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DATA PROCESSING OF STUDENT SERVICES AND THE ADMINISTRATIVE COORDINATION IN SELECTED HIGH SCHOOLS OF MICHIGAN

by

William Fredrick Cayen

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Education)
in The University of Michigan
1976

Doctoral Committee:

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CHAPTER I

INTRODUCTION

Since the Industrial Revolution there has been one device or achievement of man that has had a tremendous impact on business organizations, industrial techniques, and social evolution and that is the electronic computer. This impact is merely beginning. Were it not for the computer, atomic energy would still be a dream of the future; space research would have remained a speculative science in the custody of a handful of astronomers; communication satellites would be unknown; many industrial production methods in use today would be impossible; businesses including the field of education would require more clerical help than they could obtain to handle their paperwork alone. Not only is the computer a great aid to scientists, but it is also the key factor in that much discussed trend, automation.

Most lives will be left untouched by the pace of the technological revolution. The change generated appears to feed upon itself; the greater the rate, the greater the pressure for more. It would be unrealistic to assume that education will remain unaltered in a society committed to radical and unending change. A dynamic culture develops an almost insatiable appetite for services, particularly

educational services. Furthermore, society demands more from its social institutions when faced with stresses and strains.

Former President Johnson, in his Inaugural Address, said, "America is where each man can be proud to be himself: stretching his talents, rejoicing in his work, important in the life of his neighbors and his nation." This he acknowledged, "has become more difficult in a world where change and growth seem to tower beyond the control and even the judgment of men."

Looking at our society today, we can see where change has gotten out of hand. The baneful effects of technology are evident all around us - in polluted rivers and lakes; in smog-laden air; in the decaying hearts of cities where the "other Americans" have lived too long in dismal, unchanging poverty. We can read the painful story of technological changes in the faces of the men and women whose jobs are threatened by or lost to automation. We can see the hardship of change among those older citizens who lack the means to enjoy their lengthened life span and also among the young ones - the children of the poor - who lack the opportunity to build the needed foundation for a good and abundant life.

We look around us, and we cannot be satisfied with the quality of life that today's technology has brought us. More and more people feel that they are being swept along in the stream of change, helpless to guide themselves. Take the case of those whose jobs are taken over by computers. What choices, what alternatives are open to them? How

can they retain their economic independence and their sense of dignity and human worth? Our first, immediate instinctive reaction has been to turn to education which can open up new paths and which can provide alternatives.

Schools are changing in response to social forces. The functions of education have been redefined to include expanded concerns for a whole range of social problems as well as transmission of the cultural heritage. A new look can be found in what is taught, how it is taught, who is taught, and how long each person is taught. But are schools moving fast enough to keep pace with a world in ferment? This is the nub of the issue.[1]

Responsibilities confronting the school administrator have multiplied in number and complexity. Traditional approaches in dealing with the demands of our times have been found wanting. The school administrator of today is beginning to look for assistance to the promise of a new administrative technology in part on electronic data processing and the computer. Although the computer adds fuel to fire the forces of change, it can serve as a vehicle for coping with the intricacies created. This powerful and sophisticated tool, just out of its teens, is beginning to affect the very fabric of society, creating amazement and apprehension. As an invention hailed by some as possessing more beneficial potential than any other in history, it is bound to have a profound impact on school administration as well.

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[1]Donald H. Sanders, Computers in Society, (New York McGraw-Hill Book Company, 1973), p. 5.

That this is something more than idle speculation and empty promises by wild-eyed dreamers is demonstrated by the dramatic events surrounding computers in science, medicine, government, and business. The computer already has been put to work at hundreds of tasks ranging from the very simple to the sophisticated, from the mundane to the exotic. It is everywhere and is multiplying at a phenomenal rate. It can quickly solve complex equations, diagnose some human ailments, individualize some instructional approaches, prepare weather forecasts, check income tax returns, route long-distance telephone calls, set newspaper type, assign airplane seating, and mix cake, or cement - the list of applications never stops growing.[2]

But what can the computer do for school administration? The uses of the computer and electronic data processing (EDP) in administration of public education are limited only by the imagination of professional administrators. The time has come to stretch this creative potential.

Education, on the grade and high school level, is one of the country's greatest obligations and one of its largest endeavors. To maintain student records, to schedule classes, to correlate tests with classroom work and to plan new facilities are all tasks that normally fall to the teaching staff. Teachers are professionals; they spend

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[2]Richard W. Lott, Basic Data Processing (Prentice-Hall, Inc., Englewood Cliffs, N. J., 1967), p. 3.

years equipping themselves with knowledge and the ability to present that knowledge to our ever-growing student population. The more clerical functions that can be lifted from the shoulders of teachers, the more time they will have to instruct, together with guiding and inspiring their students.

Educational data processing is based on the design of a systematic approach to the proper and timely flow of information to the administrative and instructional decision points in the school district. Data processing is not an end in itself. Its purpose is to manipulate facts and figures according to some pre-arranged plan to produce new and more useful information, related to some educational mission. The design of a comprehensive electronic data processing system is perhaps the most difficult challenge to confront the administrator. It cannot be done by technical computer specialists alone, but must involve professionals with broad understanding of education - its mission and its administration.

Delineation of the Study

As initially conceived, this study would have encompassed all of the secondary schools in the State of Michigan. However, after reviewing the related literature in this area and attending local and state conferences regarding educational data processing, it became apparent that Oakland and Macomb Counties were two of the leaders in this area throughout the State. Therefore, the study in terms of using an instrument to survey educational data processing leaders

will be limited to all Oakland and Macomb County high schools, plus selected high schools throughout Michigan. This study will attempt to determine the various student services that use computer applications and are coordinated by a data processing leader in the high schools selected. This study will also attempt to describe and analyze the role, the background, the educational level, and a general profile of the data processing leader in these high schools.

Statement of the Problem

Electronic Data Processing (EDP) in an educational environment has seen rapid growth and is on the increase throughout the nation. In the past five years, the area of data processing for school services in secondary schools has become a necessity. After visiting with many people involved with school administration, guidance and teaching, it has become quite apparent that there are few, if any, educationally-oriented people that have been trained in the area of data processing.

School personnel, who are presently involved in secondary school data processing, have grown with the system. In most cases, these specific individuals were self initiated and self motivated toward the area of data processing. Little, if any, formal education in the area of data processing at the college level, was available or pursued. Thus, the formal background for school personnel in data processing had not been specific or universal but rather haphazard at best. Till now, there has been no systematic system of assigning a person or

persons to develop, coordinate and follow up on the many and varied school programs that use a computer service.

As our secondary schools are becoming more and more technical, with more information required for decision making by students, parents, teachers, counselors and administrators, it is imperative that the modern high school in today's society operate from a highly technical and sophisticated computer system.

The data processing leader in the high school of tomorrow will be a specific, specialized person. A person trained not only in the area of guidance or school administration, but also in the area of educational data processing. Formal education in educational data processing will be a must, in order to deal effectively with the education personnel, as well as the technical personnel at a computer center. The selection process of the high school data processing leader will be more critical than it was five years ago.

In the next five to ten years additional school administrators will be required. Background in the area of educational data processing will become more advanced and technical. Where will these educational leaders get training in the field of educational data processing? What kind of training is important to understand the entire operation of a modern high school and to communicate effectively with the technical personnel of the computer center? Who will be the data processing leaders of our education system of the 1980's?

This study will be a descriptive analysis of the role of the data processing leader in high schools of Oakland and Macomb Counties

and other selected high schools in Michigan. It will attempt to analyze their training, experience and the future plans for data processing in their local schools. It will provide specific ways available to increase one's knowledge and background in the area of educational data processing.

This study will also describe the extent to which data processing of student services is being used in selected high schools.

The results of this study should be of value to school administrators in hiring, assigning and providing appropriate in-service training for these specialized personnel. High school accrediting associations could also benefit from this study when developing minimum standards for the processing and coordination of student data for accrediting purposes.

Statement of Procedures

A survey instrument will be developed that will be sent to all high school principals of Oakland and Macomb Counties, and other selected high schools throughout Michigan. The instrument will include questions regarding the role of the data processing leader in the school, his duties, his experiences, his education in the field of data processing, especially in the area of student services. The instrument will also include questions regarding the extent to which electronic data processing of student services is being used in the high schools surveyed. Further, a personal interview of a sub-sample of the returned surveys will be made to determine the extent to which

collection and dissemination of student information fits into the entire area of secondary school administration.

The information obtained from the survey and interviews will be tabulated and analyzed by using the computer at the Oakland Intermediate School District. Summary, recommendations, and conclusions will follow the evaluation of the data. The information obtained from the survey and interviews will help to develop the extent to which Electronic Data Processing of student services in high schools is used and to develop a general profile of the person who coordinates these services - the school data processing leader.

This profile could be of help to students interested in educational data processing, school executives, directors of personnel, schools of education at the local colleges and universities, and state and national accrediting associations.

CHAPTER II

REVIEW OF RELATED LITERATURE

Attention in this chapter is given to existing literature bearing upon the general content of this study. The majority of literature that will be reviewed will have been written since 1965. The resource materials will be gathered from a variety of sources, including: textbooks, periodicals, dissertations and unpublished materials.

The major topics covered include: (a) Data Processing; (b) Educational Data Processing in Michigan; (c) Educational Administration and Data Processing; (d) Student Information Systems.

Data Processing

Let the following be cited as a definition of data processing: Data is defined as a set of facts or statistics relating to events which can be identified and measured. These events can be things which have already happened or things that may happen at any future time. Processing refers to any steps taken, by whatever means, to make data useable for a specified purpose.[1]

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[1]Richard W. Lott, Basic Data Processing (Englewood Cliffs: N. J., Prentice Hall, Inc., 1967), p. 1.

Grossman and Howe[2] indicate that data processing involves (1) collecting data for new transactions; (2) manipulating new inputs and data already in files according to a prescribed plan; and (3) producing output documents for various purposes.

Data processing systems, ordinarily, consist of a combination of programs (software) and physical equipment (hardware) designed to handle business, scientific data, or educational data at electronic speeds with self-checking accuracy. The physical equipment consists of various units, including input, storage, processing and output devices.

Few technological developments are formidable enough to mark turning points in human history. Two such phenomena have occurred in our time: The atomic bomb and the computer.

The implications of the bomb are beginning to be understood - its capacity for instant and total destructions has been demonstrated. That they will be awesome is already apparent. Indeed, as Dr. Jerome B. Wiesner, Dean of Science at the Massachusetts Institute of Technology, and former Science Advisor to President Kennedy, wrote:[3]

> The computer, with its promise of a million-fold increase in man's capacity, to handle information, will undoubtedly have the most far-reaching social

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[2]Alvin Grossman and Robert L. Howe, Data Processing for Educators (Chicago: Educational Methods Inc., 1965), p. 18.

[3]"The New Computerized Age," Saturday Review, July 23, 1966, pp. 15-16.

> consequences of any contemporary technical development. The potential for the good in the computer, and the danger inherent in its misuse, exceed our ability to imagine . . . we have actually entered in a new era of evolutionary history, one in which rapid change is a dominant consequence. Our only hope is to understand the forces at work and to take advantage of the knowledge we find to guide the evolutionary process.

Just out of its teens, the computer is beginning to affect the very fabric of society, kindling both wonder and wide-spread apprehension. Is the computer friend or enemy of man? Will it cause hopeless unemployment by speeding automation - that disquieting term that it has brought into the language? Will it devalue the human brain or happily free it from drudgery? Will it ever learn to think for itself? The answers will not be available in quite a while, but one thing is already clear: Swept forward by a great wave of technology, of which the computer is the ultimate expression, human society is surely headed for some deep-reaching changes.[4]

Technological advance in data processing is both dynamic and extensive. The ways in which data processing systems can be used seem almost boundless. Each new application demonstrates how much systems can be used to help man enlarge his capabilities.

According to Diebold, automation is characterized as a philosophy of technology - a set of concepts.[5] From these concepts

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[4]"Technology: Decybernated Generation," Time, April 2, 1965, p. 84.

[5]John Diebold, Beyond Automation (New York: McGraw-Hill Book Company, Inc., 1964), p. 132.

have been spawned the emerging disciplines of Computer Science, Information Systems Science, Cybernetics and related areas. The rapid development of these technological sciences have contributed to dislocations in our existing social institutions whether they be business, government, industry or education.

Diebold[6] commenting upon the influence of machines in society observes that:

> machines have always been important to us primarily, as agents of change. We use the very term "industrial revolution" not because of the revolutionary machines of James Watt and Richard Arkwright, but rather because they created a whole new environment for mankind - a whole new way of life. Today's crop of machines is a far more powerful agent than was that of the first industrial revolution.

According to Claffey:[7]

> The development of the computer has been one response to the increasing operations as man's activities have grown in scale and in interrelatedness. The rapid expansion in number and in mutual dependencies has imposed problems to which the computer provides a very practical answer: It is the technical means by which man can handle intricacies otherwise beyond him. There is also the economic side. Computers are not inexpensive, nor are those persons competent to brief them for new undertakings.

Throughout the centuries, the changing nature and volume of data, combined with technological progress, resulted in a gradual evolution which has been accelerated by the urgent needs of better ways of

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[6]Diebold, op. cit., p. 6.

[7]William J. Claffey, Principals of Data Processing (Belmont, California: Dickenson Publishing Company, Inc., 1967), p. 8.

handling data. Some of the factors that created the need for more efficient data processing techniques include the rapid increase in the number of clerical workers during the past fifty years. The awareness of rising personnel costs in business and government has stimulated interest in the use of mechanical and electronic devices as a more efficient and economical means of processing data. The growth and the volume of data is another factor that has resulted in an enormous amount of paper work generated.

During the last quarter century, further changes have taken place. Science has moved into the forefront of human activity. Research has gone into a multi-million dollar a year undertaking. New technology has provided a new impetus for corporate growth. Service industries have multiplied. Patterns of consumer spending have changed. The field of education has become willing to take on the challenge.

In addition to the growing need of mechanization of clerical routines and management procedures, there is a tremendously expanded need for data processing to match the new rate of technological growth and scientific research. The demands for information are enormous. Data processing systems are increasingly relied upon for information to assist in running enterprises, administering institutions, directing research and planning future activities. To this end, data processing centers are increasingly offering time sharing services to their users. The users can enter problems to be solved,

requests for information and data to be stored - all from remote terminals located either on sight or possibly thousands of miles away. The automatic reservation systems for airlines and motels are examples of the long distance entries and intra-company time sharing.

Regardless of the problem or product, the nature of the enterprise or the institution, wherever there is need for information upon which human judgments can be based, there may also exist a need for a data processing system.

Computers and allied technology are changing the face of the world, as well as that of modern education. We have accepted electronic data processing in administration of all types and kinds of organizations in the field of science and all fields of engineering.

The enhanced importance of scientific and theoretical knowledge has resulted from the need to understand, support and to control a complex and changing society. Mesthene[8] indicates that:

> A changing society must put a relatively strong accent on knowledge in order to offset the unfamiliarity and uncertainty that change implies. Traditional ways (briefs, institutions, procedures, attitudes) may be adequate when dealing with the existent and known. But new technology can be generated and assimilated only if there is technological knowledge about its operation and capability, and economic, sociological and political knowledge about the society in which it will be introduced.

Michael indicates that:

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[8]Emmanuel G. Mesthene, "How Technology Will Shape the Future", Science, July, 1968 , p. 138.

As a tool for collating and analyzing new information, the computer is an aid in the process of using knowledge. Computers help to reduce some of the complexities involved in handling large amounts of data, to render the data "more manageable". At the same time, however, they allow for more complex analysis and manipulations and foster newer, more complex modes of thinking. A "rapport with the computer" which will make it more possible for the creative person to think in terms of many variable, probable, and dynamic relationships is bound to produce multi-variable, probable and dynamic models of the world that could not be invented or evaluated otherwise.[9]

Another discussed effect that automation and computers have brought to a modern society is unemployment. Brown[10] indicates that the computer will substitute nonhuman automation for human labor, thus causing painful unemployment. Jobs have been eliminated, and displaced employees have suffered. He indicates that more of this will occur. It is inevitable. Technological change has always hurt persons whose jobs have become obsolete; but the eventual and overall effect has been beneficial. The printing press replaced manual writing, but the output of readable literature increased, and many more people were employed to meet the need. The cotton gin replaced

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[9]Donald N. Michael, The Unprepared Society: Planning for a Precarious Future (New York: Basic Books, Inc., 1968), p. 49.

[10]John A. Brown, Computers and Automation (New York: Arco Publishing Company, Inc., 1968), pp. 208-12.

laborious hand carding, but the cotton industry soon employed many thousands of new workers. There have been countless examples of technological changes that have adversely affected people's lives, but have eventually benefited the whole of society.

Automation promises untold benefits, and the computer is at the heart of automation. Just as Watt's steam engine extended the capacity of muscle power, so the computer extends the capacity of man's mind to plan and to control his destiny.

The advent of modern electronic data processing (EDP) was ushered into being only a generation ago (1946) with the introduction of the electronic digital computer. The rapid development of this technology is the reason why EDP has become synonomous with an era that is characterized by rapid change and complexity.

Sanders traces the growth in his book - Computers in Society.[11]

> A number of computers produced by IBM in the 1950's were about 2,000. Although there were about 600 computers installed in the U. S. in 1956, there were over 20,000 in operation a decade later. In 1970, it was estimated that 18,500 new computers were shipped to users; by 1976 the number of annual shipments is expected to go to 46,000 - a 650 percent increase in just 10 years.

As far back as 1955, in testimony before a Congressional Subcommittee on Automation, Ralph J. Cordiner, then President of General Electric Company, expressed his faith in the future of the computer in the following words:

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[11]Donald H. Sanders, Computers in Society (New York: McGraw-Hill Book Company, 1973), p. 41.

> When the history of our age is written, I think it will record three profoundly technological developments: Nuclear energy which increased tremendously the amount of energy available to the world's work; automation which greatly increased man's ability to use tools; computers which multiply men's ability to do mental work. Some of our engineers believe that of these three, the computer will bring the greatest benefit to man.[12]

In 1955, when these prophetic words were spoken, the computer was in its infancy - in its development. Since that time it has been remarkable. Almost 10 years later, when some 16,000 computers were in use, Fortune Magazine editorialized:

> Today, men who sought to know say that the computer will have an effect on human life comparable to the invention of the steam engine. But that is only half true; anybody who hopes to play a responsible part in the second half of the 20th Century had better understand as much as he can what computers do for - and to - people.[13]

The Computer Industry: Yesterday and Today

Historically, there has been a major jump in growth in blocks of five years. Each of these leaps has been bigger than the last. This is partly caused by IBM's cyclical introduction of new generations of computers. Each of these steps was accompanied by a major technological change.[14]

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[12]Quoted from testimony of Ralph J. Cordiner before the Subcommittee on Economic Stabilization of the Joint Committee on the Economic Report, October 26, 1955, p. 444 of the printed record.

[13]"Onrush of the Robots", Editorial in Fortune, March, 1964, p. 98.

[14]"Minicomputers That Run the Factory", Business Week, December 8, 1973 , pp. 68-78.

The stages of computer industry growth might be summarized in another manner:

1943-1949 Individual organizations, universities and federal government lab-pioneer electronic computing and data processing.

1947-1955 Small new enterprises with highly skilled people form to develop computer technology (with heavy government R & D sponsorship).

1950-1959 Large organizations make commitment to computer manufacturing through acquisition of pioneering firms and/or internal expansion, using first generation hardware.

1955-1964 Large organizations manufacturing computers educate customers on a broad scale in the use of computer technology, utilizing second generation hardware.

1963-1969 Computer customers acquire growing sophistication. They begin to dictate the direction of new product developments, enter third generation systems.

1970-1973 Standardization of computer products. Maturing technology. Periodic incremental improvements in computer systems. Some consolidation of sources of supply for computer systems. Steady growth in computer services and support business. Evolutionary or transition period.[15]

Bassler indicates the rapid growth of the United States computer industry. He indicates that the number of computers shipped is increasing at a faster rate than is their value. This he says can partly be explained by the significant increase in recent years of mini-

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[15]International Data Corporation, Computer Industry Profile (Newton, Massachusetts: Computerworld, Inc., 1973), pp. 3-4.

computers. These smaller devices are finding increasing acceptance in many places. In some cases, several minicomputers are replacing a larger system, thereby increasing the count of computers but not always increasing the tasks being performed.[16]

This statement may, in fact, be conservative. Dr. Richard W. Hammings, Director of Mathematics Research at Bell Telephone Laboratories, points out that the first dimensions were only about ten times as effective as animal power. Steam powered vehicles were about ten times faster than the horse and buggy. Computers, however, are up to ten million times as fast as the mechanical calculators they replace. Rather than compare the electronic computer to the steam engine, which triggered the industrial revolution, Hammings compares it to the Darwinian and Copernican evolution, "both of which changed man's ideas of himself and the world in which he lives".[17]

One of the major objectives of data processing has been in the reduction of clerical costs. Although attempts at cost reduction have sometimes fallen short of the goal, there have been successes, especially in situations of extremely high volume. For example, the Ford Motor Company is using a large, electronic computer to save several hundred thousand dollars a year in the cost of preparing its 100,000-man Detroit area payroll. In 1963, Westinghouse Electric

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[16]Richard Bassler, An Introduction to Computer Systems (Arlington, Virginia: College Readings, Inc., 1975), pp. 13-14.

[17]"New Tool, New World", Special Report in Business Week, February 29, 1964, p. 90.

