIVE USE

OF COMPUTER(S) QUESTIONNAIRE

SCHOOL DISTRICT LEVEL ADMINISTRATIVE USE OF COMPUTER(S) OUESTIONNAIRE

NOTE:
All questions pertain to district level administrative applications only.

A. PLANNING CONSIDERATIONS FOR IMPLEMENTATION OF COMPUTER SYSTEMS

1. Circle degree of influence that the following factors had in persuading your school board to use computers in district level administration:

	Low				High
(1) Potential advantages offered by a computer system	1	2	3	4	5
(2) Eagerness of one or two individuals	1	2	3	4	5
(3) General staff eagerness to try system	1	2	3	4	5
(4) Decrease in overall cost of performing functions	1	2	3	4	5
(5) Other (specify) _____	1	2	3	4	5

2. Was a paid professional consultant/firm used at any time? Yes_____ No_____
   If YES, check all general service(s) provided:

   Identified district needs _____   Planned district goals   _____

   Determined initial functions _____   Assisted in financial planning _____

   Recommended hardware   _____.   Recommended software   _____

   Provided initial training   _____   Available on-call for advice   _____

   Conducted feasibility study _____   Other (specify):_____

   If NO, was knowledge gained through: A district educator_____ Vendor_____

   Magazines_____ Fellow administrators_____ Other (specify):_____

3. Check all major planning steps taken by your district:

   Established planning committee _____   Reviewed research   _____

   Hired coordinator or consultant _____   Consulted state officials   _____

   Visited other district offices _____   Consulted district employees _____

   Consulted university people   _____   Developed a time line   _____

   Consulted several vendors   _____   Trained or inserviced staff _____

   Sought venders for equipment   _____   Sought board approval   _____

   Established philos. and policy _____   Implemented on trial basis   _____

   Reviewed journals/magazines   _____   Other (specify):_____

4. Check all items that best describe your district's access to computers:

   (1) Purchased some or all equipment

   (2) Rented/leased some equipment _____ If so, check: Computers_____ Peripherals_____

   (3) Used time-sharing arrangement_____

   (4) Purchased services from: Educational Regional Services Agency_____
                                 Commercial agency_____   College_____

5. Check one item which best describes your district's first use of administrative computer software:

   Used only general word processing, data base, or spreadsheet programs_____

   Used only job specific programs . . . . ._____

   Used combination of general purpose and job specific programs . . . ._____

6. Check all facility changes for computer installation in district office:

   Structural changes_____ Install air conditioner _____ New furniture_____

   Electrical changes_____ Telephone wiring changes_____ Reflooring _____

   Lighting   _____ Data storage facilities _____ Other_____

7. Choose source of training/inservice (nos. 1-5) from column on the left and enter that **number(s)** under Training Source(s) and then indicate total length of sessions (in days) beside staff position.

Source:	Staff Position:	Training Sources:	Total # Days:
(1) Vendor workshops	(a) Superintendent	_____	_____
(2) Computer company training session	(b) Bus. Administrator	_____	_____
(3) University/College course(s)	(c) Computer Coordinator	_____	_____
(4) Visitations to other districts	(d) Office sec. staff	_____	_____
(5) On the job training	(e) Other_____	____	____
(6) Self-taught			
(7) Other (specify):_____			

8. Check **all** significant problems encountered during the automation process:

Instituted changes too quickly	_____	Hardware malfunctions	_____
Installation problems	_____	Staff resistance	_____
Software complexities	_____	Unexpected costs	_____
Major office renovations	_____	Job description problems	_____
Lack of training	_____	Poor technical support	_____
Vendor delays in delivery	_____	Other_____	_____

9. Suggest recommendations regarding personnal, facilities, or planning:

(1) _____

(2) _____

(3) _____

(4) _____

B. PRESENT DISTRICT OFFICE SITUATION

1. Check **all** items which describe current access to technology:

   (1) Own all equipment   _____

   (2) Rent/lease equipment _____   If so, check: Computers_____   Peripherals_____

   (3) Time-sharing arrangement_____

   (4) Purchase services from: Educational Regional Services Agency_____

   Commerical agency_____   College_____

2. Identify current hardware used in district office by completing **brand** (B) and **model** (M) information under appropriate computer system(s).

