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ABSTRACT
              A management information system (MIS) is a systems
approach to data processing. It provides relevant, timely, and
accurage data to decisionmakers, as well as information storage,
retrieval, and transfer functions through the use of computers.
Educational administrators have been slow to implement computerized
data processing either because they fail to understand information
systems or because systems planning has been neglected. Population
growth and the changing role of education necessitate implementation
of computerized data handling. Data processing personnel are in the
best position to give educators guidance in data processing and
should be given greater roles in decisionmaking. Only with a good
information management system can current administrative and
educational confusion be ended. (RA)

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$$\mathbb{SP}$$ *a professional paper*

The Concept of Systems Management
in Educational Data Processing

by

Alec R. Bumsted

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Abstract

This paper, originally presented at the annual meeting of the Texas Chapter
of the Association for Educational Data Systems was also included as part
of a national AEDS workshop on management systems held in Washington, D. C.
on October 29, 1968.

The purpose of the paper is to define an educational management information
system and explain the necessity for the complete involvement of system
users in order to obtain system efficiency.

The Concept of Systems Management in Educational Data Processing

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Introduction

Management information systems and information management systems are the
topics of many discussions in the computing industry. Presumably, the former
provides information to management, assisting in the decision making process,
and the latter creates order in a mass of information. Since there is little
difference in the final product between the orderly and systematic processing
of required data, and the making available in a systematic fashion of the
necessary data for evaluation and decision making, the choice of titles must
of necessity rest with the individual. This paper assumes they are the
same and the discussion which follows is an attempt at clarifying what is
data systems management in education, why it is needed, and how it should
be approached.

What is a Management Information System?

Many of the current problems in American education are described as information
management, or system problems. Information management problems are woven
throughout the entire fabric of the educational process, from problems of
storing, retrieving, and displaying information, to problems of receiving,
learning and using information.

Probably the greatest influence for this technological and educational progress
is the computer itself. We are in an era completely dominated by the
computer, so much so that many have claimed that the "Computer Age" will be a
more important milestone in human history than the Industrial Revolution.

If we recognize this and wish to do something about it, can we use this
greatest influence, the computer, to keep abreast?  In the electronic computer,
can we hope to find the solution to information management and control problems
in education?

One method of solution lies in the MIS or systems approach.  A Management
Information System (MIS), must by definition furnish to management, relevant,
accurate and timely operational data to assist them in the performance of their
educational tasks.  Such a system should not be restricted to just those
persons classed as managers, for it is a fact of life that everyone in an
organization must make decisions of one kind or another.  Managers have to
make more of them and the consequences thereof are of deeper significance.

A true MIS, therefore, is one that provides the mechanism for better task
performance throughout the structure of a school system on every level of
activity.

The major objectives of an Management Information System may be summarized
as follows:

1.  Provide data to assure adequate managerial direction and control
    of all aspects of the educational system.

2.  Provide evaluative assistance in the analysis of educational
    programs and concepts, as well as of program implementation.

3.  Be responsive to, and facilitate revisions brought about
    by improvements, requirement changes, and technological advances.

4.  Afford an ongoing evaluation of the MIS itself.

5.  Provide a medium for the dissemination of information and
    interdepartmental communication.

## Why is an MIS Important?

Schools themselves are the source of a veritable mass of data responsive to automation which can be fairly well classified into 5 areas.

1. Financial operations including purchasing, payrolls, financial accounting, and budgeting.

2. Property accounting including inventory, facilities and services, warehousing and delivery schedules.

3. Student accounting which includes scheduling, grade reporting, test scoring, counseling, and transcripts.

4. Personnel including teacher certification, applicant files, retirements, ratings, and leave.

5. Education including course content assessments, computer assisted instruction, program evaluations, simulation.

At present most of this data exists, although its presence is often unknown. Many times it languishes in a forgotten pigeon hole because of the importance of daily chores. Educators, to be sure, recognize this fact and are anxious to do something about it; unfortunately it is frequently approached like a hole in the roof. When it's not raining there is no point in repairing the hole; when it is raining, it is too wet to work outdoors. Exploding school populations and the need for new techniques in both teaching and program evaluations are forcing us to find new and rapid methods for handling data and decision making. Any attempt to forestall the inevitable by refusing to accept the aid of automated data handling in large school systems can only prolong the confusion and increase the burden of data conversion.

Dr. Ernie Anderson, former president of AEDS, recently stated in "Nations
Schools" that the weak link in educational data processing is usually not
found in the equipment used but with the people involved.  He then proceeded
to list five observations based on existent school systems of which the fifth
seems relevant here.  He wrote "Time should be taken to help top administrators
understand data processing and what it might mean for their schools--data
processing is something they must make decisions about, and its use can
affect their decision making processes in almost all areas."

To the above one might add that decision making is probably the most important
function of an administrator.  Fifty years ago, most decisions in the educa-
tional environment could be made and were made at a conservative pace, in
keeping with the pace of social development.  The subjects taught in school
were relatively limited and educational attainment was measured by proficiency
in the 3 R's and the social graces.  Textbooks wore out before they became
outdated.  Today this is no longer true.  The course offerings in today's
schools are myriad.  Texts become outdated overnight.  Professions disappear
and are replaced by others requiring a totally different academic background.
It has been estimated that the average high school graduate of today must
prepare himself to change professions three times during his working life.