Corporation figures that it realized a data processing cost savings of nearly 30% on the sixteen million dollars it spent on machine rentals and programming.[18]

Another important "paper-work industry" vitally affected by the computer is banking. In recent years, hundreds of banks have installed computers for processing magnetic-ink encoded checks. In 1962, computers were installed in 178 banks, representing about 40% of all commercial bank deposits. All but two of the sixty largest banks were using computers.[19]

In the early 1950's, the Census Bureau employed approximately 4,500 people. In the early 1960's, this government agency was utilizing computers to perform twice as much data processing work with half as many people. Computers also helped the Air Force Logistics Command to reduce its manpower from 200,012 in 1956 to around 146,000 in 1964. In fact, the Federal Government is by far the world's largest user of electronic computers, employing some 1,250 machines in 1964.[20]

According to Molner[21] the world is experiencing an information explosion. Approximately ninety percent of all the scholars who have

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[18]Gilbert Burck, "On Line in Real Time", Fortune, April 1, 1964, p. 144.

[19]James B. Eckert and Robert R. Wyand, "Automation at Commercial Banks", Federal Reserve Bulletin, Vol. 48, No. 11, November, 1962, pp. 1408-20.

[20]Gilbert Burck, "The Boundless Age of the Computer", Fortune, March, 1964, p. 101.

[21]Andrew R. Molner, Computer Innovations in Education (Washington, D. C.: National Science Foundation, June, 1974), p. 7.

ever contributed to the body of scientific knowledge, are alive today. Dr. J. C. Licklider of the Massachusetts Institute of Technology, estimates that the body of recorded scientific and technical information now has a volume of about ten trillion characters. (Alpha-numeric characters - letters, numerals, and punctuation marks). Information is increasing and can be expected to double in the next twelve years.

Social factors are affecting the development of modern educational institutions. They are no longer the sole source of information. Modern tally communications bring world events instantaneously into the living rooms of families and around the world. The computer, as a means, has the potential to meet the needs of individualized learning - meeting the economic necessity of mass instruction. As a tool with its capacity for handling vast amounts of data, the computer can assist man to manipulate complex ideas into high cognitive levels of understanding.

In summary, Molner indicates our society is said to be in a transition from being one based upon industrial production to one based upon knowledge. This new emphasis on knowledge, in turn, places greater demands on education. More and more education is a pre-requisite to participation in the knowledge society. Many schools and universities are re-evaluating their curricula, examining the needs of their students and experimenting with the role of the computer in education in an effort to cope with the new demands being placed on modern education.

Current literature reveals that hardware (computers) and software (language) development is not significantly different in educational and non-educational environments. The differences lie primarily in organizational goals while bringing to bear the existing software or modification thereof in meeting these goals.

Laver[22] observes that the history of computers is so recent and the pace so rapid that, presently, no man can claim to have spent his lifetime in the computing field. He further draws the analogy that " . . . computers are the fruitflies of technology, whose rapid generation is used to test mutations in methods and components."

Why does the computer evoke such reaction? Part of the answer lies in the aura of all pervasiveness which surrounds it. As a tool which can store, analyze, manipulate, and present data in a variety of ways, it has applications of almost all spheres of human activity. Its efficiency in helping man to cope with the "information explosion" and to impose some order on complexities makes it a highly attractive device for a large number of organizations. Business firms, schools, government agencies, churches, hospitals, research laboratories and law firms all find uses for computers. The individual, in turn, finds his checks, his income tax returns, his applications for jobs or credit cards, his magazine subscriptions and his political opinions processed by computers. He also has the vague

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[22]Murray Laver, "User's Influence on Computer Systems Design", Datamation, XV, No. 10, October, 1969 , p. 107.

awareness that in the future his children, or perhaps his grandchildren, will be educated by a computer; that his informational needs will be serviced by a computer and his financial transactions will be taken care of by electronic cash and credit systems. With all of this as background, he may fear that the essentials of his personal life will be stored in the memory bank of some computer and be used for purposes beyond his control. Or, if he is an optimistic person, he may view computers as machines which will help decision makers (political) to program the ultimate in social wisdom and justice.

A second reason for the high degree of emotional reaction to computers is the challenge or competition which they seem to present to man. While everyone, who is slightly familiar with the operation of computers, recognizes that their effectiveness depends upon the intelligence and creativity of the men who program and use them, the computer specialists use the classic response "GIGO" - Garbage In, Gospel Out.[23]

If not defied, the computer is seen as human or super-human. That it is often viewed as a competitor to man is seen, for example, in the great delight that is evoked by computer errors. No other machine failure elicits the same reaction. When a computer makes a "mistake", man is reassured that this machine is as fallible as he is.

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[23]Reported in Computer World, February 26, 1975, Boston, Massachusetts, Vol. IX, No. 9.

Yet the same powers of the computer which generate hostilities in some men, evoke hope in others, and view the computer as man's extension reasoning powers and the man-computer relationship as a cooperative and beneficial one.

The impact of computers cannot be appreciated without some understanding of the society in which they are being introduced. The development and application of computer technology would not have been likely if ours were not a society that is knowledge oriented, concerned with innovation and planning, and informed by a scientific atmosphere. At the same time, use of computers generate new opportunities and new problems which the social structure must respond to. Since the change in motion by computers is very current, it is, in many cases, too early to discern their direction.

Former U. N. Secretary, General U Thant, in commenting on a commonly expressed fear that computers may produce a society controlled by technologists; suggested that all educated persons be given information about computers so that they would not be at the mercy of those who run the machines.

If one were to look at the modern business corporation, like the society of which it is a part, it is larger and more complex than its counterpart of an earlier day. As the number and size of its specialized parts and the extent of its interaction with other large organizations (unions, governments, universities) have increased, more sophisticated coordinating and planning mechanisms have become

necessary. Since corporate growth has become at least as important to modern businesses as a profit motive has traditionally been, more resources have come to be devoted to research and development and to innovation.

These changes have resulted in a reversal of the relative importance of capital and labor. While capital may have been most important in the past, today labor talented personnel has become crucial to the success of the corporation; and knowledge has become the critical factor in this success. As Daniel Bell has noted:

> "Our society may be characterized as a 'knowledge society' in two senses: First, the sources of innovation are increasingly derivative from research and development . . .; second, 'weight' of the society - measured by a larger portion by GNP and a larger share of employment - is increasingly in the knowledge field".[24]

Gould[25] indicates that not only is the management of the modern business corporation developing increasingly upon technically trained and highly specialized personnel, but throughout the occupational structure, education and training have assumed a new importance. This has occurred as a result of the progressive elimination of the less skilled occupations in the growth of professional, technical and white collared work.

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[24]Daniel Bell, "The Measurement of Knowledge in Technology", Indicators of Social Change (New York: Russel Sage Foundation, 1968), p. 198.

[25]Jay M. Gould, The Technical Elite (New York: Augustus M. Kelley, 1966), p. 18.

The great difficulty of keeping "well informed" may result from the sheer amount of information, the number and speed of new discoveries, the sophistication and the intricacies of highly specialized fields of knowledge, and the high degree of relatedness between events in different societies and different sectors of the same society. In the culture whose orientation appears to be increasingly cognitive and scientific, high values are placed upon both the generation of new knowledge and the efficient utilization of existing knowledge.

The computer, as we have indicated earlier, is merely a tool which must be creatively used if it is to provide valuable results. Consider the most spectacular triumphs of the computer - whether it is in science, engineering, education or business - it is apparent that each achievement of the computer should actually be credited to someone who analyzed the problem that did not appear to be suitable for solution: However, by use of a computer, a way was devised to use the capacities of the computer to solve that problem. Very seldom does a routine, straight forward approach lead to spectacular results. Perhaps one of the major advantages of the use of the computer is that the analysis of exceptionally creative people can be substituted for the performance of the average clerk.

Goodlad[26] states that computers, by providing timely, relevant and accurate facts, will allow managers to rely less on intuition and

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[26]John I. Goodlad, F. John O'Toole, and L. Louise Tyler, Computers and Information Systems in Education (New York: Harcourt, Brace and World, 1966), p. 8.

more on systematic analysis: managers can thus use their time and imagination more creatively. Long range planning, the further development of new products and the formulation of improved financial and public relations policies can now be given more attention.

To anyone who has had the experience of observing a large number of electronic data processing installations, it is obvious that we are a long way from realizing the full potential of this powerful new tool. For example, Kinsey & Company studied more than 300 computer installations in 27 manufacturing companies which had either been recommended by computer manufacturers or publicized as outstanding examples in the use of computers. The results of this year-long study indicated that only nine of the twenty-seven companies were achieving results that justified the cost of their computers.

Poor record of success in using computers is not due to poor machine performance. For, in general, the computers have performed in accordance to their specifications. That is not to imply that the proper machine for the job has always been obtained, or even that a suitable machine for a certain job has ever existed, but only since the late 1950's most machines have been as fast and reliable as the manufacturer claims.

One characteristic of most of the disappointing electronic data processing installations is a lack of systems approach. Actually, this is probably a symptom rather than a fundamental problem, for usually no one sets out to create a fractured system. A piecemeal

approach usually results from not specifying, as an objective, the achievement of an integrated system, or from organizational problems, or from a lack of sufficient management participation in the planning and installation.[27]

One of the most apparent characteristics of the failure is that many of them have suffered from a lack of objectives from their very inception. The futility of such situations is expressed in Alice in Wonderland, in the well-known conversation between Alice and the Cheshire Cat.

> "Cheshire-Puss", she began, rather timidly - would you tell me which way I ought to go from here?"
>
> "That depends a good deal on where you want to get to", said the cat.
>
> "I don't much care where . . .", said Alice.
>
> "Then it doesn't matter which way you go", said the cat.[28]

A computer is a challenging and extremely glamorous piece of equipment, and, in a number of cases, has been obtained primarily because someone "just wanted" a computer. Obtaining a computer is a relatively easy objective, but it does not necessarily lead to the attainment of anything worthwhile. In the absence of rational objectives, it may well lead to considerable unpleasantness.

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[27]"Only One Out of Three Pays for Itself", Business Week, April 13, 1963, pp. 152-156.

[28]Lewis Carroll, Alice's Adventures in Wonderland.

In addition, a lack of objectives almost inevitably results in a piecemeal approach to the mechanization of data processing, for to approach the use of a computer on a system-wide basis it is necessary to have the improvement of the entire data processing system as a major objective.

There is no doubt that designing and implementing a system that uses a computer successfully requires a much higher order of analytical skills than those required of the ordinary clerk who processes data. Even those who supervise data processing may be incapable of designing a good computerized system.

Although the computer provides the opportunity for spectacular success, it also presents the opportunity of equally spectacular failure, so there is no place for the person with mediocre capabilities.

Another important factor in success must be a wide spread participation by all levels of management in the design of data processing systems. Top management must understand the implications and limitations of the computer as a tool of processing data.[29]

We are now in an exciting and challenging time, for we are at the beginning of a most important technological revolution. This revolution possesses tremendous potential for increasing material welfare, but we must recognize that it also brings threats of technological unemployment

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[29]E. Wainwright Martin, Jr., Electronic Data Processing, An Introduction (Homewood, Illinois: Richard D. Irwin, Inc., 1968), pp. 498-503.

both for clerical workers and for management. Frankly, we do not know how far or how fast the more esoteric developments and assimilations of human thought processes will go. But it is obvious that even today, many managers are technologically obsolete because they are not equipped to cope with this new technology, and it is possible that the computer may well raise difficult moral questions concerning the ultimate value of the human mind and personality.

Perhaps the most important impact of the computer in recent years has been upon management's attitude and concepts. In order to use computers, management has been forced to adopt a systems viewpoint - to view the entire organization as an integrated operation and to analyze the roles of information, physical facilities and a management performance of this system. When one analyzes the role of management in such a system, he soon discovers that the highest order of tasks for management is concerned with the modification or re-designing of the system so that it can better adapt itself to the hostile and ever changing environment in which it exists.

Furthermore, management has found by experience that computers do not by themselves solve problems - they only compute. If you know what your problem is, and you can devise a method by which the problem can be solved by computation, then the electronic computer can be used as a very powerful tool to obtain a solution. But if you do not understand the problem, or if you cannot devise a method to solve it using arithmetic and logic, then any electronic computer is just so

much excess baggage. We have found that each achievement of a so-called "giant brain" is actually a product of some man or a group of men who devised the method that was utilized.[30]

Educational Data Processing in Michigan

Educational data processing activity in Michigan has been in existence for approximately a decade.

Generally, the direction and initiative for using automated systems in an educational environment has come from the local and intermediate school districts. The Michigan Department of Education has not exercised a leadership role in coordinating the development of EDP. The result has been a fragmentary approach to the development of systems and procedures on a state-wide basis. The evolving "coordinating" role appears to be an emerging function of intermediate school districts for the constituent (local) districts. The overall problem of statewide coordination between intermediate school districts and a state plan has yet to be fully met.

A Michigan Department of Education survey[31] indicates that in 1974, of 530 local and 58 intermediate school districts, 76 local districts and 21 intermediate school districts reported using data processing equipment while 284 local districts contracted data processing services.

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[30]Burck, op. cit., pp. 105-110.

[31]Michigan Public School Data Processing Survey, Michigan Department of Education, August, 1974.

A summary of the department's survey indicates the following:

	Local School Districts	Intermediate School Districts	Total
Data Processing Services	22	21	43
Communication Terminals	54	21	75
Dedicated Instructional Computers	8	3	11
Optical Scanning Equipment	16	12	28
Computer Oriented Instructional Projects	7	5	12
Contracting Data Processing Services	284	0	284

A summary of the estimated 1974 budget for the twenty-one Intermediate School Districts indicate that $5,480,405 was spent on data processing services or $260,971 average per Intermediate District.

The five Intermediate School Districts spending the greatest number of dollars on data processing services in 1974 were:

(1) Oakland Intermediate $863,000

(2) Wayne County Intermediate 688,000

(3) Macomb County Intermediate 466,000

(4) Ingham County Intermediate 340,000

(5) Genesee County Intermediate 325,000[32]

A survey of these five intermediate districts reveals that 105 local districts use the data processing services of these intermediate

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[32]Ibid, pp. 6-27.

districts in varying degrees. The data processing applications offered by each of these intermediate districts to each local school district include:

Student Records
Payroll/Personnel
Financial Accounting
Property and Supplies Accounting
Audio Visual
Transportation
Library
Adult Student Records
Miscellaneous Services

A summary of the estimated 1974 budget for the local school districts in the State of Michigan indicate that $8,414,893 or $23,246 average per district for the 362 districts reporting was spent on data processing services.

The five local school districts spending the greatest number of dollars on data processing services in 1974 were:

(1) Grand Rapids City Schools $1,100,000
(2) Detroit City School District 641,000
(3) Dearborn City School District 353,000
(4) Livonia Public Schools 317,000
(5) Flint City School District 301,000[33]

The foregoing information does suggest that at the local and at the intermediate levels in Michigan, the amount of money spent and the pace of educational data processing activity have quickened.

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[33]Ibid., pp. 28-49.

Educational Administration and Data Processing

The brief overview of data processing has made it obvious that the computer can be a useful tool in an educational environment. Karmann indicates that the extent of the needs and demands upon social institutions brought about by technological change, have only begun to be recognized as a problem. The gaining population and information explosions experienced in education as well as in society, have made it both necessary and prudent to investigate new means of handling the administrative problems involved in education. Industry and business have coped with these problems by turning to tools such as data processing and a variety of quantitative methods that developed during World War II. We are now witnessing the transformation and application of these same tools and methods to the field of education.[34]

In a major revolutionary movement, communication is of utmost importance. The significance of this dissertation resides in its attempt to communicate and promote communication. That a revolution is imminent in many quarters and taking place in others, is voiced from many individuals involved in the area of data processing. Wright Patman, Chairman, Joint Economic Committee, Congress of the

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[34]Richard A. Karmann and Robert W. Maher, Educational Data Processing: New Dimensions, Prospects (New York: Houghton Mifflin Company, 1967), p. 3.

United States, expressed this concern in his letter of transmittal for the report, Automation and Technology in Education:[35]

> The fact is that development in the storage, processing and communication of information arising from the new technologies are creating a prospect of a revolution in our system of education.

Addis indicates there is no question that computers are here to stay. Few facets of life are unaffected - their effect on people's lives is of significant scope. The computer technology is regarded as a major social phenomenon. We are truly in the computer age.

This type of status afforded the computer beckons the schools to examine their responsibility to teach about the computer, as well as examining the potential of the computer as a teaching tool and as a management tool.[36]

To ignore the presence of the computer is not a viable alternative for the educator today. It is of higher order than other fads or gimmicks. In teaching or management technique, computers are as much a way of life as television, high-speed transportation or air pollution. A more appropriate alternative for the educator is to acquire the skills and knowledge necessary to help control the direction of the computer use in schools and in society.[37]

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[35]"Automation and Technology in Education". A report of the subcommittee of economic progress of the Joint Economic Committee, Congress of the United States, Wright Patman, Chairman, Washington, D. C.: Government Printing Office, 1966 , p. 111.

[36]Winston C. Addis, Social Impact of the Computer: An Instructional Approach (Mt. Vernon, Iowa: Community Schools, April 1973), p. 2.

[37]Paper presented at the Association for Educational Data Systems Annual Convention, New Orleans, Louisiana, April 16-19, 1973.

Writing of the impact of computers upon education, Goodlad[38] expresses the theme that there are

> fears that automation will bring into education the anonymity and dehumanizing now apparent in many aspects of daily life. Such fears must be reckoned with. They are not new to civilization, to dispel them man must look inside himself - not the computer. Computers have no mechanism of self-interest; man does.

The American Association of School Administrators (AASA)[39], recognizing that educational data processing is emerging as a significant tool, created an Educational Data Processing Committee to apprise administrators of the emerging and possible future effects of automated systems upon educational administration. The charge to the committee was that

> particular emphasis was to be given to where data processing fits into the administrative hierarchy and the superintendent's role in educational data processing.

The efforts of the Educational Data Processing Committee of the AASA suggest an attempt by educational administrators to correct some initial experiences and establish a new posture toward educational data processing.

There is a very close analogy between the approach that business adapted and the approach that education is taking. Data processing, for the educator, offers the same potential for removing clerical burdens

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[38]Goodlad, op. cit., p. 104.

[39]American Association of School Administrators. EDP and the School Administrator. A report prepared by the AASA Committee on Electronic Data Processing, Washington, D. C., American Association of School Administrators, 1967, p. v.

from the shoulders of teachers and administrators. Typically, the early point of departure was financial accounting. However, educators have turned their attention more quickly to other record keeping - primarily pupil personnel accounting. The pupil represents the keystone of the educational system and justly deserves the attention devoted to the maintenance of his records. Record keeping represents only one benefit of, or reason for, introduction of data processing into the educational administration scheme. Other applications of a more sophisticated nature include payroll and purchasing, scheduling and attendance accounting, testing and grade reporting.[40]

Grossman and Howe[41] indicate the role that data processing equipment is playing in the operation of today's schools. It has very significant applications in curriculum, through the teaching of electronic data processing principles and concepts; in instruction, through the use of various automated devices used to improve and supplement the skills of the teacher; in the business office, through the use of an electronic record-keeping device; and in administration, through the use of electronic data processing equipment for improved management information systems.

Computers and computer methods are continuing to play a significant role in today's education. Despite the spectacular achievements of computer applications, such as the control of air in

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[40]Martin DeRodeff, "Administrative Organization for Educational Data Processing Services", Automated Educational Systems (Elmhurst, Illinois: The Business Press, 1967), pp. 123, 124.

[41]Grossman and Howe, op. cit., p. 5.

space travel, it is the educational role which will be the main reason we will have to become familiar with the use of computers. Anyone living in the latter half of the 20th Century needs to know something about the technological advances, its uses and misuses. This is also true of computers, but because computers and computer concepts can augment our thinking, it is desirable for everyone to have some understanding of them. To achieve this end, it behooves accessing computer education to all people, especially our youth. This can be justified by the contributions computers are bringing and will continue to bring to education.

How can the computer be used to facilitate learning and, in the process, aid the fulfillment of today's youth? By the computer's capability for vast storage of information with rapid retrieval and for extremely rapid short sorting and ordering, it can help us to perceive pattern and structure of knowledge more exactly and meaningfully than ever was possible before. Without the computer, the sorting and ordering by man would, in many instances, be an impossible task. The ability to analyze and form judgments can be aided by a sophisticated use of the computer known as simulation.

The computer can be used to facilitate for each high school student the opportunity to develop an education that is best suited to his needs. By using the computer to schedule school time tables, individualized programs of study can be programmed which allow students a wide range of options from which they may choose. Using the manual

methods the administrative tasks associated with individualized scheduling in the schools with larger enrollments are more complex and the work load is overwhelming.

Sigmund Freud, the founder of psycho-analysis, once said in answer to a question: "My purpose is to help people, love, work, and play, and enjoy all of them." Using Freud's thought, Edmund C. Berkeley, Editor of Computer and People, had this to say:

> . . . the computer, I believe, can help a person work, can help a person play, and can often give him as much enjoyment so that he can fall in love with the computer.[42]

People who understand the computer and its potential for facilitating, accelerating and enhancing the learning processes, agree for the most part with Berkeley.

More dramatic than the growth of the numbers of computers is the growth in the way that computers are being used to help solve the problems in education. In schools and laboratories across the country, experiments are being conducted that will make the school of tomorrow almost unrecognizable from the school of today.