MAJOR MICROCOMPUTER SYSTEM

Computer	B_____	M_____
Printer(1)	B_____	M_____
Printer(2)	B_____	M_____
Floppy drive	B_____	M_____
Hard disk	B_____	M_____
Card reader	B_____	M_____
Light pen	B_____	M_____
Modem	B_____	M_____
Mouse	B_____	M_____
Other_____	B_____	M_____

MINICOMPUTER SYSTEM

Computer	B_____	M_____
Terminal(1)	B_____	M_____
Terminal(2)	B_____	M_____
Printer	B_____	M_____
Disk drive	B_____	M_____
Tape drive	B_____	M_____
Card reader	B_____	M_____
Scanner	B_____	M_____
Other_____	B_____	M_____

MAINFRAME SYSTEM

Computer	B_____	M_____
Terminal	B_____	M_____
Printer	B_____	M_____
Disk drive	B_____	M_____
Tape drive	B_____	M_____
Card reader	B_____	M_____
Scanner	B_____	M_____
Other_____	B_____	M_____

TIME-SHARE SYSTEM

Terminal(1)	B_____	M_____
Terminal(2)	B_____	M_____
Printer	B_____	M_____
Card reader	B_____	M_____
Scanner	B_____	M_____
Other_____	B_____	M_____

3. <u>Circle</u> degree of present satisfaction with each of the following:
(Answer only for <u>largest</u> computer system used)

	Low				High
(a) Adequateness of your district's training program . .	1	2	3	4	5
(b) General district office staff understanding of computer capabilities.	1	2	3	4	5
(c) Sufficient district staff time to switch over to computerized system.	1	2	3	4	5
(d) General district staff satisfaction with system. . .	1	2	3	4	5
(e) Amount of software available	1	2	3	4	5
(f) Quality of software available.	1	2	3	4	5
(g) Readability of hardware/software manuals	1	2	3	4	5
(h) Technical compatibility of hardware and software . .	1	2	3	4	5
(i) Ability of hardware to handle workload	1	2	3	4	5
(j) Satisfaction with repair/maintenance	1	2	3	4	5
(k) Vendor support after service	1	2	3	4	5
(l) System flexibility (degree of computer imposed restraints).	1	2	3	4	5
(m) Reduction in time spent on routine administrative tasks.	1	2	3	4	5
(n) System response time to information requested . . .	1	2	3	4	5
(o) Ease of generating information	1	2	3	4	5
(p) Realization of cost benefits	1	2	3	4	5
(q) Increased interaction with data bases (such as class schedules and bus routes with student lists) .	1	2	3	4	5
(r) Other (specify):_____ . .	1	2	3	4	5

4. Describe the <u>most useful</u> software packages used in district office:

(1) Program name_____. Used on: Micro_____ Mini_____ Main_____

Function(s) performed:_____

Degree of satisfaction: (low) 1   2   3   4   5 (high)

(2) Program name_____. Used on: Micro_____ Mini_____ Main_____

Function(s) performed:_____

Degree of satisfaction: (low) 1   2   3   4   5 (high)

(3) Program name_____. Used on: Micro_____ Mini_____ Main_____

Function(s) performed:_____

Degree of satisfaction: (low) 1   2   3   4   5 (high)

(4) Program name_____. Used on. Micro_____ Mini_____ Main_____

Function(s) performed:_____

Degree of satisfaction: (low) 1   2   3   4   5 (high)

(5) Program name_____. Used on: Micro_____ Mini_____ Main_____

Function(s) performed:_____

Degree of satisfaction: (low) 1   2   3   4   5 (high)

5. Data transmission:
   (1) If electronic data are transferred between school(s) and district:

       (a) What types of alphanumeric data are sent?_____

       (b) Sent: Electronically (modem/terminal)_____ By mail (disks/tapes)_____

   (2) If electronic data are transferred to state department of education or to regional service agency:

       (a) What types of alphanumeric data are sent?_____

       (b) Sent: Electronically (modem/terminal)_____ By mail (disks/tapes)_____

6. Check all safeguards that you provided for electronically stored data?

   Log on (password/I.D.) before access _____   Backup tape/disk storage   _____

   Password/I.D. after access   _____   Call backs (to verify)   _____

   Physical security (off site or vault) _____   Routine password changes   _____

   Other (specify)_____ _____

7. What is the maximum district student enrollment for which you believe a micro-computer system is adequate for all district needs?_____ (nos. of students)

8. What is the present district per pupil expenditure? $_____

9. What recommendations can you offer to other district officials for consideration when using or purchasing hardware or software?

   (1)_____

   (2)_____

   (3)_____

   (4)_____

   (5)_____

C. SPECIFIC FUTURE PLANS

1. Identify priority items for future purchases:

   (a) Hardware:_____

   (b) Software:_____

   (c) Data transfer:_____

   (d) Other:_____

2. Based on your present needs, what additional equipment do you think would be most suitable for your situation (if you could buy what you wanted)?

   (a)_____   (b)_____

   (c)_____   (d)_____

THANK YOU FOR YOUR TIME AND COOPERATION. I HOPE THAT OTHER DISTRICT ADMINISTRATORS WILL BENEFIT FROM YOUR CONTRIBUTION TO THIS STUDY!

APPENDIX B

LETTER TO STATE OFFICIALS

May 7, 1985

Title *F/Name* *L/Name*
Position
Address
s/address
City, *State* *Zip*

Dear *Title* *L/Name*:

Pursuant to our telephone conversation, I am enclosing a brief
description of my study, the criteria for district selection,
and a copy of the questionnaire that I will be sending to the
district personnel which you have offered to select. I appreciate
your offer of assistance in the selection process.

The study will focus on the computerized administrative applications
at the district level. The purpose is to develop composite profiles
of four different school district categories based on student
enrollment. Seven school districts where district personnel use
computers are needed for each of the categories of: (1) less than
300 students, (2) 300 to 1,499 students, (3) 1,500 to 2,999 students,
and (4) 3,000 to 10,000 students. I would appreciate if you could
recommend 28 examples (four categories containing seven examples
each) that definitely use computers based on your present knowledge
and/or from assistance from fellow staff officials.

District officials may use any computer system(s) (microcomputer,
minicomputer, mainframe computer, or time-share) as long as the
primary microcomputer used for administration in any district
(where used) is an Apple or IBM microcomputer.

District officials will be asked to complete the enclosed sample
questionnaire. In order to mail out the questionnaires, I will need
to know the following:

        Name of contact person
        Name of school district
        Mailing address of school district
        Student enrollment or enrollment category
        Business phone number of contact person (if possible)

If you wish to notify the district administrators of your
recommendations, please do so, for it will not jeopardize the study
and it will let them know that a survey instrument is being sent to
their district.

Please send requested information to the following address and call me if there are any questions:

> W. R. Murison   Home phone: (701) 746-8201
> 403 Stanford Road
> Grand Forks, ND 58201

Thank you for your assistance since there is no other way that meaningful identification of school districts can be made.

Sincerely,

APPENDIX C

LETTER TO REGIONAL OFFICIALS IN MINNESOTA

May 7, 1985

Title *F/Name* *L/Name*
Position
Address
s/address
City, *State* *Zip*

Dear *Title* *L/Name*:

Pursuant to our telephone conversation, I am enclosing a brief
description of my study, the criteria for district selection, and
a copy of the questionnaire that I will be sending to the district
personnel which you have offered to select. I appreciate your offer
of assistance in the selection process.

The study will focus on the computerized administrative applications
at the district level. The purpose is to develop composite profiles
of four different school district categories based on student
enrollment. Seven school districts where district personnel use
computers are needed for each of the categories of: (1) less than 300
students, (2) 300 to 1,499 students, (3) 1,500 to 2,999 students, and
(4) 3,000 to 10,000 students.

I would appreciate if you could recommend four examples (four
categories containing one example each) that definitely use computers
based on your present knowledge and/or from assistance from fellow
staff officials. I realize that not every region will have examples
in the largest category(s) and you may not be able to fill each
category.