The five-year old, who enters a kindergarten, will have his registration papers processed by a computer. When he graduates years later, he will receive a diploma or degree prepared by a computer. In between, the computer will assist in teaching him, counseling him, scheduling him into classes, testing him, grading his

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[42]Berkeley, C. E. Computer and People. Volume 23, No. 3, Berkley Enterprises, March, 1974.

papers, helping him with homework and providing his report cards. As he struggles through the reading and arithmetic, the computer will be his patient tutor. If he needs information, he will not only consult his local library, but also "retrieve" materials instantaneously from other libraries in the United States, and eventually in the world.[43]

Very few institutions remain unaffected by computer technology. For the past few years there has been increasing interest on the part of administrators of elementary and secondary schools and how they might realize some of the benefits that computers offer. Many schools and school systems already use computers to some extent. Yet, a far greater number have not yet explored the possibility of what computers can do for them, by contributing to more efficient and effective school systems. Sometimes such exploration is hindered or put off, mainly because there are no immediate answers to questions - or sometimes, in some cases, there are misconceptions when answers do appear.

Education has frequently been chastised about its slowness to change. Dr. Richard Louis Bright, Associate Commissioner of Education for Research, estimates that there is a 30-year lag between innovations in education and wide-spread adoption of the innovation.[44] He also noted that it takes about fifteen years for the first three percent of school districts to make any given change.

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[43]Computers: "New Era for Education"? Education U. S. A., Special Report, 1968, p. 1.

[44]"Automation and Technology in Education", op. cit., p. 4.

To the systems analyst, such a delay in the widespread development in application of computer techniques, would greatly inhibit potential benefits for a more efficient and effective educational system. Reasons for past failure and proposed remedies are offered by Grossman and Howe.[45]

1. Reasons for Failure

   a. All too frequently, computer-based systems implemented by schools are merely faster, recognized versions of older manual systems . . . (they) provide no new information for school administrators.

   b. . . . excessive emphasis has been placed on cost justification and those applications which lead to this. As a result, insufficient attention has been given to value, justification and the application which would yield increased value.

   c. The most significant problem related to personnel is that school personnel are generally lacking in orientation to the systems approach and use of computer technology.

   d. . . . school personnel with significant educational responsibility are too often left out of computer system design.

2. Proposed Remedies

   a. Data processing organizations should be realigned to encourage broader use of computer-based systems.

   b. . . . ensure that students and educators receive ample training for the future roles of computers in schools.

   c. All educational personnel should participate in the development of a comprehensive and orderly plan of implementation.

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[45]Grossman and Howe, op. cit., pp. 3-9.

d. Administrators and educators should work together to develop and implement in-service training programs in data processing for all school personnel.

e. Lastly, various cooperative efforts in data processing should be explored, including use of the regional centers, state departments of education, and regional laboratories.

The computer specialist recognizes the potential growth in computer utilization by educational systems, and the educator is beginning to recognize its potential value. However, the biggest stumbling block to the use of computers in school is finances. Because of the dominant requirement for cost justification, educational data processing is more readily justified as a management tool than as an instructional aid. Therefore, external financial support is needed to foster future growth and development of programs and services to aid the instructional process.

Educational administrators should also be aware of some of the road blocks to educational data processing. According to Goodlad[46] the most formidable drawback to educational data processing is:

> our understanding of education as it presently operates and is likely to advance, especially our insight into the relationship between human beings involved and the vast organizational, instructional and various ad hoc techniques that presently constitute our educational system.

Foy[47] describes the balance of costs between computer hardware and the development of software. Although the cost of computer hard-

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[46]Goodlad, op. cit., p. 102.

[47]Nancy Foy, Computer Management - A Common Sense Approach (Philadelphia: Auerbach Publishers, Inc., 1972), pp. 63-81.

ware and peripheral equipment is decreasing in terms of its processing power and flexibility, software - the programs written to perform services and permit information storage and retrieval - and systems development costs have continued to rise. This can be expected to continue as the computer's power is applied to more varied and complicated information processes. The former typical 50-50 break between the hardware and software costs is closer to 40-60 today, with software and systems development cost now dominant.

Johnson[48] points out that achieving a respectable degree of mastery over the operations of the computer can require months of study and experience, plus a technical background. Few students, teachers and administrators have the time, and many do not have the interest or the aptitude to support the effort. Understanding can be achieved at different levels, however, and though computers differ widely in their size and features, there are similarities in the procedures used to manipulate the data. A grasp of some of the general aspects of electronic computing, together with examples of how the principles are applied, can lead to more accurate assessments of what the computer may, and may not, be able to contribute to the solution of educational problems.

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[48]M. Clemens Johnson, Educational Uses of the Computer: An Introduction (Chicago: Rand McNally & Company, 1971), p. 2.

Wilkins'[49] view is that despite present limitations in educational data processing utilization, it is reasonable to say that the computer can do anything that it is told to do. As Drucker[50] points out

> the strength of the computer lies in its being a logic machine. It does precisely what it is programmed to do. It also makes it a total moron; for logic is essentially stupid. It is doing the simple and obvious. The human being, by contrast, is not logical; he is perceptual. This means that he is slow and sloppy but he is also bright and has insight; the human being can adapt.

In Drucker's[51] view, the greatest impact of the computer lies in its limitations, forcing man increasingly to make decisions. The decision-making process goes to the heart of the role of administration in setting the objectives of an organization and then allocating resources to meet the objectives. In utilizing educational data processing as an administrative tool, Hearle[52] views administration and the decision-making function as

> largely a process of handling information, selecting it, comparing it, acting upon it. The comparison function is the essence of decision making - it touches setting goals, establishing programs, evaluating progress.

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[49]Leslie T. Wilkins, "Computer Impact on Public Decision Making", Public Administration Review, XXVIII, No. 6, November/December 1968 , p. 504.

[50]Peter F. Drucker, The Effective Executive (New York: Harper and Row, Publishers, 1967), p. 159.

[51]Ibid., p. 159.

[52]Edward F. R. Hearle, "Computers in Public Administration", Public Administration Review, XXVIII, No. 6, November/December 1968 , p. 487.

> Acting upon these comparisons is that personal step of human will which no machine can ever undertake.

The human problem and its relationship to educational data processing is far more significant and far-reaching than the technical ones. As Kraemer[53] indicates "less has been achieved in solving the human problems than in finding ways to apply the computer for administrative purposes".

The effectiveness of automated systems will not have a significant impact or improvement upon general administrative practices in education until education and educational administrators develop an understanding of what automated systems are capable of doing. In effect, to meet the increasing demands upon themselves and their institutions, administrators must shift from mental manual data processing to automated systems orientation.

This change or re-orientation does not imply that administrators become technicians. The answer may lie in the training of Miller's[54] "perceptive generalist" who must

> know enough of the general field and enough of the nature and problems of the specialist so that he can communicate with them with understanding, comprehensible among the specialist as a collective group and the meaningful between specialist and the general public.

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[53]Kenneth L. Kraemer, "Urban D. P." Datamation XIII, No. 8, August, 1967 , p. 68.

[54]Van Miller, "The Superintendent of Schools" in D. J. and H. C. Rudman, Eds., Preparation Programs for School Administrators, East Lansing, Michigan: Michigan State University, 1963 , Chapter 5.

This view is echoed by Raferty[55] who maintains that although technological changes have been remarkable, equally remarkable has been the rate of change. In his view, top management must receive and act upon the advice of specialists. The age of automation has brought forth a requirement for a new breed who can appraise the impact of information derived from specialists and mold technologists and personalities into programs. Raferty attempts to accomplish this task when he proposes:

> a broad generalist with some depth in many fields, yet having the ability to evaluate the impact of developments over a broad range of specialties. Not a "Jack-of-all-trades and master of none", but individuals whose training in several disciplines is cemented with a firm foundation of technical fundamentals, practical experience . . . completely objective and able to specialize temporarily, but intensively as necessary.

Technical details by which a computerized application is carried out are the responsibilities of the staff in the computer center. The extent to which teachers need to be familiar with the details and vocabulary of the field is uncertain. Some orientation could help teachers to feel more comfortable with the new technology, or at least answer a number of questions.

The ratio of school administrators to instructional staff is declining while the demand for information and required reports is increasing in many school districts. This trend is influenced by the increase of professional staff, not part of the classroom instructional

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[55]C. R. Raferty, "Management Cannot Use a Parochial Viewpoint", The Office, 67, No. 1, January 1968 , p. 75.

staff, directly involved with instructional programs. These auxiliary positions characteristically create extensive administrative and report demands. This pattern of development places an increased burden on the administrative staff to effectively perform their tasks. Asked to specify what factors tend to encourage district administrators to establish data processing services, both the local school district and the intermediate school district superintendents indicated basic factors commonly attributed to data processing. These attributes include: efficiency, speed, need for information, handling higher volume of work, ease of access and release of personnel for other duties.

The basic premise for implementing data processing service is the improvement of performance in terms of achieving school organizational objectives. These are likely to cause certain effects. The three most frequently noted effects as noted by intermediate school districts and local district superintendents were: increased information, improved efficiency and extended service.

The growth and development of educational data processing is considered inevitable by educational technologists. Accepting such a premise and assuming that such a trend is desirable, a primary objective then, is to facilitate that growth and development. Basic necessities of the transition process are communication and understanding.

Lack of knowledge and understanding of the potential of computerized educational data processing appears to be the dominant constraint to a more rapid growth and development of this technology in educational applications. School administrators who recognize the potential must become spokesmen to encourage other educators to consider the potential and to gain adequate knowledge and understanding for effective leadership in its application.[56]

Grossman and Howe[57], in their text Data Processing for Educators, indicate that one of the specific purposes of the California Research and Development Center in Educational Data Processing is:

> The conduct and support of simulation studies.--- It is evident that certain types of complex decision processes can be performed by computer systems more efficiently than by humans. The potential of these techniques in education appears to be great. Efficient use of data would allow educators to make decisions and allow them to experiment with techniques and solutions before trying them in school.

Most people are fairly aware of how the modern school system is being affected by the host of complex technological and social developments taking place today. Interestingly, not only is the computer one of these developments, but hopefully, if it is understood and used properly, it can be a means of enhancing these benefits and diminishing their negative effects. Some background factors evolve around such matters as the rapid increase in the number of students,

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[56]American Association of School Administrators, op. cit., p. vii.

[57]Grossman and Howe, op. cit., p. 261.

frequently too rapid for existing facilities and personnel to keep up. There are more and increasingly complex subjects to be taught, and hosts of clerical and record keeping tasks are involved in keeping the school running, both as an organization and as an institution of learning. Similarly, the benefits of computers as they apply to schools need little elaboration at the general level. Basically, they are merely tools for doing jobs better and their advantages revolve around fundamental matters, which can be summarized as follows:

> Speed. The computer can condense many hours of purely clerical work into a relatively few seconds of running time. There are certain tasks that only people can do, but many tasks involve repetitive, manipulative effort of little value in themselves. Only the results of the manipulation are of significance. People can be better utilized for more creative and meaningful work.
>
> Reliability and Accuracy. A properly functioning computer, once programmed and tested to do a given job, rarely "makes a mistake".
>
> Access. Frequently, the sheer volume of information makes selective access to, and use of, a major problem. Standard computer techniques make most information "finger-tip availability".
>
> Capacity. There is practically no "saturation point" in terms of amount of data that can be effectively handled by a computer within the capacity range for which it has been designed. Similarly, neither the complexity nor the variety of data that can be handled impose any significant limitations.

Speaking specifically in terms of school systems, these basic benefits can be derived from the use of the computer in various ways:

> As an administrative tool. This is the more or less traditional use of the computer. Until very recently it has been used mainly as a recordkeeping, accounting, and reporting tool.

> These functions, of course, are among the tasks of the school administration. Like most every other institution of our day, the average elementary or secondary school has experienced the number and variety of accounting, clerical and similar tasks.
>
> As an instructional tool. A more recent innovation computer use revolves around its application as a tool for instruction. Many educational institutions today are using some level of computer-assisted instruction or learning.
>
> As a subject of instruction. Third, the computer itself, because of its wide-spread use in the business and professions, actually becomes a subject of instruction. There are very few people in the school today who will not, at some time in their careers, require some knowledge of computers and their operation; they may actually enter a profession in the computer world.[58]

For the purposes of this study, our major emphasis is directed toward the use of the computer as an administrative tool as it relates to student services.

AEDS Monitor reports that the computer is employed with rising frequency as an aid to education in a number of clerical tasks in the classroom, as a student record keeping system, student scheduling, grade reporting, test scoring and attendance accounting. The machine is able to manipulate and store student data with speed and accuracy, and prepare clear printed reports. The student accounting services are provided by the computer more frequently in the senior high and junior high schools.[59]

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[58]International Business Machines Corporation, Computer Concepts for Elementary and Secondary Schools (White Plains, N. Y., 1969), p. 5.

[59]AEDS Monitor, The Association for Educational Data Systems, Washington, D. C., Volume 10, October 1974 , p. 12.

Business procedures such as payroll and inventory, are commonly adapted to electronic data processing (EDP). Preparation of state and federal reports is another frequent area of application. A large high school can find that it is difficult to operate without some application of computer technology.

Effects of applications upon students are difficult to assess. While the computer provides a management aid to the teacher, to the administrator, and to the counselor, many data handling tasks within a school are performed manually. There is some expectation that the use of the machines to prepare routine reports and score tests will give teachers more time for the development of instructional materials and for conferences with individual pupils. The amount of time actually saved would be debatable, as would the additional time by the teacher.

As computers become wide-spread in education, they are creating issues that educators must tackle. What will be the role of the teacher in the computerized classroom? How is the educational information provided by the computer to be used? Who will pay for the costly development of computer facilities?[60]

The major application of computer technology in education is in the area of administration. Increasingly, school systems are turning over such tasks as student records, payrolls, personnel files, class scheduling and inventories to a computer.

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[60]"Computers: New Era for Education?" op cit, p. 1.

One of the largest and most comprehensive computer systems is operating in the Chicago schools, where information on more than 600,000 students in 600 schools have been automated since 1960. Chicago administrators estimated that their teachers had been spending from 20 to 35 hours per month on non-instructional tasks - and did not include grading papers. In a city the size of Chicago, time spent by teachers on clerical work was evaluated at about 5,000 positions.

Complete cumulative records on each student, from the time he enters the Chicago school system to the day he graduates, are maintained on computer tapes. As Chicago has thousands of students who may attend as many as six schools in the first five weeks of school, one of the main advantages of the computerized reports is to speed up the flow of information as students transfer from one school to the next. An optical scanner can pick up a teacher's mark on an attendance sheet and feed it into the computer which prepares and updates 2,000 class rosters on a regular basis. Before the computer came along, each school principal plastered his walls once a year with maps showing every street, railroad tracks and alleys in his area. He then went to his student files and pin-pointed every student on the map. Hundreds of such maps were brought into the central office where one big map was prepared to form the basis for deciding what changes were to be made in attendance zones and where new schools were to be built. Chicago has since put on magnetic tape

a map of the city, street by street, matching the map with data from the automated student and facilities files. The computer has made planning and decision making less laborious for the Chicago administrator. The computer can also schedule 150,000 high school students for classes in a weekend, record grades on a standardized test, and tell the business office what, when, how much, and where to order supplies.[61]

Chicago uses its computer center around the clock with teaching and research functions scheduled during the school day and administrative functions scheduled at night. Data processing classes are available for high school students in the 11th and 12th grades. The machine is also used for in-service education - for school personnel - for administrators to clerks, to learn various aspects of computer operations and programming.

Data processing people have a jargon all their own. Discussing the area of electronics with experts makes only for further confusion. Most educators sit, wide-eyed, and listen to such terms as "drum storage", "control panel", "B-registration", "disk pack" and "Fortran". Fortunately, student scheduling is one operation that can be performed with very little knowledge of computers or other data processing equipment.

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[61]International Business Machines Corporation, More About Computers (International Business Machines Corporation, White Plains, New York, 1971).

Today's advancements in educational management, combined with the rapid growth in student enrollments in schools, have emphasized the need for data processors to be used in establishing and maintaining a student record data base, required for providing attendance and academic-mark-reporting data to satisfy disciplines. Specific programs are available that provide a systematic procedure for recording, retrieving, manipulating and reporting significant data of students, particularly attendance and academic mark information. The objectives of such programs are to provide effective data on individual students, as well as aggregate, statistical reports needed for sound analytical decisions by educators and administrators.

Various automated, academic mark reporting systems have been developed in the past. The development projects have normally been programmed individually by each user, resulting in considerable duplication of effort. It is apparent that many services required by one school are also required by others. The elimination of such duplication is an objective of certain programs available to the users.

The maintenance of attendance records is an important aspect of student accounting. In many states the amount of state aid to public education is based on average student attendance. Under normal methods, considerable time is expended by teachers and staff personnel on keeping records. (Recapitulating information for state reports). Programs are available that simplify such tasks by collecting original

data at the source via easy - turnaround documents, enabling reports to be prepared accurately and rapidly, and eliminating many clerical transcriptions.

A common situation in most schools is that each file of information, whichever it would be for student and teacher records, or cost accounting, his evolved separately. An idealized concept relating to school computer centers is that of a total information system. A school which is termed a total information system would have computerized files for all its information, not only data on students, but data on teachers, facilities, instructional materials and budget. In other words, all information and records used in running the school system would be stored in electronic files in the computer center.

The purpose of the central data bank would be to facilitate rapid retrieval and use of the contents, which under typical conditions would be scattered around the offices and departments of the school system. Careful planning and extensive programming must provide information needed by teachers in classrooms, management and administrators and other staff members in various school operations.[62]

Perhaps a total information system could also be designed so that information in one section of the file could quickly be compared with information from another section. The ability to cross-reference information in selected combinations would make it possible to

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[62]Johnson, op. cit., p. 38.

investigate problems difficult to study otherwise. One possibility would be to study pupil achievement in relation to teacher characteristics.[63]

In a conference held by the Association for Educational Data Systems[64] entitled, How to Train Teachers and School Administrators for the Computer Age, the conference report noted that computer technology will not only affect the educators who specialize in it but also will influence the work of teachers, administrators, business managers, curriculum supervisors and counselors. The deans at the conference indicated that public school administrators should have at least a conceptual understanding of the computer, and that every school system should have at least one administrator who understands the technical aspect.

Unless a large number of school superintendents and public school officials are trained or re-trained in the use of computers, the conference concluded, the significant administrative problems caused by both the hardware and the software, will likely result in an inefficient allocation in human and financial resources. The conference report further stated:

> The critical task of blending hardware, software, manpower and administrative needs falls squarely on the shoulders of the educational administrator and the school superintendent. Moreover, the

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[63]Ibid., p. 55.

[64]Association for Educational Data Systems. Training Teachers for Technology. A special Report of Two Conferences of Deans of Education (Washington, D. C.: The Association, 1970), p. 44.

> difficult task of enlightening the public as to myth and reality in education computing is usually another responsibility of the school administrator.
>
> Educational researchers and administrators should know as much about the capabilities of the computer as the technicians and should take the lead in discerning and selecting the appropriate uses to which educational technology can be put. This means that the school superintendent must not only be able to understand the equipment and the computer specialists, but he must also be able to use them efficiently.

Student Information Systems

Every school system is required to keep certain student records to prepare reports about these records for local, state, and/or federal authorities at regular intervals, and to prepare additional special reports which present particular items of student information to these authorities. It is much easier to compile and present these reports if information is gathered systemically and kept ready for convenient retrieval. Without an effective system for gathering, storing, and collecting these data, requests for special reports necessitate excessive development of inaccurate, incomplete statistics.

The maintenance of an extensive, accurate, and current base of student information is essential to a school concerned with student development - physical, educational, vocational, and/or social. The progress of a student in any of these areas is the result of many factors, some within the school system, some outside it. Since his

present condition is, in great measure, a result of previous experience, information regarding these earlier experiences as well as other data are essential to the educator who would plan and monitor the student's progress.

The development of a good curriculum, good instructional materials, and good instructional procedures is closely related to student development. Planning an instructional program relevant to the needs of the students, the school and the community requires massive quantities of data. The advantages of having these data in a systematic, current, easily accessible data base or bases is obvious.[65]

Systems for processing student data have much in common with other information systems. Basic data must be collected and recorded, records must be created and maintained, information must be reported to authorized parties, and obsolete data must be removed from files.

There is great diversity in state and local data requirements, as well as in management approaches. For this reason, no single student information system can be applicable to all schools in the United States.

An information system can be defined as "a set of well-defined rules, practices, and procedures by which (individuals), equipment,

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[65] U. S. Department of Health, Education and Welfare/Educational Division, Student/Pupil Accounting (Washington, D. C.: U. S. Government Printing Office, 1974), p. 133-34.

or both are to operate on given input so as to generate information satisfying specifications derived from the needs of given individuals in a given (administrative) situation". Every organization from the largest corporation or government agency to the smallest local school system or school, has some form of information system.[66]

Student records are an actuality. They exist because they are needed and used for many necessary educational purposes, such as for instruction and guidance, for checking on compliance with attendance and health laws, and for administrative purposes such as determining tuition status, scheduling students into classes, planning school bus routes, and completing reports on membership and attendance for the State Department of Education.

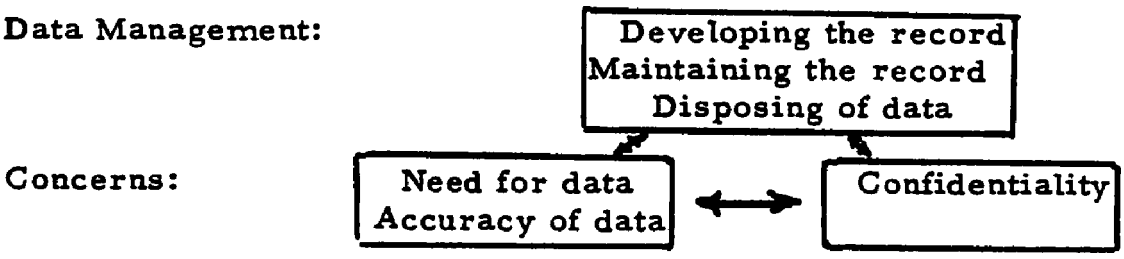
Because of their importance, student's records must be administered with effective procedures. Sound procedures demonstrate competent data management and provide for accountability. As illustrated on the following page, the necessary recordkeeping activities of building, maintaining, and disposing of record files should be based on concerns for data need (including relevancy) and data accuracy as well as on concerns for confidentiality.[67]

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[66]F. Heany, Development of Information Systems (New York City: Ronald Press, 1968), p. 7.

[67]Ibid., p. 7.

MANAGEMENT OF STUDENT DATA



Recently, a number of taxpayers, parents, students, school officials, business leaders, and politicians have suggested that educational programs should be improved and that education should be managed more efficiently. Some persons have concluded that additional student data are needed to help bring about such desired educational improvements. With a massive technical capability already existing for managing far more educational data than presently are collected, the pressures for increasing the collection of student data lead inevitably to these questions:

> What student data are essential to the best interests of the student and the school? Are additional data really needed? Should some existing data be discarded?
>
> What are the costs of collecting student data and maintaining student records? Are these costs justified?
>
> What procedures will adequately safeguard the confidentiality or privacy of student records?

Confidentiality Problems and Concerns

The confidentiality issue now is receiving greater attention than ever before as a result of the expansion of machine and electronic processing of student data. When student data are kept in a folder,

and when access to these data is physically controlled by the school official having responsibility for their safekeeping, the issues of confidentiality are complex, but relatively close control of these data can be managed.

In recent years, however, a variety of systems for the automated handling of student data has been designed. These data systems have at least two characteristics which complicate the issue. First, the installation of such a data system depends upon a base of many students in order to make the storage and retrieval of student data economically feasible. This often means that several local education agencies pool their student data for central processing. Keeping data confidential in this type of data system is difficult. Secondly, the central storage of data removes the control of these data from the local school to a central office where such problems as monitoring of student data become more complex for students, parents, and professional staff members alike. Removing data from the care and control of the professional person responsible for them can lead to decreased vigilance and can result in breach of confidentiality or invasion of privacy, legal complications, and even court cases.

Concern about the proper use of data in data banks and automated personal data systems has been expressed at the national level by Senator Sam J. Ervin, Jr., and by Elliot L. Richardson, while Secretary of the Department of Health, Education, and Welfare. One concern of the former has been the possible excessive use of

social security numbers as a personal identifier, especially in the acquiring of information from information systems. The latter appointed an advisory committee to analyze the consequences of using computers to keep records about people.

The Secretary's Advisory Committee on Automated Personal Data Systems assessed the general impact of computer-based record-keeping on private and public matters. Three effects of computer technology were specially identified by the committee in its report, Records, Computers and the Rights of Citizens.[68]

> The computer enables an organization to enlarge its data-processing capacity substantially.
>
> The computer greatly facilitates access to personal data, both within organizations and across boundaries that separate organizations.
>
> Computerization also creates a new class of record keepers whose functions are basically technical and whose contact with the suppliers and users of data is often remote.

The Committee also described possible effects of computerized personal data on individuals, organizations, and the society as a whole.[69]

> The availability of too much data may result in a computerized record keeping system becoming rigid and insensitive to the interests of individual data subjects.

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[68]U. S. Department of Health, Education, and Welfare, Records, Computers and the Rights of Citizens: Report of the Secretary's Advisory Committee on Automated Personal Data Systems (DHEW Publication No. (OS) 73-94, Washington: U. S. Government Printing Office, July 1973), p. 32.

[69]Ibid., ch. II.

> Relatively easy access to data increases the possibility for unauthorized access to a data bank for purposes of commercial exploitation or blackmail.
>
> Easy access to data for authorized purposes has been a source of leakage of data from some personal data systems. Further, authorized use of computer-based personal data systems may be hazardous where lines of authority and responsibility are overlapping or ambiguous - where there is a fundamental lack of uniform legal constraints, homogeneous record-keeping practices, and common standards of judgment.
>
> The possibility exists for assembling data from computer-based information systems into a master file of intelligence dossiers.

To help alleviate or eliminate shortcomings in personal data systems, the Secretary's Advisory Committee recommends the use of five basic principles as safeguard requirements for both administrative personal data systems and statistical-reporting and research systems. The following five principles may thus serve well as basic requirements for all student information systems;

> There must be no personal data recordkeeping systems whose very existence is secret.
>
> There must be a way for an individual to find out what information about him is in a record and how it is used.
>
> There must be a way for an individual to prevent information about him that was obtained for one purpose from being used or made available for other purposes without his consent.
>
> There must be a way for an individual to correct or amend a record of identifiable information about him.
>
> Any organization creating, maintaining, using, or disseminating records of identifiable personal data

> must assure the realibility of the data for their intended use and must take precautions to prevent misuse of the data.[70]

These basic principles are reflected in the recommendations for student records presented in this chapter and in the Family Educational Richts and Privacy Act of 1974.[71]

Guidelines for Protecting Confidentiality of Records in A Computerized Data Bank

A major step in safeguarding student records is through measures to limit access and protect the confidentiality of student data in a computerized data bank.

When a school or school system uses automatic data processing, provision should be made to safeguarding information that could be traced to, or identified with individual students. Safeguards include, initially, the careful design of questionnaires, inventories, interview schedules, and other data-gathering instruments and procedures to limit the personal information to be acquired to that which is absolutely essential. Additional safeguards include the encoding

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[70] Ibid., p. 41.

[71] Section 438 of the General Education Provision Act (GEPA), as added by Section 513 of Public Law 93-380, the Education Amendments of 1974, enacted August 21, 1974. In brief summary, the Family Educational Rights and Privacy Act of 1974 imposes several requirements on educational bodies which deny or prevent parents (or students over 18 or at the post-secondary level) the right to inspect all official records and other materials relating to their children and to challenge the contents. The Act also prohibits the release of personally identifiable data except to specified persons without the written consent of parents.

of names, addresses, serial numbers, and data transferred to tapes, disks, and printouts. Securely locked spaces and cabinets may be necessary for handling and storing documents and files. Codes should always be kept in secure places, distinctly separate from encoded data. The shipment, delivery, and transfer of all data, printouts, and files between offices and institutions may require careful controls. Computer to computer transmission of data may be restricted or forbidden. Provision should also be made for the destruction of all edited, obsolete, or depleted data on punched cards, tapes, disks, and other records.[72]

Accounting. - Computers with magnetic disk files usually have the capability of interrupting a program in operation and inquiring into a file from the computer console or from a terminal at a remote location. The computer can transmit information to the terminal, where it may be printed or displayed on a cathode ray tube. This permits interaction between the individual entering the data and the computer. Because the use of a terminal gives the user direct access to the computer memory and, in many cases, to the data base or data bank itself, it is necessary to develop safeguards to prevent unauthorized individuals from obtaining confidential information and to guard against unwarranted modification of file data.

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[72] The Institutional Guide to DHEW Policy on Protection of Human Subjects (Washington: U. S. Government Printing Office DHEW Publication No. NiH 72-102 , 1971), p. 6.

What are some of these security precautions? First, the use of the terminal should be restricted to authorized personnel. If possible, information requests should be forwarded to a member of the central office staff who is authorized to work with the data base. If the request is in order, this individual will look up the record and report the desired information to the requester.

A second technique for safeguarding access to the data base is to require the inquirer to enter a password before the computer will allow interrogation of the data base. Knowledge of the password is limited to authorized staff members, and the password is changed periodically to ensure confidentiality.

Another procedure for protecting confidentiality involves the use of an information requisition. Such a form helps assure compliance with established safeguard procedures and serves later as a record identifying persons and organizations who request information, showing who authorized the release of data, and indicating what information was transmitted.

Summary of Issues

The issues of student data management and confidentiality may be summarized by six broad policy statements of a committee of the Michigan Child Accounting and Attendance Association.[74] The first

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[73]U. S. Department of Health, Education, and Welfare, Education Division, op. cit., p. 12.

[74]Michigan Child Accounting and Attendance Association, Committee Reports, Information Guide for the Collection-Maintenance-Dissemination of Student Records (Pontiac, Michigan: The Assoc., 1972).

two statements focus on the issue of what data should be a part of the student record:

Statement I. - Information concerning students should be collected for the purpose of assisting school personnel in helping students with their academic and vocational decisions.

Statement II. - Education agencies should have written policies concerning the collection, maintenance, use, and dissemination of student records. Parents, students, and school personnel should be aware of these policies.

It is intended (in the second statement) that provision should be made in local policies for parents or students to review student data before these data are placed in the record. Provisions should enable parents or students to object when they feel that such data are not correct or do not belong in the record.[75]

Two statements are addressed to the issues of how data in the student record may be reviewed, verified, and corrected:

Statement III. - Education agencies should have procedures to verify the accuracy of data in the student's permanent record and to destroy information no longer pertinent or required by law.

Statement IV. - Education agencies should have policies and procedures which allow the student the right to review, verify, and

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[75]If the record is not modified to respond fully to the objection, the objection itself should become a part of the record.

challenge the accuracy of the information in the student's permanent record. These policies should include procedures for appeal if a parent or student believes the record is in error.

Thus, parental and student review of data maintained in a student's file is provided for specifically after the data are placed in the record.

The final two policy pronouncements deal with the issue of how access to student data may be controlled:

Statement V. - No one other than authorized school personnel, parents, or students, on a need-to-know basis, should have access to a students's permanent record without either the written permission of the student or his parents. If such a student is a minor, the parents or legal guardian must give permission for release of information contained in the student's permanent record.

Statement VI. - Education agencies should include in their written policies, procedures that would provide for the control and use of the permanent student record in educational research and school management.

These six statements emphasize the need for written policies at local and state levels to assure that student records are developed and used in the best interest of the students. In like manner, the use of student records also should serve the best interests of the school system or institution. Recordkeeping activities, therefore, should be carried out in a spirit of mutuality, to the benefit of the institution

(or the general public welfare) as well as for the benefit and welfare of the individual. Records should serve both. Neither should have complete and unilateral control of student records.

State and local laws, regulations, policies, and needs for using and safeguarding student records do vary greatly. For this reason, each school system or institution must find its own manner for dealing most effectively with data management and confidentiality issues and for stating resultant policies and procedures in writing to assure clarity and uniformity of interpretation. When such policies and procedures are published at appropriate intervals (e.g., annually), parents, students, school personnel, and others may become familiar with them and help apply them and improve them.

CHAPTER III

PRESENTATION OF FINDINGS

The research from field investigations of educational data processing leaders in high schools and the relationship to student services are presented in this chapter. This data is separated and presented in four categories. The responses from the survey instrument sent to data processing leaders, as well as the personal interviews with selected principals, are presented using composite and individual tables. The data appear in the following sequence.

Background Descriptive Data of the Selected High Schools

The Data Processing Leader in the Selected High Schools

Significant Chi Square Test of Independence

The Interviews of Selected Principals

Background Descriptive Data of the Selected High Schools

A survey instrument was developed and sent to 72 high school principals in Oakland and Macomb Counties and 12 other selected high school principals throughout Michigan. See Appendix A for a copy of the survey instrument. By means of a cover letter, Appendix A, the high school principals were asked to send the survey instrument

to the person in his/her high school who was directly involved with data processing for completion. In another cover letter, Appendix A, the data processing person was asked to complete the survey instrument to the best of his/her ability.

Sixty-four surveys were completed and returned. The responses from the surveys were coded and punched onto IBM Cards. The information on the card was tabulated and analyzed through the use of the data processing center at Oakland County Intermediate Schools, under the direction of Dr. William Veitch.

The tabulations and analyses of the data are now presented.

TABLE 1

SIZE OF HIGH SCHOOL

Number of Students	Absolute Frequency	Relative Frequency (Percent)
0-500	3	4.7
501-1000	7	10.9
1001-2000	44	68.8
2000 plus	10	15.6
TOTAL	64	100.0

Table 1 indicates that 44 (68.8%) of the 64 high schools responding to the questionnaire had between 1,001-2,000 students enrolled, while only three high schools (4.7%) had a student population of less than 500.

TABLE 2

GRADES IN HIGH SCHOOL

Grades	Absolute Frequency	Relative Frequency (Percent)
9-12	35	54.7
10-12	29	45.3
TOTAL	64	100.0

Table 2 indicates that 35 (54.7%) of the 64 high schools included grades 9-12, while 29 (45.3%) included grades 10-12.

TABLE 3

DATA PROCESSING SYSTEM USED

Category Label	Absolute Frequency	Relative Frequency (Percent)
In-house	2	3.1
County	51	79.7
Other*	11	17.2
TOTAL	64	100.0

*Private Business
Combination of In-House and County System

Table 3 indicates that the majority of high schools, 51 (79.7%) of the 64, used their county's intermediate school district data

processing system. Only 2 (3.1%) high schools have a computer within their own school district capable of satisfying student service needs of their high school. Eleven (17.2%) other high schools use various data processing systems. The majority of these other systems are private business or a combination of both the "in-house" computer and the county system to satisfy the demands of their high school.

TABLE 4

TYPE OF DATA PROCESSING SYSTEM USED

Category Label	Absolute Frequency	Relative Frequency (Percent)
On Line	44	68.8
Off Line	20	31.2
TOTAL	64	100.0

Table 4 indicates that 44 (68.8%) high schools have direct access to student information, while 20 (31.2%) high schools do not have this direct access capability and are considered off line. Of the 51 schools using the county data processing system as indicated in Table 3, it is quite evident from this table that not all of these high schools have direct access (on line) to the computer and must carry information to a center or to the county itself for processing.

Tables 5 through 10, which are to follow, indicate the kinds of data processing equipment located in the respective high schools.

TABLE 5

KEYPUNCH MACHINE LOCATED IN THE HIGH SCHOOL

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	20	31.2
Yes	44	68.8
TOTAL	64	100.0

TABLE 6

TYPEWRITER TERMINAL LOCATED IN THE HIGH SCHOOL

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	29	45.3
Yes	35	54.7
TOTAL	64	100.0

TABLE 7

CARD READER AND PRINTER LOCATED IN THE HIGH SCHOOL

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	44	68.8
Yes	20	31.2
TOTAL	64	100.0

TABLE 8

SORTER LOCATED IN THE HIGH SCHOOL

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	42	65.6
Yes	22	34.4
TOTAL	64	100.0

TABLE 9

OPTICAL SCANNER LOCATED IN THE HIGH SCHOOL

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	53	82.8
Yes	11	17.2
TOTAL	64	100.0

TABLE 10

OTHER DATA PROCESSING EQUIPMENT LOCATED IN THE HIGH SCHOOL

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	55	85.9
Yes	9	14.1
TOTAL	64	100.0

The keypunch machine is, by far, the most prevalent machine located in high schools - 44 (68.8%) of the 64 schools have access to a keypunch machine, while only 11 high schools (17.2%) have the more advanced optical scanner available to them.

Table 10 indicates that 55 (85.9%) of the high schools do not have other additional data processing equipment than those listed in Tables 5 through 9, while 9 high schools (14.1%) indicated the "other"

category. A breakdown of this category reveals that nine high schools have no data processing equipment located in their school. This would mean that for these nine high schools, any and all information that is put into the computer must be machine processed outside of the local high school.

Some other data processing equipment located in high schools that was listed include: Data Phone, Decolator, Burster, Check Signer, and Computers.

Tables 11 through 24 indicate the uses that are made of the computer by local high schools. The survey allowed the data processing person to check as many services that apply to his/her school.

TABLE 11

USING THE COMPUTER FOR GRADE REPORTING

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	8	12.5
Yes	56	87.5
TOTAL	64	100.0

Tables 11 and 12 indicate that more than 85% of the high schools surveyed use the services of the computer for grade reporting and computer scheduling, while only nine high schools do not use the computer in assisting the administration in the performance of these tasks.

TABLE 12

USING THE COMPUTER FOR COMPUTER SCHEDULING

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	9	14.1
Yes	55	85.9
TOTAL	64	100.0

TABLE 13

USING THE COMPUTER IN BUILDING THE MASTER SCHEDULE

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	29	45.3
Yes	35	54.7
TOTAL	64	100.0

TABLE 14

USING THE COMPUTER FOR STUDENT ATTENDANCE

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	24	37.5
Yes	40	62.5
TOTAL	64	100.0

TABLE 15

USING THE COMPUTER FOR STORING STUDENT INFORMATION - PERMANENT RECORDS

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	38	59.4
Yes	26	40.6
TOTAL	64	100.0

TABLE 16

USING THE COMPUTER FOR STUDENT MEMBERSHIP INFORMATION

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	28	43.7
Yes	36	56.3
TOTAL	64	100.0

TABLE 17

USING THE COMPUTER FOR COMPUTER ASSISTED INSTRUCTIONAL PROGRAMS (CAI)

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	33	51.6
Yes	31	48.4
TOTAL	64	100.0

TABLE 18

USING THE COMPUTER FOR TEST SCORING AND ANALYZING

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	33	51.6
Yes	31	48.4
TOTAL	64	100.0

TABLE 19

USING THE COMPUTER FOR AUDIO-VISUAL MATERIAL REQUESTS

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	59	92.2
Yes	5	7.8
TOTAL	64	100.0

TABLE 20

USING THE COMPUTER FOR STUDENT MOBILITY INFORMATION

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	56	87.5
Yes	8	12.5
TOTAL	64	100.0

TABLE 21

USING THE COMPUTER FOR COUNSELING AND GUIDANCE INFORMATION

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	43	67.2
Yes	21	32.8
TOTAL	64	100.0

TABLE 22

USING THE COMPUTER FOR RESEARCH IN HIGH SCHOOL

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	52	81.2
Yes	12	18.8
TOTAL	64	100.0

TABLE 23

USING THE COMPUTER FOR STUDENT ACTIVITIES

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	62	96.9
Yes	2	3.1
TOTAL	64	100.0

TABLE 24

USING THE COMPUTER FOR
SPECIAL APPLICATIONS

Category Label	Absolute Frequency	Relative Frequency (Percent)
No	53	82.8
Yes*	11	17.2
TOTAL	64	100.0

*College type scheduling
Maintenance scheduling
Bookstore inventory
Lock assignments
Simulations
Laboratory Activities
Computer assisted instruction including:
Drill and practice
Games and programming
Elections

Table 24 indicates that there are some special activities in various high schools that use the services of the computer. Some of these services are listed in this table.

In reviewing the fourteen tables - 11 through 24- it becomes quite evident that Grade Reporting (Table 11), and Computer Scheduling (Table 12), are a high priority response in the high school's use of computers. Such computer services as Building the Master Schedule (Table 13), Student Attendance (Table 14), Storing of Student Information (Table 15), Student Membership Information (Table 16), Computer Assisted Instructional Programs (Table 17), Test Scoring

and Analyzing (Table 18), and Counseling and Guidance Information (Table 21), have a medium priority response for use of the computer in high schools. Services such as Audio Visual Material Requests (Table 19), Student Mobility Information (Table 20), Research (Table 22), Student Activities (Table 23), and Special Applications as listed in Table 24 show a very low priority response for the high school's use of the computer.

A summary of the descriptive data of the selected high schools surveyed reveals that electronic data processing of student services is very much evident in some form or another in all high schools. The majority of the high schools surveyed contain 1,000-2,000 students that are enrolled in grades 9 through 12. The high schools surveyed use the data processing system of their intermediate school district more often than that of private business or a self-contained system within their respective school districts.

Of the 51 high schools using the services of their intermediate school district data processing system, 44 of these have immediate, direct access to student information contained in the storage files of the computer. These 44 high schools are thus considered "on line" because of this direct access capability.

Most high schools have some data processing equipment located right in their school. The keypunch machine and the typewriter terminal are, by far, the most popular machines. The more recent optical scan machine is being used by only 11 of the 64 high schools surveyed.

What use is made of the computer for high schools? Grade reporting and the scheduling of students to classes are the most popular uses of the computer and have a very high priority in the high school's use of the computer. Student attendance, the storing of student information, test scoring and analyzing, building the master schedule, the storing of counseling and guidance information, and the computer assisted instruction are used by some high schools and can be considered to have a medium priority in the high school's use of the computer. Such services as student mobility information, high school research, student activities information, audio-visual material requests, and special applications make very little use of the electronic data processing and thus have a very low priority in the high school's use of the computer.

The Data Processing Leader in the Selected High Schools

The following information is presented in table form and reflects the responses of 64 high school data processing leaders surveyed. These responses describe the background and training, the responsibilities and the insight that these men and women have regarding their unique position as a high school data processing leader.

Table 25 indicates the age of data processing leaders in the 64 high schools surveyed. Responses indicate the 32 (50%) of the respondents are within the 40-49 age bracket, while 20 (31.3%) are in the 30-39 age category.

TABLE 25

AGE OF THE DATA PROCESSING LEADER

Years of Age	Absolute Frequency	Relative Frequency (Percent)
20-29	4	6.3
30-39	20	31.3
40-49	32	50.0
50-59	7	10.0
60 and over	1	1.6
TOTAL	64	100.0

TABLE 26

YEARS IN EDUCATION OF THE DATA PROCESSING LEADER

Years in Education	Absolute Frequency	Relative Frequency (Percent)
1-5	4	6.3
6-10	11	17.2
11-15	19	29.7
16-20	16	25.0
21 and over	14	21.9
TOTAL	64	100.0

Table 26 indicates the number of years that data processing leaders have been in education. The majority (19 or 29.7%) of data processing leaders indicated that they have been involved in education from 11 to 15 years. There were only four responses (6.3%) that indicated that they have been involved in education less than five years.

TABLE 27

SEX OF DATA PROCESSING LEADER

Category Label	Absolute Frequency	Relative Frequency (Percent)
Male	60	93.8
Female	4	6.3
TOTAL	64	100.0

Table 27 indicates the sex of the data processing leader. Of the 64 high schools surveyed, 60 (93.8%) of the data processing leaders were male. Only 4 (6.3%) were female.