District officials may use any computer system(s) (microcomputer,
minicomputer, mainframe computer, or time-share) as long as the
primary microcomputer used for administration in any district
(where used) is an Apple or IBM microcomputer.

District officials will be asked to complete the enclosed sample
questionnaire. In order to mail out the questionnaires, I will need
to know the following:

        Name of contact person
        Name of school district
        Mailing address of school district
        Student enrollment or enrollment category
        Business phone number of contact person (if possible)

If you wish to notify the district administrators of your
recommendations, please do so, for it will not jeopardize the study
and it will let them know that a survey instrument is being sent
to their district.

Please send requested information to the following address and call
me if there are any questions:

      W. R. Murison   Home phone: (701) 746-8201
      403 Stanford Road
      Grand Forks, ND 58201

Thank you for your assistance since there is no other way that
meaningful identification of school districts can be made.

Sincerely,

APPENDIX D

LETTER TO DISTRICT OFFICIALS RECOMMENDED

BY STATE OFFICIALS

May 7, 1985

Title *F/Name* *L/Name*
Position
Address
s/address
City, *State* *Zip*

Dear *Title* *L/Name*:

I am currently enrolled as a doctoral student in educational
administration at the University of North Dakota and I am interested
in school district computer applications in educational administration
as a dissertation topic. The purpose of the study is to investigate
school districts that use computers for administrative functions at
the district level and to develop four systems profiles of hardware,
software, and personnel for each of the four student enrollment
categories.

Your district was recommended by state officials as a district that
utilizes computerized administrative applications. I would appreciate
it if you would take some time to share some of your experiences and
recommendations as requested in the enclosed questionnaire. I realize
that you may be inundated with surveys and, yet, districts such as
yours are the ones that can provide the best information for
administrators who are just beginning the automation process.

My intention is to answer a number of questions that many district
administrators have been asking when first considering the introduction
of computers to the district office.

The survey instrument should take no longer than thirty minutes to
complete. If you have any preprinted materials that you feel might be
helpful, I would appreciate your sending them as well.

Please find enclosed a survey instrument and a return envelope. I
truly would appreciate any help that you might provide in this study
and if there are any questions, please call me.

     W. R. Murison   Home phone: (701) 746-8201
     403 Stanford Road
     Grand Forks, ND 58201

Thank you.

Sincerely,

APPENDIX E

LETTER TO DISTRICT OFFICIALS NOT DIRECTLY

RECOMMENDED BY STATE OFFICIALS

May 7, 1985

Title *F/Name* *L/Name*
Position
Address
s/address
City, *State* *Zip*

Dear *Title* *L/Name*:

I am currently enrolled as a doctoral student in educational
administration at the University of North Dakota and I am interested
in school district computer applications in educational administration
as a dissertation topic. The purpose of the study is to investigate
school districts that use computers for administrative functions at
the district level and to develop four systems profiles of hardware,
software, and personnel for each of the four student enrollment
categories.

I would appreciate it if you would take some time to share some of
your experiences and recommendations as requested in the enclosed
questionnaire. I realize that you may be inundated with surveys and,
yet, districts such as yours are the ones that can provide the best
information for administrators who are just beginning the automation
process.

My intention is to answer a number of questions that many district
administrators have been asking when first considering the introduction
of computers to the district office.

The survey instrument should take no longer than thirty minutes to
complete. If you have any preprinted materials that you feel might
be helpful, I would appreciate your sending them as well.

Please find enclosed a survey instrument and a return envelope. I
truly would appreciate any help that you might provide in this study
and if there are any questions, please call me.

W. R. Murison   Home phone: (701) 746-8201
403 Stanford Road
Grand Forks, ND 58201

Thank you.

Sincerely,

APPENDIX F

CUMULATIVE LIST OF HARDWARE IN DISTRICTS SURVEYED

The following is a cumulative list of the equipment used throughout the districts surveyed in this study (without regard to district size). Some districts used two and, in one situation, three separate computer systems. In districts where officials used a computer system larger than a minicomputer in addition to using a microcomputer and the microcomputer system was not Apple or IBM, the micro system was not considered in the results. If the microcomputer was not an Apple or IBM and it was the only computer system, the entire survey was rejected. This eliminated surveys from districts using a Burroughs B 22 computer, a Xerox 820-II, a Dec III, and a number of Radio Shack systems.