Table 28 indicates the number of years that the current data processing leaders have been involved in educational data processing. The majority of leaders, 29 (45.3%), have been involved in data processing five years or less. Fifty-one (79.7%) of the leaders have been involved in educational data processing for ten years or less.

This is a good indicator of the recent trend by educators to become more involved in data processing and computers.

TABLE 28

THE DATA PROCESSING LEADER AND THE YEARS INVOLVED IN DATA PROCESSING

Years in Data Processing	Absolute Frequency	Relative Frequency (Percent)
1-5	29	45.3
6-10	22	34.4
11-15	10	15.6
16-20	2	3.1
21 and over	1	1.6
TOTAL	64	100.0

Table 29 indicates that the majority of educators (54 or 84.4%) involved in data processing at the high school level are considered administrators. This is an indicator that the administration of high schools is highly involved in educational data processing. In the five high schools where the teacher was a data processing leader, the vast majority of data processing was related to computer assisted instruction (CAI). In high schools where a teacher completed the survey, very little use, if any, of computer time was devoted to the administration of the schools. This was usually true in smaller high

schools surveyed. In schools where the data processing supervisor was the person completing the survey, it was indicated that very few student services used by the high school administration were obtained through the use of the computer.

TABLE 29

TITLE OF DATA PROCESSING LEADER

Category Label	Absolute Frequency	Relative Frequency (Percent)
Teacher	5	7.8
Counselor	1	1.6
Administrator	54	84.4
Data Processing Supervisor	4	6.3
TOTAL	64	100.0

Table 30 indicates that the majority (42 or 65.6%) of the data processing leaders in the high school are more recent members of the current staff, while only 2 (3.1%) persons have been at their present school for 20-29 years.

Using the information from Table 25 through 30, we can conclude that the majority of data processing high school leaders are male administrators, who have been involved in data processing for nine

years or less, and have been on the staff of their current high school for nine years or less, while their age ranges between 30 and 49 years of age.

TABLE 30

THE DATA PROCESSING LEADER AND THE YEARS AT THIS SCHOOL

Number of Years	Absolute Frequency	Relative Frequency (Percent)
0-9	42	65.6
10-19	20	31.3
20-29	2	3.1
TOTAL	64	100.0

TABLE 31

DATA PROCESSING LEADERS CARRY DATA TO THE COMPUTER CENTER

Category Label	Absolute Frequency	Relative Frequency (Percent)
Yes	17	26.6
No	47	73.4
TOTAL	64	100.0

Table 31 indicates that most data processing leaders (47 or (73.4%) do not personally collect and carry data to the computer center. The task of carrying data to the computer center is done most often by a secretary, a custodian or some type of mail clerk.

TABLE 32

PERCENT OF TIME DATA PROCESSING LEADER IS INVOLVED IN DATA PROCESSING

Percent of Time	Absolute Frequency	Relative Frequency (Percent)
0-10	29	45.3
11-25	23	35.9
25-50	7	10.9
50 and over	5	7.8
TOTAL	64	100.0

Table 32 indicates that 29 (45.3%) of data processing leaders spend 10% or less of assigned time on data processing activities. Twenty-three (35.9%) of the data processing leaders average between 11 to 25 percent of their assigned time with data processing activities. It is difficult to say whether the time spent on data processing activities is a choice of the data processing leader and his supervisor, or an activity that is determined by other priorities currently existing

on a day to day basis in high schools. Many survey responses indicated that the percent of time the data processing person spends varies greatly at different times of the year. For example, when high schools are in the process of scheduling or grade reporting, some data processing leaders spend between 75 to 100 percent of their time on these activities, while at other times only a small percentage of their time is involved in data processing.

TABLE 33

RESPONSIBILITIES OF DATA PROCESSING LEADERS

Category Label	Absolute Frequency (Yes)	Relative Frequency (Percent	Absolute Frequency (No)	Relative Frequency (Percent)
Student Discipline	39	60.9	25	39.1
Student Attendance	32	50.0	32	50.0
Teacher Evaluation	39	60.9	25	39.1
Curriculum	40	62.5	24	37.5
Student Activities	23	35.9	41	64.1
Other*	30	46.9	34	53.1

*The categories listed as "other" include:

Ordering Supplies
Negotiations
General Supervision
Counseling
Meetings
Budget Building
Maintenance of Building and Grounds
Athletics
Processing Staff Substitutes
Teaching

Table 33 describes the responsibilities assigned to the data processing leader other than that of data processing leader or coordinator. The survey responses indicate that the nature of the assigned responsibilities do not vary greatly from one high school to another but the percent of time spent performing these responsibilities will vary substantially from school to school.

TABLE 34

METHOD OF ACQUIRING THE POSITION AS DATA PROCESSING LEADER

Category Label	Absolute Frequency (Yes)	Relative Frequency (Percent)	Absolute Frequency (No)	Relative Frequency (Percent)
Assigned-Based on Screening Process	22	34.4	42	65.6
Only Qualified Person Available	11	17.2	53	82.8
Individual Interest	34	53.1	30	46.9
Other*	19	29.7	45	70.3

*The categories listed as "other" include:
Part of the assigned responsibilities
Position grew to include data processing responsibilities
Principal of the school

Table 34 describes how the data processing leader acquired his current position. The majority of responses (34 or 53.1%) indicated that a person was needed to take on the data processing responsibilities in the high school at the time that a change-over from manual data processing to electronic data processing took place. Because of the

individual's personal interest he/she was the natural person to take on these responsibilities.

The table also indicates that since electronic data processing is found in most high schools today, a number of persons (22 or 34.4%) were selected as data processing leaders based on their knowledge, background, or previous experience in this area.

TABLE 35

SPECIALIZED TRAINING IN DATA PROCESSING BEFORE ACQUIRING YOUR PRESENT POSITION

Category Label	Absolute Frequency (Yes)	Relative Frequency (Percent)	Absolute Frequency (No)	Relative Frequency (Percent)
College or University Course	19	29.7	45	70.3
Commercial Course	3	4.7	61	95.3
No Specific Training	39	60.9	25	39.1
Other*	11	17.2	53	82.8

*The category listed as "other" includes:
On the job training
Individual interest
Intermediate school district training

Table 35 describes what kind of training, if any, a person received before becoming the data processing leader at his high school. The majority (39 or 69.9%) of the data processing leaders in high schools have had no specific training before acquiring their current

position. This information reflects the responses reviewed in Table 34 which indicated 34 (53.1%) of the data processing leaders acquired their current responsibilities in the area of electronic data processing through their own individual interest as opposed to any other qualifications.

Approximately one third (22 or 34.4%) of the individuals responding to the survey did participate in a college or commercial course in electronic data processing. A careful analysis of the information presented in this table indicates that most data processing leaders in high schools were not formally educated in the area of electronic data processing when they assumed or were assigned this responsibility in their high school.

Table 36 indicates that most high school data processing leaders have not had a lot of training in the area of educational data processing even after acquiring their current position in their high school. It appears from this table that many data processing leaders receive just enough information and assistance to solve their immediate problems or concerns either through workshops, in-service at the intermediate school district or participation in a users group. These responses could relate to the priority that data processing activities have in a local high school as compared to other responsibilities which are assigned to the person acting as data processing leader.

TABLE 36

SPECIALIZED TRAINING SINCE BECOMING A DATA PROCESSING LEADER

Category Label	Absolute Frequency (Yes)	Relative Frequency (Percent)	Absolute Frequency (No)	Relative Frequency (Percent
Workshops	20	31.3	44	68.7
In Service-Intermediate School District	22	34.4	42	65.6
College or Commercial Course	8	12.5	56	87.5
On the Job Training	10	15.6	54	84.4
Participation in Various Users Groups	16	25.0	48	75.0
Various Conferences	9	14.1	55	85.9
None	25	39.1	39	60.9

Table 37 reflects the qualities important for prospective educational data processing personnel as indicated by the current educational data processing leaders. Today's high school data processing leaders think that if someone were to replace them in the near future he would need the following qualities: Understanding of computer languages, acquired administrative experiences and ability to provide leadership. The table also indicates that other qualities might be very important to certain high schools but that the majority of applicants would need at least to possess these three qualities.

TABLE 37

QUALITIES IMPORTANT FOR A PROSPECTIVE EDUCATIONAL DATA PROCESSING LEADER

Category Label	Absolute Frequency (Yes)	Relative Frequency (Percent)	Absolute Frequency (No)	Relative Frequency (Percent)
Understand Computer Languages	42	65.6	22	34.4
Teaching Background	28	43.8	36	56.3
Administrative Experience	43	67.2	21	32.8
Guidance Experience	14	21.9	50	78.1
Leadership Qualities	39	60.9	25	39.1
Mathematical Background	23	35.9	41	64.1
Other*	19	29.7	45	70.3

*The categories listed as "other" include:

Knowledge of Computer Process
In Service Training
Interest in Detail
Logical Mind
Interest and Desire
Ability to Think Three-Dimensional
Imagination
Experience in Areas Where Data Will be Used
Ability to Relate to Data Processing Personnel and School Staff

TABLE 38

STATUS OF EDUCATIONAL DATA PROCESSING PROGRAMS AND SERVICES

Category Label	Absolute Frequency	Relative Frequency (Percent)
Increase	59	92.2
Decrease	2	3.1
Staying the Same	3	4.7
TOTAL	64	100.0

Table 38 indicates that the data processing leaders in our high schools today see computer programs and services increasing in years to come by a very large majority (59 or 92.2%). Two responses indicate that data processing services will decrease. The reasons given for these responses were: (1) Too much emphasis is placed on the computer; machines are attempting to run the schools. (2) Heavy financial burden being placed on schools; we can do without some frills.

Tabel 39 indicates the reasons why data processing leaders see data processing services and programs in their high school increasing, decreasing or staying the same as indicated in Table 38. The majority of responses indicate that data processing services and programs will increase due to Data Processing Expertise (43 or 67.2%), Available Hardware (38 or 59.4%), and Available Software (35 or 54.7%). This

information may be an indication that electronic data processing in the field of education has developed slowly, is continuing to grow and provide programs and services to educators, and will play a part in the operation of all high schools in years to come.

TABLE 39

REASONS EDUCATIONAL DATA PROCESSING PROGRAMS AND SERVICES WILL INCREASE

Category Label	Absolute Frequency (Yes)	Relative Frequency (Percent)	Absolute Frequency (No)	Relative Frequency (Percent)
Financial Costs	15	23.4	49	76.6
Enrollment	23	35.9	41	64.1
Data Processing Expertise	43	67.2	21	32.8
Available Hardware	38	59.4	26	40.6
Available Software	35	54.7	29	45.3
Other*	16	25.0	48	75.0

*The category listed as "other" includes:
Time saver
Demand for more service
State and federal legislation
Increased use of the computer in the business world
Need for more accurate accountability
Need for more efficiency
Unlimited storage of information
Reduction in cost - saving of clerical time

TABLE 40

DATA PROCESSING LEADERS AND MEMBERSHIP IN DATA PROCESSING ORGANIZATIONS

Category Label	Absolute Frequency (Yes)	Relative Frequency (Percent)	Absolute Frequency (No)	Relative Frequency (Percent)
Association for Education Data Systems (AEDS)	1	1.6	63	98.4
Michigan Association for Educational Data Systems (MAEDS)	11	17.2	53	82.8
Intermediate School District Data Processing Organization (SIMS)	15	23.4	49	76.6
Other*	7	10.9	57	89.1

*The category "other" includes:
No data processing organization

Table 40 indicates that very few current high school data processing leaders belong to the national, state or county data processing organizations. There could be a number of reasons for this:

a. School personnel see no need for such an affiliation.
b. Membership in these organizations may take more time than current data processing leaders in high school have available.
c. School personnel are unaware of the possible benefits from membership.
d. Membership in such an organization is not a priority for high school data processing leaders as compared to his/her daily demands within their high school.
e. Cost of membership exceeds the benefits.

TABLE 41

UPDATING OR ACQUIRING NEW KNOWLEDGE OF EDUCATIONAL DATA PROCESSING

Category Label	Absolute Frequency (Yes)	Relative Frequency (Percent)	Absolute Frequency (No)	Relative Frequency (Percent)
Seminar or Conference	39	60.9	25	39.1
Workshop or In-Service	7	10.9	57	89.1
College or Commercial Course	6	9.4	58	90.6

Table 41 indicates that the majority (39 or 60.9%) of data processing leaders have attended at least one or more seminars or conferences since acquiring their current responsibilities in data processing. Only 13 (20.3%) of the leaders spent a prolonged period of time at a workshop, academy or enrollment in a course updating or acquiring new knowledge in the area of educational data processing. This small number may be due to: (a) Lack of finances available at the local school level for prolonged workshops or in-service. (b) Lack of available and qualified substitutions for the data processing leader for a prolonger period. (c) Other priorities within a high school often take precedence.

TABLE 42

TRAINING OF FUTURE EDUCATIONAL DATA PROCESSING LEADERS

Category Label	Absolute Frequency (Yes)	Relative Frequency (Percent)	Absolute Frequency (No)	Relative Frequency (Percent)
College or University Course	37	57.8	27	42.2
Workshop, Seminar or In-Service	49	76.6	15	23.4
Commercial Course	11	17.2	53	82.8
Administrative Experience	37	57.8	27	42.2
Leadership Qualities	40	62.5	24	37.5
Guidance Experience	14	21.9	50	78.1
Mathematics Background	21	32.8	43	67.2
Knowledge of Computer Languages	34	53.1	30	46.9
Interest and Desire	47	73.4	17	26.6
Other*	9	14.1	55	85.9

*The category listed as "other" includes:
Knowledge of tasks that need to be done
Getting to know data processing personnel
Familiarity with computer process including hardware and software
Experience in business or industrial data processing
Knowledge of the Intermediate School District data processing center

A review of Table 42 indicates that if the current data processing leaders in high schools could train future educational data processing personnel they would emphasize that the person have one or more college or university courses in educational data processing, attend

workshops, seminars and in-service programs, have experience as an educational administrator, have leadership qualities, have some knowledge of computer languages and a definite interest and desire for the whole concept of electronic collection and dissemination of information related to student services in high schools.

A review of Table 35 indicates that only 19 (29.7%) of the current data processing leaders took a college or university course before acquiring their present responsibilities in data processing. Table 42 indicates that 37 (57.8%) of the current data processing leaders think it is necessary for the future training of educational data processing leaders to complete á college or commercial course in data processing.

Table 43 indicates that the majority of data processing leaders in high school (49 or 76.6%) feel that their experience and knowledge of data processing will be useful in their personal advancement. Only 15 (23.4%) indicate this knowledge will not be useful. The age of the data processing leader and his/her future plans certainly could have something to do with this response.

A summary description of the data processing leader in the high schools surveyed indicates that the majority are male administrators, ranging in age from 30-49 years. They have spent 10-20 years in the field of education, but have spent less than 10 years in the area of educational data processing. These individuals have spent less than nine years on the staff of their current high school.

TABLE 43

USEFULNESS OF DATA PROCESSING EXPERIENCE FOR PERSONAL ADVANCEMENT

Category Label	Absolute Frequency	Relative Frequency (Percent)
Yes	49	76.6
No	15	23.4
TOTAL	64	100.0

The majority of these data processing leaders spend less than 25% of their time involved in data processing activities. The time involved in data processing activities will vary from high school to high school, depending on other responsibilities such as student discipline, student attendance, curriculum, teacher evaluation and student activities.

Most current data processing leaders acquired the responsibility as data processing leader in their high school through their own individual interest in the area, rather than through any kind of specialized training, such as a college or commercial course related to electronic data processing. Since becoming the data processing

leader in their high school, specialized training in data processing has increased for these individuals through participation at workshops, in-service at the intermediate school district, participation in various users groups and attendance at a college or commercial course. Most current data processing leaders who belong to any organization related to data processing joined their intermediate school district organization, rather than a state or national data processing association.

Current data processing leaders indicate that for the future, knowledge related to the data processing of student services can be acquired through participation at seminars and conferences. They see data processing services and programs related to schools increasing by an overwhelming majority. Data processing expertise, available hardware and available software were indicated as the main reasons for this future increase in the high school's use of the computer. According to the responses of the current data processing leaders in the high schools surveyed, the quality seen as important for persons planning to be involved in future high school data processing, include: an understanding of computer languages, administrative experience, leadership qualities, interest and desire and in-service training. Of the persons currently involved in data processing at the high school level, 49 of 64 indicated that their experiences in data processing have definitely helped them in their personal advancement.

Significant Chi-Square Tests of Independence

The data that follow are organized into bivariate frequency tables or contingency tables as they are sometimes called. The statistical chi-square test was made to determine whether classification on the row variable is independent of classification on the column variable.

In each of these tables the calculated statistics equal or exceed the tabled value, the finding is significant and the hypothesis of independence is rejected. Thus, the row and column variables are determined to be dependent at the specified level of significance. The exact interpretation of each table will be dependent upon the nature of the row and column variables.

Table 44 indicates that as the size of the high school increases (column variable) the chances of the high school using the computer for grade reporting (row variable) also increases. One out of three high schools with a student population of less than 500 students uses the computer for grade reporting (33.3%). While four out of seven high schools with a student population between 501-1000 use the computer for grade reporting (57.1%). In 42 out of 44 high schools, with a student population between 1001-2000, the computer is used for grade reporting (95.5%). In 9 out of 10 high schools, with more than 2000 students, the computer is used for grade reporting (90.0%).

In this table, the calculated chi-square is significant to the .01 level. Thus, the hypothesis of independence is rejected and the row and column variables are significantly related.

TABLE 44

SIZE OF HIGH SCHOOL VS GRADE REPORTING BY COMPUTER

Students in High School	Grade Reporting by Computer No	Yes	Row Total	Row Pct / Col Pct / Tot Pct
0-500	2	1	3	
	66.7	33.3	4.7	
	25.0	1.8		
	3.1	1.6		
501-1000	3	4	7	
	42.9	57.1	10.9	
	37.5	7.1		
	4.7	6.3		
1001-2000	2	42	44	
	4.5	95.5	68.8	
	25.0	75.0		
	3.1	65.6		
2000 +	1	9	10	
	10.0	90.0	15.6	
	12.5	16.1		
	1.6	14.1		
COLUMN TOTAL	8	56	64	
	12.5	87.5	100.0	

Significance = .01

In Table 45 the column variable of school size is placed against the concept of using the computer for test scoring - the row variable. As the size of the high school increases the chances of the school using the computer for test scoring also increases. One reason why this relationship may exist is that few small high schools are involved in

data processing operations in any form while larger high schools, as a whole, are involved much more in data processing applications.

In this table the calculated chi-square is significant to the .05 level. Thus, the hypothesis of independence is rejected and the row and column variable are significantly related.

TABLE 45

SIZE OF HIGH SCHOOL VS TEST SCORING BY COMPUTER

Students in High School	Grade Reporting by Computer		Row Total	Row Pct Col Pct Tot Pct
	No	Yes		
0-500	3 100.0 9.1 4.7	0 0.0 0.0 0.0	3 4.7	
501-1000	6 85.7 18.2 9.4	1 14.3 3.2 1.6	7 10.9	
1001-2000	18 40.9 54.5 28.1	26 59.1 83.9 40.6	44 68.8	
2000 +	6 60.0 18.2 9.4	4 40.0 12.9 6.3	10 15.8	
COLUMN TOTAL	33 51.6	31 48.4	100.0	

Significance - .05

TABLE 46

SIZE OF HIGH SCHOOL VS AUDIO VISUAL REQUESTS BY COMPUTER

Students in High School	Grade Reporting by Computer No	Yes	Row Total	Row Pct / Col Pct / Tot Pct
0-500	3	0	3	
	100.0	0.0	4.7	
	5.1	0.0		
	4.7	0.0		
501-1000	7	0	7	
	100.0	0.0	10.9	
	11.9	0.0		
	10.9	0.0		
1001-2000	42	2	44	
	95.5	4.5	68.8	
	71.2	40.0		
	65.6	3.1		
2000+	7	3	10	
	70.0	30.0	15.6	
	11.9	60.0		
	10.9	4.7		
COLUMN TOTAL	59	5	64	
	92.2	7.8	100.0	

Significance - .05

In Table 46 the column variable of size of high school is placed against the row variable of another application of data processing - audio visual requests. The table indicates that as the size of the high school increases the chances of the school using the computer for audio visual requests also in creases. Very few high schools (5 of 64) use the computer for audio visual requests and these high schools are the larger schools.

In this table the calculated chi-square is significant at the .05 level. Thus, the hypothesis of independence is rejected and the row and column variables are significantly related.

TABLE 47

SIZE OF HIGH SCHOOL VS IMPORTANCE OF ADMINISTRATIVE EXPERIENCE

Students in High School	Administrative Experience No	Administrative Experience Yes	Row Total	Row Pct / Col Pct / Tot Pct
0-500	2	1	3	
	66.7	33.3	4.7	
	9.5	2.3		
	3.1	1.6		
501-1000	4	3	7	
	57.1	42.9	10.9	
	19.0	7.0		
	6.3	4.7		
1001-2000	15	29	44	
	34.1	65.9	68.8	
	71.4	67.4		
	23.4	45.3		
2000 +	0	10	10	
	0.0	100.0	15.6	
	0.0	23.3		
	0.0	15.6		
COLUMN TOTAL	21	43	64	
	32.8	67.2	100.0	

Significance - .05

In Table 47 the column variable of high school size is placed against one of the qualities indicated as being important for a person considering a future in educational data processing. The table indicates that the larger the high school the more the current data processing leaders feel administrative experience is needed for a person considering a future in educational data processing. In all of the ten high schools with a student population in excess of 2000 students,

the survey responses indicated that administrative experience is a very important factor for future educational data processing leaders.

The calculated chi-square is significant to the .05 level. The hypothesis of independence is rejected and there is a significant relationship between the row and column variable.

TABLE 48

PERCENT OF TIME INVOLVED IN DATA PROCESSING VS STORING OF STUDENT INFORMATION BY COMPUTER

Percent of Time in Data Processing	Storing of Student Information by Computer		Row Total	Row Pct Col Pct Tot Pct
	No	Yes		
0-10	20	9	29	
	69.0	31.0	45.3	
	52.6	34.6		
	31.3	14.1		
11-24	8	15	23	
	34.8	65.2	35.9	
	21.1	57.7		
	12.5	23.4		
25-49	7	0	7	
	100.0	0.0	10.9	
	18.4	0.0		
	10.9	0.0		
50 +	3	2	5	
	60.0	40.0	7.8	
	7.9	7.7		
	4.7	3.1		
COLUMN TOTAL	38	26	64	
	59.4	40.6	100.0	

Significance - .01

In Table 48 the column variable indicates the percent of time the data processing leader in the high school is involved in data processing. This variable is placed against the row variable - the storing of student information - which is one of the services of the computer used by high schools.

The table indicates that 20 of 29 high school data processing leaders using 10% or less of their time in data processing activities do not use the computer to store student information. A reason for this response may be that current data processing leaders using less than 10% of their time for data processing activities do not have enough time and/or personnel available to keep up with the storage and maintenance of student information in the computer.

Of the five data processing leaders using more than 50% of their time in data processing activities only two store student information in the computer. A reason for this response may be that there is no need to store student information in the computer due to cost, additional time required, or that manual storage of student information is doing an adequate job at the present time. Also, the persons involved in high school data processing more than 50% of their time have other district responsibilities in data processing such as payroll, personnel, accounts payable, etc. These same reasons also apply to data processing leaders using 24-49% of their time in data processing activities.

The calculated chi-square is significant to the .01 level. The hypothesis of independence is rejected and there is a significant relationship between the column and row variables.

TABLE 49

PERCENT OF TIME INVOLVED IN DATA PROCESSING VS TEACHER EVALUATION RESPONSIBILITIES

Percent of Time in Data Processing	Teacher Evaluation Responsibilities No	Yes	Row Total	Row Pct / Col Pct / Tot Pct
0-10	9	20	29	
	31.0	69.0	45.3	
	36.0	51.3		
	14.1	31.3		
11-24	7	16	23	
	30.4	69.6	35.9	
	28.0	41.0		
	10.9	25.0		
25-49	5	2	7	
	71.4	28.6	10.9	
	20.0	5.1		
	7.8	3.1		
50 +	4	1	5	
	80.0	20.0	7.8	
	16.0	2.6		
	6.3	1.6		
COLUMN TOTAL	25	39	64	
	39.1	60.9	100.00	

Significance - .05

In Table 49 the row variable of teacher evaluation as a time consuming responsibility is placed against the column variable of the

percent of time a data processing leader is involved in data processing. The more involved a person is in data processing activities the less time there is available for other responsibilities including teacher evaluation. Thus, a data processing leader spending 10% or less of his time on data processing activities will be able to be more involved in teacher evaluation - 69% of this category are involved in teacher evaluation. While a person spending 25% or more of his time with data processing activities has little time to devote to teacher evaluation. A total of 3 out of 12 or 25% fell in this category.

The calculated chi-square is significant to the .05 level. The hypothesis of independence is rejected and the row and column variables are significantly related.

In Table 50 the row variable of curriculum involvement being a time-consuming responsibility of the data processing leader is placed against the percent of time a data processing leader is involved in data processing activities - the column variable.

The table indicates that as the percent of time used for data processing activities increases, the amount of curriculum involvement by data processing leaders decreases. Of the 29 persons spending 10% or less of their time with data processing activities 23 (79.3%) indicated they were involved with curriculum responsibilities. The 12 persons spending 25% or more of their time with data processing activities had only 2 (16.6%) who indicated they were involved in curriculum responsibilities.

The calculated chi-square is significant to the .01 level. Thus, the hypothesis of independence is rejected and the relationship between the row and the column variables indicates a significant relationship.

TABLE 50

PERCENT OF TIME INVOLVED IN DATA PROCESSING VS CURRICULUM INVOLVEMENT RESPONSIBILITIES

Percent of Time in Data Processing	Curriculum Responsibilities No	Yes	Row Total	Row Pct / Col Pct / Tot Pct
0-10	6	23	29	
	20.7	79.3	45.3	
	25.0	57.5		
	9.4	35.9		
11-24	8	15	23	
	34.8	65.2	35.9	
	33.3	37.5		
	12.5	23.4		
25-49	6	1	7	
	85.7	14.3	10.9	
	25.0	2.5		
	9.4	1.6		
50 +	4	1	5	
	80.0	20.0	7.8	
	16.7	2.5		
	6.3	1.6		
COLUMN TOTAL	24	40	64	
	37.5	62.5	100.0	

Significance - .01

In Table 51 the row variable of enrollment in a commercial data processing course is placed against the percent of time a data processing leader is involved in data processing activities - the column variable.

TABLE 51

PERCENT OF TIME INVOLVED IN DATA PROCESSING VS TAKING A COMMERCIAL COURSE IN DATA PROCESSING

Percent of Time in Data Processing	Commercial Course in Data Processing No	Yes	Row Total	Row Pct Col Pct Tot Pct
0-10	28	1	29	
	96.6	3.4	45.3	
	45.9	33.3		
	43.8	1.6		
11-24	23	0	23	
	100.0	0.0	35.9	
	37.7	0.0		
	35.9	0.0		
25-49	7	0	7	
	100.0	0.0	10.9	
	11.5	0.0		
	10.0	0.0		
50 +	3	2	5	
	60.0	40.0	7.8	
	4.9	66.7		
	4.7	3.1		
COLUMN TOTAL	61	3	64	
	95.3	4.7	100.0	

Significance - .01

Table 51 indicates that only 3 persons of the 64 responding to the survey took a commercial type data processing course before becoming involved in data processing at their high school. Thus, most persons involved in educational data processing at the high school level never took a commercial data processing course. Two of the 5 persons or 40% who are involved more than 50% of their day with data

processing activities took a commercial type data processing course. A careful review of the individuals surveyed who spend more than 50% of their day on data processing activities indicates that they are the data processing supervisors for the school district with high school responsibilities. Thus, these individuals would have been involved in commercial training before acquiring their current position. Refer to Table 35 for more information.

TABLE 52

PERCENT OF TIME INVOLVED IN DATA PROCESSING VS DATA PROCESSING PROGRAMS AND SERVICES INCREASING DUE TO AVAILABLE HARDWARE

Percent of Time in Data Processing	Available Hardware No	Yes	Row Total	Row Pct Col Pct Tot Pct
0-10	14 48.3 53.8 21.9	15 51.7 39.5 23.4	29 45.3	
11-24	8 34.8 30.8 12.5	15 65.2 39.5 23.4	23 35.9	
25-49	0 0.0 0.0 0.0	7 100.0 18.4 10.9	7 10.9	
50 +	4 80.0 15.4 6.3	1 20.0 2.6 1.6	5 7.8	
COLUMN TOTAL	26 40.6	38 59.4	64 100.0	

Significance - .05

The calculated chi-square is significant to the .01 level. Thus, the hypothesis of independence is rejected and there is a relationship between the row and column variable which is significant.

In Table 52 the column variable of the percent of time a data processing leader spends on these activities is placed against the reason for data processing programs and services increasing or decreasing in high schools - available hardware - the row variable.

Table 52 indicates that the data processing person who spends the most time involved in data processing programs and services sees available hardware as a reason why education data processing programs and services in their high school will increase or decrease. A careful review of this information reveals that data processing leaders who spend more than 50% of their time on data processing realize that hardware is available at the present time. However, finances, personnel and/or leadership in the school district or the high school are the reasons why high school programs and services are not increasing.

A review of the other time categories (0-10%, 11-24%, and 25-50%) indicates that as the percent of time involved in data processing activities increases for the data processing person, the reason indicated for data processing programs and services increasing or decreasing in the high schools as related to available hardware, also tends to increase. Thus, of the 29 data processing persons who spend 10% of their time in data processing activities, only 15 (51.7%) feel

that available hardware is one of the reasons why data processing activities and services are increasing or decreasing in high schools. Of the 7 data processing persons who spend 25-49% of their time in data processing activities, all 7 (100.0%) feel available hardware is one of the reasons why data processing activities and services are increasing or decreasing in high schools.

The calculated chi-square is significant at the .05 level. This indicates that the hypothesis of independence is rejected and the row and column variables indicate a relationship which is significant.

TABLE 53

DATA PROCESSING PROGRAMS AND SERVICES
VS DATA PROCESSING EXPERTISE

Data Processing Programs and Services	Data Processing Expertise No	Yes	Row Total	Row Pct Col Pct Tot Pct
Increase	17	42	59	
	28.8	71.2	92.2	
	81.0	97.7		
	26.6	65.6		
Decrease	1	1	2	
	50.0	50.0	3.1	
	4.8	2.3		
	1.6	1.6		
Same	3	0	3	
	100.0	0.0	4.7	
	14.3	0.0		
	4.7	0.0		
COLUMN TOTAL	21	43	64	
	32.8	67.2	100.0	

Significance - .05

In Table 53 the column variable indicating the status of data processing programs and services is placed against a criterion which may be the cause of this increase or decrease. The criterion is data processing expertise which is the row variable.

The table indicates that data processing programs and services in high schools will increase due to data processing expertise in 42 of 59 responses (71.2%). Only 2 responses indicate a decrease in data processing programs in high schools. While 3 responses indicate that data processing programs and services in high schools will remain the same in years to come.

The increase in data processing programs and services may be related to the data processing leader's knowledge of data processing services and programs. When school districts contract with the intermediate school district for data processing services an increase in awareness and expertise has to occur. This knowledge alone is enough to improve one's own expertise in the area of electronic data processing. The few cases that indicate a decrease or remain the same regarding data processing programs and services in high schools, are too small in number to predict the cause and effect for the response. The high schools responding in this manner, however, may use the computer for minimal services and may not have the need or the finances to get more involved.

The calculated chi-square value is significant to the .05 level. Thus, the hypothesis of independence is rejected and there is a

significant relationship between the row and column variables.

TABLE 54

DATA PROCESSING PROGRAMS AND SERVICES VS AVAILABLE HARDWARE

Data Processing Programs and Services	Available Hardware No	Yes	Row Total	Row Pct / Col Pct / Tot Pct
Increase	21	38	59	
	35.6	64.4	92.2	
	80.8	100.0		
	32.8	59.4		
Decrease	2	0	2	
	100.0	0.0	3.1	
	7.7	0.0		
	3.1	0.0		
Same	3	0	3	
	100.0	0.0	4.7	
	11.5	0.0		
	4.7	0.0		
COLUMN TOTAL	26	38	64	
	40.6	59.4	100.0	

Significance - .05

In Table 54 the row variable of available hardware is placed against the future place data processing programs and services will have - the column variable.

Table 54 indicates that 38 of 59 responses (64.4%) indicate that the data processing programs and services in high schools will increase in future years due to an increase in available hardware. This can be achieved because data processing leaders in today's high schools see

that many more programs and services will be available in future years based on the increase in services in the past few years. This increase in programs and services is especially noticable in school districts that use the large and sophisticated data processing facility at the intermediate school district rather than a small, unsophisticated setup in one's own school district.

The five responses indicating a decrease in data processing programs or keeping the programs the same, may be responses from high schools that are not using the intermediate school district data processing services, but have an "in-house" operation or send their computer work to a private business for processing.

The calculated chi-square is significant at the .05 level. The hypothesis of independence is rejected and a significant relationship exists between the row and column variables.

In Table 55 the row variable of available software is placed against the column variable of the future status of data processing programs and services.

In this table the reason for an increase in future data processing programs and services in high schools is related to available software in 35 of 59 high schools responding to the survey. Data processing leaders feel that as new and better programs (software) become available to them the more their district will use the computer. Districts tied into the intermediate school districts have found that as more programs become available the more use of the computer will be

made for high school services. The five responses indicating a decrease in future data processing programs or programs remaining the same may be responding to a lack of real involvement in data processing activities. The high schools responding in this manner use the computer for very few activities due to their size. Thus, there is no real interest in available software for future programs related to student services.

The calculated chi-square is significant at the .05 level. The hypothesis of independence is rejected which indicates that a significant relationship exists between the row and column variables.

TABLE 55

DATA PROCESSING PROGRAMS AND SERVICES VS AVAILABLE SOFTWARE

Data Processing Programs and Services	Available Software		Row Total	Row Pct Col Pct Tot Pct
	No	Yes		
Increase	24 40.7 82.8 37.5	35 59.3 100.0 54.7	59 92.2	
Decrease	2 100.0 6.0 3.1	0 0.0 0.0 0.0	2 3.1	
Same	3 100.0 10.3 4.7	0 0.0 0.0 0.0	3 4.7	
COLUMN TOTAL	29 45.3	35 54.7	64 100.0	

Significance - .05

TABLE 56

THE USEFULNESS OF DATA PROCESSING EXPERIENCE VS THE NUMBER OF YEARS INVOLVED IN EDUCATION

Usefulness of Data Processing Experience	Number of Years in Education 1-5	6-10	11-15	16-20	21+	Row Total	Row Pct / Col Pct / Tot Pct
Yes	3	9	18	13	6	49	
	6.1	18.4	36.7	26.5	12.2	76.6	
	75.0	81.8	94.7	81.3	42.9		
	4.7	14.1	28.1	20.3	9.4		
No	1	2	1	3	8	15	
	6.7	13.3	6.7	20.0	53.3	23.4	
	25.0	18.2	5.3	18.8	57.1		
	1.6	3.1	1.6	4.7	12.5		
COLUMN TOTAL	4	11	19	16	14	64	
	6.3	17.2	29.7	25.0	21.9	100.0	

Significance - .01

In Table 56 the row variable indicates the number of years the data processing leader has been in education. This variable is placed against the column variable - the usefulness of the data processing leader's experience in his/her personal advancement in future years.

Table 56 indicates that of the 49 who responded yes to the usefulness of their data processing experience, 30 of the data processing persons have been in the field of education for less than 15 years. While 19 of the persons responding yes to this question have been in education for 16 years or more. Eleven of the 15 persons who feel that their experience in data processing has not or will not be helpful in

their future plans have been involved in education for more than 16 years. These data processing persons may be at an age where their experience will not help them achieve professional advancement or they may simply not be interested in any advancement.

Of the 50 data processing leaders who have been in education for less than 20 years, only 7 felt that their data processing experience was not useful for their advancement. This indicates that the younger data processing leaders feel their knowledge and experience has helped or will help them in their personal goals.

The calculated chi-square is significant at the .01 level. Thus, the hypothesis of independence is rejected and a significant relationship between the row and column variables exists.

TABLE 57

USEFULNESS OF DATA PROCESSING EXPERIENCE VS ATTENDANCE AT A WORKSHOP OR IN SERVICE TRAINING

Usefulness of Data Processing Experience	Workshop or In-Service Attendance		Row Total	Row Pct Col Pct Tot Pct
	No	Yes		
Yes	15	34	49	
	30.6	69.4	76.6	
	60.0	87.2		
	23.4	53.1		
No	10	5	15	
	66.7	33.3	23.4	
	40.0	12.8		
	15.6	7.8		
COLUMN TOTAL	25	39	64	
	39.1	60.9	100.0	

Significance - .05

In Table 57 the row variable of attendance at a workshop or in-service training is placed against the column variable of the usefulness of one's data processing experience.

Table 57 indicates that of the 49 persons who felt their data processing experience was useful, 34 (69.4%) have attended a workshop or in-service training since being appointed to their current position. Five of 15 data processing leaders indicated that their data processing experience was not useful to their personal goals, but did attend a workshop or in-service training related to data processing. This table indicates that the majority of data processing leaders feel that their experience in data processing is helpful in attaining a personal goal and will make every effort to attend workshops or/and in-serivce training to supplement their knowledge of computers, computer programs and available services. These workshops are most often conducted by the data processing personnel from the intermediate school district.

The chi-square was calculated and is significant at the .05 level. The hypothesis of independence is rejected and a significant relationship exists between the row and column variables.

In Table 58 the row variable of attendance at a seminar or conference is placed against the column variable of the usefulness of one's data processing experience.

The table indicates that of the 49 persons who feel their data processing experience will be helpful in attaining their personal goals,

only 2 (4.1%) attended a seminar or conference related to data processing. Of the 15 data processing leaders who did not feel their data processing experience has or will be helpful in achieving their personal goals, 5 (33.3%) attended a seminar or conference since acquiring their current position.

Thus, we can conclude that attendance at a seminar or conference related to data processing is not considered a very high priority of those data processing leaders who feel that their experience in data processing has been or will be helpful in their personal advancement.

TABLE 58

USEFULNESS OF DATA PROCESSING EXPERIENCE VS ATTENDANCE AT A SEMINAR OR A CONFERENCE

Usefulness of Data Processing Experience	Seminar or Conference		Row Total	Row Pct Col Pct Tot Pct
	No	Yes		
Yes	47 95.9 82.5 73.4	2 4.1 28.6 3.1	49 76.6	
No	10 66.7 17.5 15.6	5 33.3 71.4 7.8	15 23.4	
COLUMN TOTAL	57 89.1	7 10.9	64 100.0	

Significance - .01

The chi-square has been calculated and is significant at the .01 level. The hypothesis of independence is rejected and thus a significant relationship exists between the rowand column variables.

TABLE 59

USEFULNESS OF DATA PROCESSING EXPERIENCE VS KNOWLEDGE OF COMPUTER LANGUAGE

Usefulness of Data Processing Experience	Knowledge of Computer Language No	Yes	Row Total	Row Pct / Col Pct / Tot Pct
Yes	19	30	49	
	38.8	61.2	76.6	
	63.3	88.2		
	29.7	46.9		
No	11	4	15	
	73.3	26.7	23.4	
	36.7	11.8		
	17.2	6.3		
COLUMN TOTAL	30	34	64	
	46.9	53.1	100.0	

Significance - .05

In Table 59 the row variable of the knowledge of computer languages is placed against the column variable which is the usefulness of data processing experiences.

In this table, 30 (61.2%) of the 49 data processing leaders who feel their data processing experience has been or will be useful in their personal advancement indicated that a person interested in a future in educational data processing should have knowledge of computer

languages. Of those 15 data processing leaders who do not believe that their data processing experience has been or will be useful in their personal advancement, a total of 4 (26.7%) felt that knowledge of computer languages should be a part of a person's background in educational data processing. We can conclude from this information that knowledge of computer languages is one criterion that most current data processing leaders feel is important for prospective persons interested in educational data processing. This is an interesting conclusion considering most of the current data processing leaders have not had any formal knowledge of computers, let along the knowledge of computer languages, when they acquired their current position. Refer also to Table 36.

The calculated chi-square is significant at the .05 level. Thus, the hypothesis of independence is rejected and the row and column variables are significantly related.

In Appendix B a number of bivariate frequency tables are presented. The calculated chi-square value exceeds the specified .05 and .01 level of significance. Thus, in these tables, there is no significant relationship between the row and column variables.

In summarizing the significant chi-square tests of independence at the .01 and the .05 level of significance, it is important to see the relationship that exists between such variables as: the size of the high school and the student services that use electronic data processing operations, the percent of time the data processing leader in the high school devotes to data processing activities, and the kind of other responsibilities he has as a full-time professional staff

member, the future of data processing programs in high schools and their causes for these programs and services increasing, decreasing or staying the same, the usefulness of the data processing leader's experience and his/her enrollment in data processing classes and participation at conferences, seminars, and in-service activities related to data processing activities.

These bivariate frequency tables reject the hypothesis of independence and because of their low chi-square (1% or 5% level) we can conclude that the two variable presented in each table are related. In other words, the larger the high school, the greater the chance the schools are involved in grade reporting and audio visual requests by computer. The larger the high school, the more current data processing leaders feel that administrative experience is needed for a person considering a future in educational data processing.

High schools who store student information by means of a computer usually have a data processing leader who spends up to 25% of his/her time involved in data processing activities. The more time a data processing leader spends on such responsibilities as teacher evaluation and curriculum involvement in the high school, the less time he/she has to devote to data processing of student services.

Current data processing leaders who spend up to 25% of their time involved in data processing activities indicate that programs and services that use the computer will increase in the future as a result of additional software (programs), hardware (machines) available to them and through an increase in their own expertise in computer-

related activities. Experience in data processing at the high school level has helped those individuals in their future personal advancement, especially if they have been involved in education from 11-20 years, attend data processing workshops, conferences, or in-service training, and have knowledge of computer languages.

Personal Interview of Selected High School Principals

The following information is a reflection of the responses given by the principals from ten high schools in Oakland County. These responses were obtained from personal interviews with the ten high school principals.

The questionnaire used and the personal interview with the principals attempt to gather information related to the data processing of student services and the coordination of these services by a data processing leader in their high school.

Each question that was asked of the principals with the frequency and percent of response as given by the principals interviewed is listed below. The nature of some questions allows for more than one response to be given. Rather than discourage some responses or put a priority on them, it was decided to list all the responses given by the ten interviewed principals

1. Who determines the amount and the nature of the information that your school collects regarding students? For example - name, address, birthdate, etc.