TABLE 49

CUMULATIVE LIST OF HARDWARE IN DISTRICTS SURVEYED

	Respondents
Microcomputer Hardware	N

Microcomputer (N=58) [4 districts used 2 systems]

Apple	40
IIe	26
MacIntosh	7
IIc	5
Model III	1
Lisa	1
IBM	22
PC	15
XT	4
AT	1
5110	1
5323 (attaches to a high-end Sys 38 micro)	1

TABLE 49--Continued

Microcomputer Hardware	Respondents N
Minicomputer (N=15) [1 district used 2 systems]	16
IBM	5
System 36	3
System 34	1
System 23	1
Burroughs	9
B-80	2
B-90	1
B-91	1
B-93	1
B920	2
B930	1
CP9582	1
BRD Dolphin	1
Data 100 Model 88	1
Mainframe Computer (N=9)	
Burroughs	4
CP1955	1
B6800	1
7900	1
No model	1
Digital/Dec	3
Vax	1
11/23	1
11/44	1
IBM	2
5360	1
360	1
Floppy Drives	
Apple	40
IIe Disk II	20
IIe Duo Disk	6
IIc (built in)	5
Mac (built in)	7

TABLE 49--Continued

	Respondents
Microcomputer Hardware	N
Apple III	1
Lisa	1
IBM	24
PC	15
XT (2 XT connected to a hard disk)	4
AT (built in)	2
5170	1
5114	1
5323	1
Hard Disk	
Corvus	5
6 MB	3
10 MB	1
20 MB	1
Apple Profile	2
IBM	6
XT	4
5323	1
5170	1
Televideo 4016	1
Tec Mar Mac Drive	1
Swintec 1146	1
Printers	
Epson	20
MX 80	8
FX 80	5
MX 100	3
LQ 1500	2
FX 100	1
RX 80	1

TABLE 49--<u>Continued</u>

Microcomputer Hardware	Respondents N
IBM	18
PC Graphics	2
Wheelwriter	2
Quietwriter	2
3287	2
System 34	1
System 36	1
3530	1
5103	1
5211	1
5219	1
5225	2
5242	2
Apple	18
Imagewriter	13
LQP	1
Laserwriter	2
Applewriter	1
Model not stated	1
Okidata	10
U-93	2
U-92	2
83A	2
U-84	1
U-80	1
Model not stated	2
Digital/DEC	5
LA 120	1
Digital 100	1
Decwriter III	1
Decwriter IV	1
Decwriter (no model)	1
Diablo	5
Diablo 620	1
Diablo 630	4
NEC	5
Spinwriter 3515	2
3530	2
7710	1

TABLE 49--<u>Continued</u>

Microcomputer Hardware	Respondents N
Silver Reed	3
Exp 500	3
Brother	2
Dynar DX15	1
HR Series (no models given)	1
Prowriter 8510	2
Panasonic 1091	1
Texas Instruments 855	1
Qume Sprint 5	1
Star Delta 15	1
Burroughs	12
9249	5
9246-6	4
9251	1
TP313	1
No model (2000 lpm)	1
BRD Dolphin (no model)	1
Data 100 88	1
Okidata 84	1
Card Reader	
Chatsworth	3
OMR 1000	1
OMR 500	1
OMR 2000	1
NCS	1
Sentry 3000	1
Light Pen	
(None were used)	

TABLE 49--Continued

Microcomputer Hardware	Respondents N
Modem	23
Hayes	10
Smart 300	1
1200	9
Apple	6
300-1200 baud	1
1200 baud	5
IBM 3864	1
Jacob Anderson AT1234A	1
UDS 202LP	1
Nec DSP9600	1
Mitzuba 1200 Smart	1
Comdata 212	1
Digital DF03	1
Mouse	9
Apple	8
IIe and IIc	4
Mac	4
Other Microcomputer Accessories/Peripherals	
SAFT Surge Protector	1
Apple Keyboard AZM2003	1
Terminal	
Burroughs	25
B-80 (no model)	1
ET 1100	7
ET 1210	1
SR 110	1
MP 985	1