Response:	Frequency	%
A. Parents	0	0
B. Students	0	0
C. School Board	0	0
D. Administration	7	70
E. Other (County - Oakland Schools through state and federal regulations)	3	30

2. How long is this student information kept on file?

Response	Frequency	%
Permanently	10	100

3. Where is the information on students kept? (After the student leaves school - graduates, transfers or drops out).

Response	Frequency	%
A. Student records office (Including counselor's office) in the school	8	80
B. Central office	2	20

4. Who has access to the student information?

Response		Frequency	%
A. While the student is enrolled	(Counselors)	2	20
	(Records clerk)	1	10
	(Any professional in the school)	7	70

5. Who has access to the student information?

Response		Frequency	%
A. After the student leaves school (graduates, transfers or drops out)	(Counselors)	1	10
	(Records clerk)	8	80
	(Any professional in the school)	1	10

At what point does manual data collection on students stop and electronic data collection begin?

Response	As a result of:	Frequency	%
A. Increased efficiency and improved services of data processing		1	10
B. Available programs that			

	Frequency	%
reflect greater efficienty for schools including scheduling	3	30
C. Improved accuracy of information	2	20
D. Expanded services of Oakland Schools in educational data processing	2	20
E. Increase in student enrollment and volume of information needed	2	20

6. Is there a point at which electronic data processing cost exceeds the value and a school return to manual data collection and dissemination?

Response	Frequency	%
A. Yes	0	0
B. No	10	100

Additional comments:

A. Will use the computer differently; for example, instead of computer scheduling - college type scheduling
B. Information too valuable to go back to a manual collection system
C. Cost is high, but well worth the results

7. What training should a local school person have who is responsible for the collection and dissemination of student information?

Response	Frequency	%
A. Be able to communicate with data processing people and high school personnel	3	9.9
B. Knowledge of schedule building	1	3.3
C. Experience in data processing in a local high school	1	3.3
D. Ability to learn data processing	3	9.9
E. Administrative experience and/or counseling experience	2	6.6
F. No specific training	1	3.3
G. Understanding of high school organization and curriculum	6	19.8
H. Minimum knowledge of computers	3	9.9
I. Ability to follow a problem through to the end	2	6.6

	Frequency	%
J. Experience in educational data processing	2	6.6
K. An organized person	2	6.6
L. Person interested in detail, logic and foresight	4	13.2

8. How do school leaders get into the field of educational data processing?

Response	Frequency	%
A. Interested in educational data processing	6	39.6
B. By taking a computer course	1	6.6
C. Training at the county level	1	6.6
D. By accident or by chance when a person had to convert to an educational data processing position	4	26.4
E. Saw educational data processing as a development of skills, organization and logic that led to personal satisfaction	3	19.8

9. List some problems or concerns you have concerning electronic data processing.

Response	Frequency	%
A. Changing over from card system to optical scan system	2	10
B. Changing from an "in house" system to the "county system" of educational data processing	2	10
C. County tries to accommodate too many school districts, thus they are always making changes. Student services are always in a state of flux	2	10
D. Student services are the lowest priority at the county level in educational data processing. Personnel and software are not as effective		

	Frequency	%
or efficient as in the other areas of data processing	2	10
E. Information available from the county is often wasted because school administration and staff do not have the time or the knowledge to make thorough use of the information received	4	20
F. Feels good about educational data processing	1	5
G. Often requires more manual work to get the information ready for the computer use, than if the job were done completely by hand	2	10
H. More faith in the decisions of people than in machine responses	1	5
I. Lack of knowledge and sophistication with computer information by the professional educator, administrator, lay person, school board member	2	10
J. Would like more information from the computer regarding students in their buildings	2	10

10. How did your data processing leader gain his experience in this area?

Response	Frequency	%
A. Personally sought it from Oakland Schools	1	6.6
B. Administrative intern	1	6.6
C. College courses in data processing	3	19.8
D. Math oriented background	1	6.6
E. Assigned - part of the job description	2	13.2
F. Worked into the position as a result of his/her knowledge, interest and hard work	7	46.2

11. How could one update his knowledge in the field of educational data processing?

Response	Frequency	%
A. Sharing ideas and knowledge with other data processing leaders in other high schools	7	31.5
B. Sharing ideas and knowledge with data processing people at the county level	3	13.5
C. Attending workshops, conferences related to educational data processing	4	18.0
D. Sharing information at the county-wide educational data processing meetings (SIMS - Student Information Systems)	5	22.5
E. Taking a course in data processing	1	4.5
F. Attending in-service related to educational data processing within one's own school district	2	9.0

In summarizing the interviews of selected high school principals regarding the nature of student information collected, we can conclude that the school administration determines what kinds of information is collected, where it is kept, and who has access to this information in their high school. In most cases, information about students is kept on file in a records office in the school, and is accessed by a professional in the school or a designated records clerk.

The collection, storage and dissemination of student information in high schools have been shifted in recent years from a manual system to an electronic system. This is a result of the advancement of programs (software) related to student services, an increase in student enrollment, volume of student information required for

decision making, increased efficiency and expanded data processing services available through the intermediate school district.

According to the high school principals surveyed, the data processing leader in the high school should have knowledge of high school organization and curriculum, interest in detail, foresight, and ability to learn data processing with a minimum knowledge of computers and be able to communicate with data processing people as well as high school personnel.

Most persons involved in data processing at the high school level acquired their responsibilities through their own initiative, interest, hard work, or as an assignment by a superior to take on this added responsibility.

The principals indicated that much of the information that is available through the computer concerning students and programs is wasted because school administrators and staff do not have the time or the knowledge to make thorough use of the information received. They also indicated that changing from an "in-house" system to the intermediate school district data processing system often causes problems of transition for all involved. Adequate knowledge and sophistication of computer printout information by the professional educator, administrator, lay person or school board member are often lacking in our current educational system.

The best way to update one's knowledge in the field of educational data processing is by sharing ideas and knowledge with other

data processing leaders from other high schools, through county-wide educational meetings and/or attendance at workshops or conferences related to educational data processing.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

Introduction

In recent years the educational administration is faced directly or indirectly with the effects of two revolutionary phenomena - the population explosion and the influence of technological developments. The effects of the latter in great measure reflects the basis for this study.

The expenditure of human and material resources during the decade of the 1960's established educational data processing as a potential tool for use by the educational administrator. The activities of the last decade can be viewed principally as the introduction of electronic data processing into an educational environment. The initial experience of the administrators, especially in high schools with automated systems demonstrated that electronic data processing is not a panacea for their administrative ills. The value of data processing as an administrative tool in the school district or in the high school is directly related to the extent of an administrator's involvement and understanding of the processes necessary to make it a viable instrument. If there is to be an emergence of educational data processing, especially in the area of student services as a unique

adaptation of a technology to serve the needs of education, a broader and deeper perception of the technology will be required of educators.

Purpose of the Study

Electronic data processing of student services and the coordination in high schools is a relatively recent phenomenon.

The basic purpose of this study is to determine the various students' services that use the computer applications and are coordinated by a data processing leader in selected high schools of Michigan. This study also attempts to describe and analyze the role, the background, the educational level and the general profile of the data processing coordinator in these high schools.

Research Design

The data base reflected in this descriptive study was drawn from all high schools in Oakland and Macomb Counties, and other selected high schools throughout Michigan. The high schools in the counties of Oakland and Macomb were selected for this study because of their involvement in the area of electronic data processing as related to student services.

Data Collection

The method used to establish a data base for the study was a survey questionnaire. This survey was sent to the principals of all the high schools in Oakland and Macomb Counties and to other selected high schools in Michigan. The principal was asked to forward the

questionnaire to the person who coordinated the data processing activities in their high school. The questionnaire reflects the: (a) Various student services that use computer applications in the high schools; (b) Role, background, educational training and a general profile of the data processing coordinator in the selected high schools.

In addition to the mailed survey questionnaire, a personal interview using a questionnaire was used. The interviews were made with high school principals in schools where data processing of student services was an ongoing activity. This questionnaire reflected the: (a) Nature of information collected on students; (b) Access and security of student information; (c) Role and training of the data processing leader in their high school.

Evaluation and Conclusion

Computer technology in high schools has developed rapidly in the last ten years. This study brings out the nature of the responsibilities of one administrator in each high school in the area of educational data processing. It indicates that most high schools use up to 25% of an administrator's time in collecting, coordinating and disseminating information about and for students with the help of the computer. The individual responsible for this task is a person, 30-49 years, who acquired his current responsibilities through hard work, desire and interest in the field of educational data processing. Very little technical training was needed when the current data processing administrator began taking over these responsibilities. Today, however,

after a number of years behind them, these same individuals feel that a knowledge of computer languages and much in-service training is necessary for any person considering a position in educational data processing.

Educational administrators are demonstrating that they are responding to the rapidly changing requirements in educational administration. The administrator associated with the high schools surveyed has been the principal leadership source for introducing and implementing automated systems in the high school environment. The degree of acceptance of electronic data processing in the high schools surveyed, can be directly attributed to this core of data processing leaders.

In providing the leadership role for the introduction of electronic data processing, the administrator had to develop a basic perception and knowledge of electronic data processing upon which to build future data processing activities within their high school. With the help of in-service training, workshops and formal classes in data processing, these individuals have worked hard to implement an acceptable system of data processing within their school that will benefit students, staff and community with more information and a better understanding than was available through the old manual-type system.

The high school principals surveyed indicated that in their desire to be supportive of efforts to implement automated systems and to

forestall any radical departure from prevailing practices, established the practice of assigning an educator with interest and/or skills to prepare and coordinate any transition to an automated system. The rationale for this approach appeared to be twofold: (a) To expedite the problem of communication between the technician and the non-technician; (b) To retain control over procedures and services.

This practice has prevailed in all but one high school involved in this study. This is a practice which seems firmly entrenched based upon the responses of those surveyed.

On a state-wide basis, Michigan has suffered from a fragmentary approach to the introduction and implementation of electronic data processing in an educational environment. The leadership and coordination of the State Department of Education has been notably lacking. With the exception of a few exemplary local district programs, the intermediate school districts have emerged as a coordinating agent for educational data processing endeavors.

Top level administrators, while supportive of educational data processing activities, presently have a minimal understanding of a systems approach which complements and is essential to educational data processing activity. The only leadership that attempts to understand and implement the automated system in high schools is the data processing leader as described in this study. He has the responsibility of assisting fellow administrators and staff members in defining and meeting educational objectives through the assistance of electronic data processing.

The increase in educational data processing expenditures over the past years are not only indicative of the increased cost of maintaining educational data processing facilities, but a willingness to recognize improved reporting and reliability of information using educational data processing methods. The successes have been sufficient to create an attitude that if conditions permitted, administrators would expand data processing facilities and/or operations. The influence of educational data processing is just beginning to be noticed in the area where educational enterprise exists, meeting the instructional needs of young people. There is evidence to support that significant efforts are being made to develop and/or expand the educational needs of students. The major obstacles to future development based on the responses of the administrators are: (1) Increasing costs of educational data processing; (2) Shortage of qualified personnel; (3) Lack of understanding and training of existing personnel in adapting educational data processing to institutional uses; (4) Lack of technological limitations especially acceptable software (programs).

Educational data processing is emerging as a management tool after a slow beginning as a mechanical clerk that was used to relieve the old manual methods in schools. With the adaption of educational data processing methods in high schools, some of the immediate problems of relieving tedious clerical tasks created by increased demands for record keeping have been eliminated. Initially, educa-

tional data processing's primary objective in school districts was to replace manual clerical tasks. However, with familiarity of educational data processing methods and procedures and with their growth, certain administrators appear to be developing the skills of analyzing and forecasting as an aid to decision making. The ability to obtain more comprehensive reporting should enable administrators to develop an aspect of accountability at varying levels of the organizational structure, which heretofore was not easily obtained.

Educational data processing has been most successful in the educational environment, adopting to the area of finance. The success of these financial related areas is primarily a carry over from non-educational enterprises.

Education in general, and high schools in particular, have not as yet experienced the full impact and efficient utilization of educational data processing. Presently the cost, time available and the efforts of educators must be considered when the implementation of additional programs is being considered. Administrators are realizing that educators must assume a greater burden in preparing personnel for utilizing educational data processing in meeting the needs of education.

As high school administrators observe or initiate new or improved systems of data processing in their high school, the following ideas should always be considered. It is very easy for high school administrators to become too data-processing orientated, so as to lose sight of the main purpose in school - that of educating children. A few

examples of the way some high schools currently use data processing and automation with their students rather than to them are described. In the past few years many high schools have shifted from a computer type scheduling of students to the "college or arena" type scheduling. The "college or arena" scheduling, in most cases, allows students to select their classes, teacher and periods of the day, all within a framework of a master schedule. The computer actually does the clerical work after the student has made his/her selections. The computer type scheduling which has become less acceptable in high schools today allows the student to select his/her classes and the computer selects the teacher and the periods of the day for the student. A computer completed schedule is then distributed to students for their use.

Vast resources of knowledge are available for students' use through books, magazines, films, pamphlets regarding careers, colleges and trade or technical schools. This information has recently been organized and programmed into a system of information files so that students interested can go to a cathode-ray display machine and request this information using an attractive typewriter keyboard. Immediate feedback responding to the student's request will be available on a screen in front of the student. This kind of information can be very helpful to the student, his parents and his counselor.

Computer assisted instruction (CAI) is becoming more and more popular in high schools, especially in the areas of science, mathe-

matics, and social sciences. These CAI programs allow students in a class to have direct access to a computer through cathode-ray display machines, typewriter terminals or teletype machines. This method of problem solving allows students to make computations, run simulations and acquire basic facts. This type of instruction does not eliminate a teacher's contact with his/her students, but rather tends to increase the individual contact teachers have with their students. The speed of the computer can increase the potential of the teacher, making it possible to carry out more educational tasks and free the teacher from time-consuming chores. Students must learn to work with the equipment, interpret the results received and be able to accept temporary failure. This type of application assists the teacher in the management of classroom activities.

In order to better assist teachers in their management of classroom data and materials, the staff at the local high school must have an understanding of what data processing can do for them in their high school. School computer centers, as we have found in this study, provide a variety of business services and student accounting services. The student accounting services tend to affect teachers more directly. Listed on the following page are several ways in which student accounting services are carried out within the framework of educational data processing. The ways in which applications are made to work would depend on the local school district operations. Some of the applications include:

1. Student scheduling
    a. Computer scheduling
    b. College or arena scheduling
2. Grade reporting
3. Test scoring and analyzing
4. Attendance reporting
5. Permanent records
6. Special applications
    a. Locker assignments
    b. School bus assignments
    c. Research
    d. Low achievement students
    e. College bound students
    f. Scheduling of audio visual equipment

In summary, data processing involves: (a) The collecting of data for new transactions; (b) Manipulating new inputs and data already in files according to prescribed plan; (c) Producing output documents for various purposes. Thus, the computer can be and is used as an aid in classroom management in many of the high schools described in this study.

School administrators must guard against any hasty conclusions regarding the inevitability of progress. Things happen too fast; events, developing a momentum all of their own tend to get out of control with

bewildering rapidity, and all too often today's brilliant dreams become the dark nightmares of the future.

It requires no excessive amount of extrasensory perception to see some of the dangers that might face us if certain capabilities of the computer world were to be misdirected. Together, the various data files of the different networks - medical, educational, financial, legal and law enforcement, etc. - could contain a complete record from birth until death of even the most private affairs of everyone. In the absence of adequate controls, there are obviously enormous possibilities for industrial espionage and even blackmail in some such situations.

Administrators must constantly be aware of the vast amounts of information contained in the central storage unit of the computer on students who are enrolled in their schools. Some of the student information would be of a general nature and its use would not compromise the student's right to privacy. Some items might be of a more sensitive nature and would be desirable to possess restrictions upon their use. Examples of items for which limited access may or may not be indicated are religion, ethnic groups, teacher ratings, personality profiles, health records and disciplinary and police records.

It is very easy for teachers and parents to mistrust the computer. However, security problems, highlighted by the computer, have always existed. Information residing within a file would not pose a problem but simply remain there until it is retrieved by someone. Security

problems can arise unintentionally simply because information is entered into a file and retrieved by inexperienced staff who do not understand how information is to be used and by whom. Problems can arise from careless handling and loss of records. Problems can also arise when people misuse information.

Security problems extend beyond the individual student. School administrators have the responsibility for releasing any information to persons outside the school and then only with the permission of the student and/or the parents.

Problems of preventing unauthorized individuals from obtaining access to restricted information on students are not easily solved, and perhaps there is no foolproof solution. One evident possibility is to assign a responsible person in each high school that is qualified to receive and disseminate this information that is obtained from the student files in the computer. Such a person could be the data processing leader that we have described in this study.

When one thinks data processing and computers, whether in the field of business, education, or the sciences, the word automation comes to mind. How do computers in education affect automation, and what are the effects of automation in our society? Automation is part of the explosion of knowledge we now are witnessing. The unusual measure of this explosion is the quotation attributed to J. Robert Oppenheimer that our scientific knowledge doubles approximately every eight years. This makes for greater specialization and reduces

the possibility of making well-rounded citizens in a democratic society who have to understand many things in order to take an active and informed part in the decision-making process. In effect, the increase in knowledge and complexity means an increasing tendency to delegate some of our decisions to others - to consumer groups, political parties, trade associations, etc.

Automation should be an unmixed blessing, leading us to higher production, better health and safety, and a higher standard of living. To put it briefly, automation makes possible the more effective use of our resources and speeds their distribution. In practice, all of these achievements are being accomplished, but at a social cost which is not fully known. Man within limits is conquering nature. Some examples include sending man to the moon, observing live coverage of the XIIth Winter Olympics from Austria, open heart surgery, kidney transplants, better chemicals for better and more food production, etc., etc. However, man is lagging in his conquest of the social environment. We have the ability to produce and distribute an abundant supply of water and food, but yet some of our population are underfed. The housing in many of our large cities is substandard and congested although we have the knowledge and means of overcoming these deficiencies.

What are the educational implications that arise from automation, of which electronic data processing is a part? First of all, every change calls for a new skill which in turn calls for retraining or

re-education. Because of this, there are increasing demands for adult education. Education is the key to maintaining skills needed on a changing evolving job. Finally, education has been shown to pay off in lifetime income and is often considered a worthwhile investment. Above all, there is much evidence to support lifelong learning. It is a necessity for the older person to learn new skills, some of which may be to better utilize their leisure time.

Secondly, unemployment has been running at approximately seven to eight percent. In the face of this problem, the primary educational responsibility must be in the area of saleable skills. How is this tremendous task possible of preparing students for a future which is as yet unknown?

We do have an affluent society with large pockets of unemployment, poverty and deprivation. Could we not decide to distribute this affluence more evenly? Most of our population is overfed, although there are children and adults who go hungry. Most adults, disregarding those who are retired, are working and on a payroll, but many others are unemployed and have involuntary leisure when they can least afford it. These people tend to be undereducated and underskilled, have obsolete skills and are ill prepared to cope with the change, adversity and technology advances.

This segment of our society is paying a disproportionate share of the cost of automation. The displaced coal miner, the semi-literate shipping clerk, the Negro migrant, the frustrated high school

dropout - bear the brunt of technological change. No one planned it this way, but the engineer, the businessman, the building contractor, the scientist and the technician with their ingenuity, education, initiative and self-confidence along with luck and fortunate choice of parents - are reaping the benefits of automation.

We somehow need to close the gap between our lagging social measures and our dormant human concerns on the one hand, and our deliberate stimulation and exploitation of physical science and resources on the other.[76]

The rise and spread of a computer-service society can be seen to bring an unprecedented advance in the potential for cooperative human control over the social and physical environment. This new capability has been spread out in the period of alarming and increasing social problems marked by accelerated social change.

The spread of computers in automation even in the field of education in our advanced industrial society, has been characterized by emphasis on technical problems and by a chronic neglect of human problems. Social factors inevitably turn out to be far more important and more complex than the technical challenge over the long run. This kind of evolution enthrones the engine and unseats the driver.[77]

Although the popular stereotype in the United States regards the

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[76]William W. Brickman, Automation, Education and Human Values (New York, School and Society Books, 1966), p. 65.

[77]Ibid, pp. 67-70.

effects of automation as an inevitable loss of jobs with rising unemployment, close analysis reveals that this interpretation is invalid for other industrial countries experiencing rapid automation. As Harold Shackaman[78] indicates, the impact of automation and extension of computers into social affairs was seen to be intertwined with a transformation of the entire cultural complex; economic, political, education, ethical, philosophical, demographic, regional, national, and global factors all enter into the social equation for automation.

Accelerated rate of social change, the increased need for rapid social and individual adjustment to new conditions, and the high rate of obsolescence of knowledge and skills learned early in life are interpreted as requiring a rising level of human intelligence and a transition toward life-long learning in computer-serviced societies.

Education will increasingly require a real time flavor that must be tailored to meet the demands of individuals for new knowledge and new situations as they arise. Problems of leisure time and free time are seen to be increasingly tied to the rise of automation.

Great qualitative changes may occur in society through computer assisted intelligence. According to Harold Shackman, form and technique of democracy may be transformed and may be spread through all levels of society as more and more people may be able to pool their opinions, knowledge and efforts more frequently and more rapidly

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[78]Harold Shackman, Computers, Systems Science, and Evolving Society (New York, John Wiley and Sons, Inc., 1967), p. 595.

over a wide range of social affairs.[79] This vast pooling of social information made possible by man-computer communication may lift human intelligence to new heights and make possible more powerful forms of democracy and more universal application of experimental methods towards solution of social problems.

Scientific progress should continue to spiral upward, making human regulation and control of social and earthly evolution a reality rather than a dream. The main obstacle to achievement of this "new Utopia", as Boguslaw calls it, is not technological, it is human.[80]

According to Jencks,[81] economic success seems to depend on varieties of luck and on-the-job competence that are moderately related to family background and schooling. He indicates that we cannot equalize luck or job competence but we can eliminate poverty. We would have to change the rules of the game so as to reduce the rewards of competitive success and the cost of failure.

Employers could be constrained to reduce wage disparities between their best and their worst paid workers. The state could make taxes more progressive and provide income supplements to those who cannot make an adequate living from wages alone. The state could also provide free public service for those who cannot afford to buy adequate

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[79] Ibid, p. 37.

[80] Robert Boguslaw, The New Utopians (Englewood Cliff, New Jersey, Prentice-Hall, 1965).

[81] Christopher Jencks, Inequality (New York Basic Books, Inc., 1972), pp. 3-14.

services. The next effect would be to make those people with competence and luck subsidize those with the least competence and luck to a far greater extent than they do today.

Jencks indicates that unless we change the political and moral premise on which most Americans now operate, poverty and inequality of opportunity will persist at pretty much their present level.

The relationship that exists between the quality of high schools and a student's success or failure in the world of work is also an important factor in today's changing society. An article in August, 1975, Harvard Educational Review by Christopher S. Jencks of Harvard University, discusses the quality of schools and the data from Project Talent, which tried to relate high school quality to high school characteristics. Jencks defines high school quality as "any set of characteristics that affects the average student's rate of growth between the 9th and the 12th grades".[82] This means, for example, in Michigan that changes in high school characteristics like teacher experience, class size, and social composition are unlikely to change high school effectiveness, and that holding schools accountable for one outcome is unlikely to guarantee effectiveness on another. The author also argues that the equalization of high school quality would do little to reduce inequality among young adults. However, the difficulty is that nobody knows how to eliminate disparities in high school qualities at

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[82]Christopher S. Jencks and Marsha D. Brown, "Effects of High Schools on their Students", Harvard Educational Review August, 1975 , pp. 273-324.

least when these are defined in terms of educational outcomes. The best that can be done is to eliminate disparities in inputs.

With the constant changing technology there is a need for a broad, general education because there is no room at the bottom for those who are illiterate, unskilled, undereducated or otherwise unable to become meaningful parts of our society. We must develop an awareness for change and be receptive to it, for change is certain to come.

There is a need for all citizens to have a better knowledge and understanding of the democratic process, a need for civic competence as well as an appreciation of human relations. Finally, there is a need for life-long learning as a means of economic survival. Education must be continually sought and acquired through one's lifetime so that knowledge can be cultivated and shared.

To use the words of Willard Wirtz, former Secretary of Labor, "there is no reason to be afraid of machines . . . . there is great reason, however, to be concerned how hard it is to get people who are educated and trained to see what machines are doing to people who are not educated and trained."[83]

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[83]Address by Secretary of Labor, W. Willard Wirtz, Fifth Constitutional Convention, A.F.L.-C.I.O., New York City, November 14, 1963.

Recommendations

The following recommendations are offered in the belief that technological growth in an educational environment will accelerate rather than diminish.

If education is to be responsive within the environment in which it operates and the administrator's role is to continually examine the indices of what constitutes good education, administrators will need to become the interface between the emerging technologies, the educational process and the society they are obliged to serve. In essence, the educational administrator should have at his disposal the total body of data related to the educational enterprise bearing upon the educational process. The ability to communicate these processes rest in great measure upon a reliable information system which reflects the total educational endeavor. To implement such a system requires the following considerations.

1. The establishment of programs, support and involvement of university personnel with public school personnel in the development of programs of instruction of both a technical and non-technical orientation must be made to deal with the emerging technology and its relationship to education. This could be accomplished at the university level by requiring prospective school administrators to enroll in a data processing experience.

2. Information systems are an end product of man-machine interaction. To promote understanding and better utilization of computer-based information systems by administrators, formalized in-service activities in the area of student services must be made available

through state, university, intermediate school district and/or local school district sponsorship.

3. Educational personnel should participate in the development of a comprehensive and orderly plan of implementation using data processing services. School administrators and university educators should work together to develop and implement an in-service training program in data processing for school personnel.

4. Educational administrators must acquire the skills and the knowledge necessary to help control the use of the computer in schools. Computer-based information should be available for decision making by school personnel, However, administrators must constantly guard against losing the freedom, flexibility and personal touch that is necessary in the operation of schools if and when computer-based technology is established.

5. Various cooperative efforts in data processing should be continuously explored, including the use of regional centers, state departments of education and regional laboratories for the establishment and coordination of educational research and better implementation of computer-based technology in schools.

6. There is a need to continue whatever educational research is presently going on, incorporating the use of the computer and to develop further research using: simulations, gaming, "what if" questions, and cost effectiveness studies. This research could determine: the possible effects of a state-wide computer system, guidelines as to when to automate an activity and how far it should be automated, the effects of computer operations on decision making and the effects of computers on people including students, staff, boards of education and community members.

APPENDIX A

QUESTIONNAIRE DATA

Royal Oak, Michigan 48067
September 10, 1975

Dear High School Principal:

As a candidate for the Doctoral Program in Educational Administration at the University of Michigan, I have undertaken a study to determine the use of data processing and its administrative coordination in selected high schools of Michigan.

I am especially interested in surveying the person or persons directly associated with data processing in your school, in order to accumulate information regarding their involvement, education, background and future insights into the field of educational data processing.

Would you please pass on the attached questionnaire to the person in your school who is most closely associated with schedule making, grade reporting, student attendance, etc.

Thank you very much.

Sincerely yours,

William F. Cayen

WFC:mf

Royal Oak, Michigan 48067
September 10, 1975

Dear Data Processing Leader:

Attached is a questionnaire that is being sent to selected high schools in the State of Michigan. The questionnaire has been developed to gather information from people like yourself, who are directly involved with data processing. The information will be used to develop a study in Educational Administration as partial fulfillment of a Doctoral Program at the University of Michigan.

I would very much appreciate your responses to the questions listed below. When completed, please enclose the questionnaire in the pre-stamped self addressed envelope and mail to me.

If you have any questions regarding the survey or the study, feel free to call me at Berkley High School (548-5388).

Thank you very much for your time and comments.

Sincerely yours,

William F. Cayen

WFC:mf

SURVEY QUESTIONNAIRE

Card Column	Code	Check Appropriate Category
		Age:
1	1	___ 20-29
	2	___ 30-39
	3	___ 40-49
	4	___ 50-59
	5	___ 60 or over
		Years of Experience in Education:
2	1	___ 1-5
	2	___ 6-10
	3	___ 11-15
	4	___ 16-20
	5	___ More than 21
		Sex:
3	1	___ Male
	2	___ Female
		Years involved in data processing:
4	1	___ 1-5
	2	___ 6-10
	3	___ 11-15
	4	___ 16-20
	5	___ More than 21
		Position:
5	1	___ Teacher
	2	___ Counselor
	3	___ Administrator
	4	___ Other (Please explain) _____
		Years at this school:
6	1	___ 0-9

2 ___ 10-19
3 ___ 20-29
4 ___ 30 or more

Size of school:

7
1 ___ 0-500
2 ___ 501-1000
3 ___ 1001-2000
4 ___ More than 2000

Grades in the school:

8
1 ___ 9-12
2 ___ 10-12

Data processing system:

9
1 ___ In-House
2 ___ County system
3 ___ Other (Please explain) _____

Is your school district:

10
1 ___ On Line
2 ___ Off Line

Type of data processing equipment in the school (Check as many as apply)

11 1-0 ___ Keypunch
12 1-0 ___ Typewriter terminal
13 1-0 ___ Card reader and printer
14 1-0 ___ Sorter
15 1-0 ___ Optical Scan Reader
16 1-0 ___ Other (Please explain)_____

My school is serviced by the computer in the following ways: (Check as many as apply)

17 1-0 ___ Grade reporting
18 1-0 ___ Computer Scheduling
19 1-0 ___ Building the Master Schedule

20	1-0	___	Student Attendance
21	1-0	___	Storing student information (permanent records)
22	1-0	___	Student membership information (CA15)
23	1-0	___	Computer assisted instruction programs (CAI)
24	1-0	___	Student test scoring and analyzing
25	1-0	___	Audio visual material requests
26	1-0	___	Student mobility information
27	1-0	___	Counseling and guidance
28	1-0	___	Research
29	1-0	___	Student activities (Please name)_____
30	1-0	___	Special applications (Please name)_____

Do you collect and carry data from sources within your school to a computer center?

31	1	___	No
	2	___	Yes

If you do not do this - who does this task in your school district? _____

Percent of time involved in data processing operations:

32	1	___	0-10%
	2	___	11-25%
	3	___	26-50%
	4	___	Above 50%

My major responsibilities other than data processing and the percent of time involved in these ta ks are: (Check any two that apply)

33	1-0	___	Student discipline	___%
34	1-0	___	Student attendance	___%
35	1-0	___	Teacher evaluation	___%
36	1-0	___	Curriculum	___%
37	1-0	___	Student activities	___%
38	1-0	___	Other (Please Explain)	
				___ %

How did you acquire your position as data processing leader?

39	1-0	___	Assigned - based on a posted position
40	1-0	___	Only qualified person to take the position
41	1-0	___	My individual interest in the area
42	1-0	___	Other (Please explain)_____

Other personnel responsible for data processing in your school and the percent of time involved: _____

What specialized training in data processing have you had before coming to the school as a leader in the area of data processing?

43	1-0	___	College or university course
44	1-0	___	Commercial type course
45	1-0	___	No specific training
46	1-0	___	Other (Please explain)_____

What specialized training have you had since becoming a data processing leader in your school?

_____

What qualities do you think are important for a person considering a future in educational data processing? (Check as many as apply)

47	1-0	___	Understanding of computer languages
48	1-0	___	Teaching background
49	1-0	___	Administrative experience
50	1-0	___	Guidance experience
51	1-0	___	Leadership qualities
52	1-0	___	Mathematics background
53	1-0	___	Other (Please explain)_____

In secondary schools do you see data processing programs and services: (Check one)

54 1 ___ Increasing
2 ___ Decreasing
3 ___ Staying the same

What reasons will be responsible for the above answer: (Check as many as apply)

55 1-0 ___ Financial costs
56 1-0 ___ Enrollmant
57 1-0 ___ Data processing expertise
58 1-0 ___ Available hardware
59 1-0 ___ Available software
60 1-0 ___ Other (Please explain)_____

I belong to the following professional data processing organizations:

61 1-0 ___ Association for Educational Data Systems (AEDS)
62 1-0 ___ Michigan Association for Educational Data Systems (MAEDS)
63 1-0 ___ County Data Processing organization
64 1-0 ___ Other (Please specify)_____

Since acquiring my present posi tion I have updated or increased by knowledge in the area of educational data processing by:

65 1-0 ___ Attending a seminar or conference
66 1-0 ___ Attending a workshop or in service
67 1-0 ___ Taking a course

Based on your own experience, what suggestions do you have for training a leader in the area of educational data processing? (Check as many as apply)

68 1-0 ___ College or university course in data processing
69 1-0 ___ Attendance at workshops, seminars and in-service activities
70 1-0 ___ Completion of a commercial course in data processing

71	1-0	___	Administrative experience
72	1-0	___	Leadership qualities
73	1-0	___	Counseling experience
74	1-0	___	Mathematics background
75	1-0	___	Knowledge of computer languages
76	1-0	___	Interest and desire
77	1-0	___	Other (Please explain)_____

Do you think your background and experience in data processing is or will be useful in your personal advancement?

78	1	___	Yes
	2	___	No

APPENDIX B

BIVARIATE FREQUENCY TABLES

TABLE 60

USEFULNESS OF DATA PROCESSING EXPERIENCE
VS SIZE OF HIGH SCHOOL

Data Processing Experience	Students in High School 0-500	501-1000	1001-2000	2000+	Row Total	Row Pct Col Pct Tot Pct
Yes	3 6.1 100.0 4.7	4 8.2 57.1 6.3	34 69.4 77.3 53.1	8 16.3 80.0 12.5	49 76.6	
No	0 0.0 0.0 0.0	3 20.0 42.9 4.7	10 66.7 22.7 15.6	2 13.3 20.0 3.1	15 23.4	
COLUMN TOTAL	3 4.7	7 10.9	44 68.8	10 15.6	64 100.0	

Significance - 0.48

TABLE 61

USEFULNESS OF DATA PROCESSING EXPERIENCE
VS AGE OF DATA PROCESSING LEADER

Data Processing Experience	Age of Data Processing Leader					Row Total	Row Pct Col Pct Tot Pct
	20-29	30-39	40-49	50-59	60 +		
Yes	4	18	23	4	0	49	
	8.2	36.7	46.9	8.2	0.0	76.6	
	100.0	90.0	71.9	57.1	0.0		
	6.3	28.1	35.9	6.3	0.0		
No	0	2	9	3	1	15	
	0.0	13.3	60.0	20.0	6.7	23.4	
	0.0	10.0	28.1	42.9	100.0		
	0.0	3.1	14.1	4.7	1.6		
COLUMN TOTAL	4	20	32	7	1	64	
	6.3	31.3	50.0	10.9	1.6	100.0	

Significance - .079

TABLE 62

SIZE OF HIGH SCHOOL VS SCHEDULING STUDENTS BY COMPUTER

Students in High School	Computer Scheduling No	Yes	Row Total	Row Pct / Col Pct / Tot Pct
0-500	1	2	3	
	33.3	66.7	4.7	
	11.1	3.6		
	1.6	3.1		
501-1000	1	6	7	
	14.3	85.7	10.9	
	11.1	10.9		
	1.6	9.4		
1001-2000	5	39	44	
	11.4	88.6	68.8	
	55.6	70.9		
	7.8	60.9		
2000 +	2	8	10	
	20.0	80.0	15.6	
	22.2	14.5		
	3.1	12.5		
COLUMN Total	9	5	64	
	14.1	85.9	100.0	

Significance - 0.687

TABLE 63

PERCENT OF TIME INVOLVED IN DATA PROCESSING VS GRADE REPORTING USING A COMPUTER

Percent of Time	Grade Reporting No	Grade Reporting Yes	Row Total	Row Pct Col Pct Tot Pct
0-10	4 13.8 50.0 6.3	25 86.2 44.6 39.1	29 45.3	
11-25	2 8.7 25.0 3.1	21 91.3 37.5 32.8	23 35.9	
25-50	1 14.3 12.5 1.6	6 85.7 10.7 9.4	7 10.9	
50 +	1 20.0 12.5 1.6	4 80.0 7.1 6.3	5 7.8	
COLUMN TOTAL	8 12.5	56 87.5	64 100.0	

Significance - 0.890

TABLE 64

PERCENT OF TIME INVOLVED IN DATA PROCESSING VS SCHEDULING STUDENTS BY COMPUTER

Percent of Time	Computer Scheduling		Row Total	Row Pct Col Pct Tot Pct
	No	Yes		
0-10	4 13.8 44.4 6.3	25 86.2 45.5 39.1	29 45.3	
11-25	4 17.4 44.4 6.3	19 82.6 34.5 29.7	23 35.9	
25-50	0 0.0 0.0 0.0	7 100.0 12.7 10.9	7 10.9	
50-/	1 20.0 11.1 1.6	4 80.0 7.3 6.3	5 7.8	
COLUMN TOTAL	9 14.1	55 85.9	64 100.0	

Significance - 0.681

TABLE 65

PERCENT OF TIME INVOLVED IN DATA PROCESSING VS THE USEFULNESS OF DATA PROCESSING EXPERIENCE

Percent of Time	Useful Data Processing Experience		Row Total	Row Pct Col Pct Tot Pct
	No	Yes		
0-10	19 65.5 38.8 29.7	10 34.5 66.7 15.6	29 45.3	
11-25	19 82.6 38.8 29.7	4 17.4 26.7 6.3	23 35.9	
25-50	7 100.0 14.3 10.9	0 0.0 0.0 0.0	7 10.9	
50 +	4 80.0 8.2 6.3	1 20.0 6.7 1.6	5 7.8	
COLUMN TOTAL	49 76.6	15 23.4	64 100.0	

Significance - 0.202

SELECTED BIBLIOGRAPHY

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Books and Pamphlets

Addis, Winston C. Social Impact of the Computer: An Instructional Approach. Mt. Vernon, Iowa: Community Schools, 1973.

American Association of School Administrators. EDP and the School Administrator. Washington, D. C.: American Association of School Administrators, 1967.

Bassler, Richard. An Introduction to Computer Systems. Arlington, Virginia: College Readings, Inc., 1975.

Boguslaw, Robert. The New Utopians. Englewood Cliff, New Jersey: Prentice Hall, 1965.

Brickman, William W. Automation, Education and Human Values. New York: School and Society Books, 1966.

Brown, John A. Computers and Automation. New York: Arco Publishing Company, Inc., 1968.

Claffey, William J. Principals of Data Processing. Belmont, California: Dickerson Publishing Company, Inc., 1967.

Diebold, John. Beyond Automation. New York: McGraww-Hill Book Company, Inc., 1964.

Drucker, Peter F. The Effective Executive. New York: Harper and Row Publishers, 1967.

Foy, Nancy. Computer Management - A Common Sense Approach. Philadelphia: Auerbach Publishers, Inc., 1971.

Goodlad, J. I., and others. Computers and Information Systems in Education. New York: Brace and World, Inc., 1966.

Gould, Jay M. The Technical Elite. New York: Augustus M. Kelley, 1966.

Grossman, Alvin and Howe, Robert L. Data Processing for Educators. Chicago: Educational Methods, Inc., 1965.

Heany, F. Development of Information Systems. New York: Ronald Press, 1968.

International Business Machines Corporation. Computer Concepts for Elementary and Secondary Schools. White Plains, New York: International Business Machines Corporation, 1969.

_____. More About Computers. White Plains, New York: International Business Machines Corporation, 1971.

_____. Computer Industry Profile. Newton, Massachusetts: Computer World, Inc., 1973.

Jencks, Christopher. Inequality. New York: Basic Books, Inc., 1972.

Johnson, M. Clemens. Educational Uses of the Computer: An Introduction. Chicago: Rand McNally and Company, 1971.

Karmann, Richard A. and Maher, Robert W. Educational Data Processing: New Dimensions, Prospects. New York: Houghton

Lott, Richard W. Basic Data Processing. Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1967.

Martin, E. Wainwright. Electronic Data Processing, An Introduction. Homewood, Illinois: Richard D. Irwin, Inc., 1968.

Michael, Donald N. The Unprepared Society: Planning for a Precarious Future. New York: Basic Books, Inc., 1968.

Molner, Andrew R. Computer Innovations in Education. Washington, D. C.: National Science Foundation, 1974.

Sanders, Donald H. Computers in Society. New York: McGraw-Hill Book Company, 1973.

Shackman, Harold. Computers, Systems, Science and Evolving Society. New York: John Wiley and Sons, Inc., 1967.

Articles and Periodicals

The Association for Educational Data Systems. AEDS Monitor, X (October, 1974).

"Automation and Technology in Education." Joint Economic Committee, Congress of the United States, Wright Patman, Chairman (1966).

Bell, Daniel. "The Measurement of Knowledge in Technology." Indicators of Social Change. Russell Sage Foundation (1968).

Berkeley, C. E. Computer and People, XXIII (March, 1974).

Burck, Gilbert. "The Boundless Age of the Computer." Fortune (March, 1964).

_____. "On Line in Real Time." Fortune (April, 1964).

Computer - World, IX (February, 1975).

"Computers: New Era for Education?" Education USA, Special Report (1968).

DeRodeff, Martin. "Administrative Organization for Educational Data Processing Services." Automated Educational Systems (1967).

Eckert, James B. and Robert R. Wyand. "Automation at Commercial Banks." Federal Reserve Bulletin, XXXXVIII (November, 1962).

Hearle, Edward F. R. "Computers in Public Administration." Public Administration Review, XXVIII (November/December, 1968).

The Institutional Guide to DHEW Policy on Protection of Human Subjects (DHEW Publication No. 72-102, 1971).

Jencks, Christopher and Brown, Marsha D. "Effects of High Schools on Their Schools." Harvard Educational Review (August, 1975).

Kraemer, Kenneth L. "Urban D. P." Datamation XIII (August, 1967).

Laver, Murray. "Users Influence on Computer Systems Design." Datamation, XV (October, 1969).

Mesthene, Emmanuel G. "How Technology Will Shape the Future." Science (July, 1968).

Michigan Child Accounting and Attendance Association Committee Reports. Information Guide for the Collection-Maintenance-Dissemination of Student Records (1972).

Michigan Public School Data Processing Survey. Michigan Department of Education (August, 1974).

Miller, Van. "Superintendent of Schools." Preparation Programs for School Administrators (1963).

"Mini Computers that Run the Factory." Business Week (December, 1973).

"The New Computerized Age." Saturday Review (July, 1966).

"New Tool, New World." Business Week (February, 1964).

"Only One Out of Three Pays for Itself." Business Week (April, 1963).

"Onrush of the Robots." Fortune (March, 1964).

Raferty, C. R. "Management Cannot Use a Parochial Viewpoint." The Office, 67 (January, 1968).

"Technology: Decybernated Generation." Time (April, 1965).

U. S. Department of Health, Education and Welfare. Records, Computers, and the Rights of Citizens: Report of the Secretary's Advisory Committee on Automated Personal Data Systems. DHEW Publication No. 73-94 (July, 1973).

U. S. Department of Health, Education and Welfare. Student/Pupil Accounting. DHEW Publication No. 71-4732 (1974).

Wilkins, Leslie T. "Computer Impact on Public Decision Making." Public Administration Review, XXVIII, No. 6 (November/December, 1968).

Unpublished Material

Address by Secretary of Labor W. Willard Wirtz, Fifth Constitutional Convention, AFL-CIO. New York: November, 1963.

American Association of School Administrators. EDP and the School Administrator. Washington, D. C., 1967.

Association for Educational Data Systems. Training Teachers for Technology. Washington, D. C., 1970.