TABLE 49--<u>Continued</u>

Microcomputer Hardware	Respondents N
TD 830	6
TD 831	2
MT 983	1
B-91	1
B-90	1
Console	1
MP-985	1
No model	1
IBM	9
3180	1
3276-78	1
System 23	1
System 36	1
5251	3
5292	1
Terminal Emulator	1
Wyse 75	1
ADDS T/A	1
Texas Instruments	1
Teletype 43	1
Ergo 301	1
BRD Dolphin	1
Data 100 88	1
Minicomputer Disk Drive	
Burroughs	5
B-80	2
B920	1
9493-80	1
(No model 65 MB with a CP9582)	1
IBM	1
System 36	1

TABLE 49--<u>Continued</u>

Microcomputer Hardware	Respondents N
Data 100 (no model stated)	1
<u>Minicomputer Tape Drive</u>	3
Burroughs	2
B920	1
No model	1
Data 100 (no model stated)	1
<u>Card Reader</u>	
Burroughs (600 cpm--no model stated)	1
Data 100 (no model stated)	1
<u>Scanner</u>	
NCS	2
OCR	1
3000	1
NCR (no model stated)	1
Burroughs (no model stated)	1
<u>Minicomputer Other</u>	
Burroughs Keypunch 100cpm	1
PD 130500-3 Line Purifier	1
<u>Mainframe Disk Drive</u>	
Burroughs	3
B9493-80	1
B9494-41	1
B207	1
IBM	1
200MB (no model given)	1

TABLE 49--Continued

	Respondents
Microcomputer Hardware	N
Digital/Dec	2
DEC 11/44	1
Digital RL02	1
Mainframe Tape Drive	
Burroughs	1
B9491-41	1
IBM 8809-1C	1
Dec 11/44	1

APPENDIX G

RECOMMENDATIONS FOR IMPLEMENTATION PROCEDURES

The following is a detailed list of responses to the research question, What recommendations did surveyed administrators have regarding personnel, facilities, or planning during the implementation stage?

Need for Adequate Training

Good training is essential. (7 responses)

Conduct "follow-up" conferences with personnel after workshops. (1 response)

Provide more time for staff training to build confidence. (1 response)

Release time is necessary for secretarial and clerical staff for on-the-job training. (1 response)

Need for Positive Staff Reaction and Commitment

User personnel must be willing to become involved. (1 response)

User personnel must be familiar with computers. (1 response)

Steps need to be taken to establish a positive mental attitude by all personnel. (1 response)

Condition staff to create enthusiasms during planning processes. (1 response)

Be sure that key personnel are committed to installation and functions. (1 response)

Do not assign the job to people who are already working full-time on other tasks. (1 response)

Careful Planning

"Plan-Plan-Plan--Test-Test-Test--Implement." (3 responses)

Involve many people in the planning stage--include clerical staff. (3 responses)

Proper planning is essential. (2 responses)

Allow enough money in the budget for unforeseen circumstances. (1 response)

Need a coordinated plan with respect to integration of hardware and software. (1 response)

Determine software to be purchased before deciding upon the computer. (1 response)

Issue vendor purchase orders far enough in advance to allow for timely delivery and testing of hardware and software prior to actual need. (1 response)

Implementation Suggestions

Allow a longer time to shift over (more time was needed than respondents had originally planned). (3 responses)

Begin slowly. (2 responses)

Install the system all at one time rather than gradually. (1 response)

Buy programs that are "complete and ready-to-go." (1 response)

Allow plenty of "lead-time." (1 response)

Hire additional help to set up new or additional computerized record keeping. (1 response)

Sources of Information/Direction/Advisement

Observe similar applications firsthand. (3 responses)

Have at least one person very knowledgeable on staff. (2 responses)

Use a commercial firm rather than "in-house" advisement. (1 response)

Consider contracting with a programmer or computer expert on a "as need basis." (1 response)

Get the "right" programmer. (1 response)

Use consultants. (1 response)

Good Vendor Support

Find good software support. (1 response)

Know vendor products, support capabilities, and reputation. (1 response)

Necessary Changes

Appropriate furniture should be purchased. (1 response)

Facilities should be adjusted to ensure proper environment for computers and users. (1 response)

Miscellaneous

Promise staff only what you can deliver. (1 response)

Continually reevaluate expectations. (1 response)

Be prepared for problems. (1 response)

If you believe that it is a good investment--don't wait. (1 response)

It is not cheaper--but it is more effective and efficient. (1 response)

APPENDIX H

RECOMMENDATIONS FOR PURCHASING HARDWARE AND SOFTWARE

The information contained in this appendix is a complete list of the responses to the research question, What recommendations did surveyed administrators have regarding established computer systems?

Hardware

Plan big enough--easier than upgrading, retraining, and recreating new files. (3 responses)

Look ahead to expansion capabilities. (3 responses)

Purchase brand-name equipment (one respondent had many hardware problems). (3 responses)

Purchase good-quality hardware. (1 response)

Consider a hard disk drive and networking to start with. (1 response)

Nothing but IBM. (1 response)

Choose hardware with a wide variety of software. (1 response)

Be sure to have adequate computer memory capacity to meet needs. (1 response)

Software

Thoroughly test software to your satisfaction. (5 responses)

Find the software first and then select the hardware. (5 responses)

Be cautious of hardware/software compatibility. (4 responses)

Test software in "hands-on" situation before purchase or at least preview software before purchasing. (2 responses)

Budget adequately for software--do not try to save money on software. (2 responses)

List potential output. (1 response)

Plan for integrated data bases wherever possible. (1 response)

One does not need expensive programs to do an adequate job. (1 response)

Buy complete programs--do not leave optional portions until later. (1 response)

Try to establish a software-update service. (1 response)

Using "canned" software eliminates the need for programmers. (1 response)

General Recommendations

Find other school districts that are using similar systems and applications and check with them first. (9 responses)

Define needs and tasks carefully. (7 responses)

Choose a reliable vendor with good support. (6 responses)

Proper training is essential--one person to a computer. (4 responses)

Make sure vendor will be around in the future. (3 responses)

Have a local staff person designated to review and recommend hardware and software. (3 responses)

Go slowly. (1 response)

Select a coordinator or "expert." (2 responses)

Project time lines and add a 15 percent margin. (2 responses)

Discuss and coordinate with all parties outside of the district who are involved (e.g., regional or state persons) to plan for compatibility. (1 response)

Discuss with current users. (2 responses)

Plan carefully. (2 responses)

Buy what is needed to handle all applications. (1 response)

Force employee users to use a micro by giving them the time to practice and to attend workshops. (1 response)

Talk to the individuals using the system--not the ones who purchased the equipment--when looking for truthful responses as to the adequateness of a system under review. (1 response)

Set up guidelines for electronic usage. (1 response)

Select a coordinator first. (1 response)

There is a need for adequate research and the reading of journals. (1 response)

Provide local staff with adequate inservice time. (1 response)

Use a consultant. (1 response)

Have independent consulting help available when needed.
(1 response)

Be careful. (1 response)

Choose one computer model for district-wide administration.
(1 response)

Develop a district-wide plan. (1 response)

Maintain "state-of-the-art" hardware and software. (1 response)

Ask for demonstrations. (1 response)

Be aware of sales representatives. (1 response)

Prepare proper work space. (1 response)

Look at all possible alternatives. (1 response)

Do your homework first. (1 response)

Have someone ultimately responsible. (1 response)

Use a committee to determine needs. (1 response)

Plan on spending inservice and consulting funds. (1 response)

Inservice trainers must be aware of district needs. (1 response)

Use only reliable vendors. (1 response)

Do not be afraid to experiment. (1 response)

Do not wait until you are completely satisfied. (1 response)

Develop a master plan and evaluate the total system. (1 response)

Standardize district equipment. (1 response)

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