Obviously, to operate at such an accelerated pace, administrators must
accelerate their decision making.  The decisions they make must be based on
accurate, up-to-date, and comprehensive information.  That information must
be abstracted from the tremendous volume of data pouring in from many sources,
most of which was unheard of or at least not considered an important factor a
generation ago.

Since administrative officials as a class outrank data processors, the demand
for faster and more efficient methods of handling this paperwork has been
passed on to computer personnel for resolution.  "Let George do it" has become
an axiom for "passing the buck."  Who is George?  The educational data processor.

In response to this pressure for quick results, many educational data processors
have had a tendency to associate the computer with speed alone and not with the
new functions resulting from that speed. Personnel shortages and in some cases
a lack of system planning, force them to adapt hand methods and old applications
to automation rather than determine new applications. As a result, through
three successive generations of automated equipment, the tendency to emulate
has been the easy way out, and it is literally true that hand sorting and
desk calculator procedures have been programmed into the most sophisticated of
electronic computers.[1] Another tendency has been to consider each application
as a unique whole and to program it either without regard to other applications
or often in spite of them. Thus there is no cross reference capability nor
compatibility in data definitions. This is not the isolated circumstance, it
is the vast majority.

## How Does One Approach Systems Management?

Probably the most important reason for the slow diffusion of computer systems
applications into education, is the lack of widespread demonstration and
dissemination of results achieved by successful data processing installations.
To a great extent, operational school personnel do not know what computers and
data processing systems can do for them in helping to solve their problems.

This is one area in which the responsibility for its resolution lies not with
the educator but with the data processor. Again, perhaps, the source of the

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[1] A good case in point is the alphabetic assignment of personnel numbers
for efficiency in machine sorting. Miss Adams is assigned a low order number,
Mr. Williams is given the highest. As soon as Miss Adams marries Mr. Smith,
or Mr. Yancy is hired, the whole system blows up and loses its significance
but the procedure is maintained. It would be much more efficient for the
computer to assign a random number, or human engineering wise, to use
social security numbers.

problem lies in the heavy work load (in this case the data processor's),
but such an excuse is not a valid one.  Additional help would be authorized
if operational personnel were indoctrinated in the services they might expect
and uses to which a computer might be put in the solution of their (the
educator's) individual problems.  Operating funds in like manner can be made
available if their use is sufficiently warranted.

This dissemination of information extends beyond the confines of a specific
school system.  Too often those educational data processors who have the most
to offer have the least to say and for better or worse, much of their work
must be repeated in other districts.  An encouraging start for the sharing of
this information on a national basis has been made by the Association for
Educational Data Systems.  However, AEDS will only be as good as its members
make it, and thus responsibility returns once again to the computer
professional.

Another contributor to the limitations in present usage is the fragmented
approach to system design.  A total systems approach is a meaningless though
often used expression,but the closer one approaches totality, the better the
system will be.  To serve the information needs of the administrators,
teachers, counselors, students, and program directors, a system must be
designed with all potential users in mind.  Consideration must be given to all
data sources and all data destinations within the framework of the proposed
system.

From the experience gained in military, business and scientific applications
of computers, it seems likely that as the number and variety of significant
applications in education grows, and as their value and usefulness are
demonstrated to educators, the demand for management systems and integrated
applications increases.  As a result, we can expect that computer
technology will provide effective assistance to educators in realizing their
educational objectives.

The preceding discussion has attempted to point out several factors which
might be compared to the effect produced by the action of an irresistible
force on an immovable object. We have significant pressure building up for
more and better education, resulting in a consequent administrative burden
which is so overloaded that it cannot meet the demands. Of course, as in
many other insurmountable problems there is a solution. Systems Management
and MONEY! Since it is a lot easier to do something about systems management
than money, I shall confine my remarks to the former.

There are two extremes in the concept of educational data processing systems
and many variations between. One concept is that no two school systems are
alike and therefore any system design work must be unique to its subject
schools. People believing this and lacking funds for system development,
throw up their hands and do nothing. The other concept is that all school
systems are essentially the same, and what has been done for one can be used
in any other. This usually results in procrastination while everyone waits
for John to do the "dirty" work. The truth of course lies somewhere in
between, and many applications can generally be applied with suitable adapta-
tion. Student scheduling programs for example, can be readily transferred
from school to school adapting for curriculum variation or other local
requirements. Payroll generation programs are also fairly standard and when
properly documented can be readily modified for unique circumstances.

Now if some computer programs, which are the most explicit product of a
computerized information system, can be transferred from district to
district economically, it stands to reason that the overall system specifi-
cations and system documentation can become more and more applicable, as
they regress from the specific and approach the general or conceptual stage.
It is also true that within the conceptual area, more active participation
can be expected from administrators and evaluators since the language spoken
is not a technical one. It deals with common educational goals, not the
explicit mechanics for obtaining them. It is objective, not subjective.

A practical approach to the establishment of such a common language is by
means of an advisory committee having representatives from all departments
in the school system. Their charter would be to define in realistic terms
their immediate and long range objectives, to evaluate the services provided
by data processing, and to recommend priorities for additional computer
services.

This advisory committee should not be taken lightly. It represents top
management and ultimately determines the success or failure of the entire
information system. As the committee progresses and becomes familiar with the
computer's potential, the influence exerted becomes a two way force. The
computer presents information to guide the committee in their respective
operations as they concern program planning, budgeting, accounting and
evaluation. The committee provides a stimulus for additional computer
services to assist in these vital functions.

We thus establish a dynamic organization at the top level of school administra-
tion which is every bit as important to sound systems management as the
computer installation itself. If this establishment of a high level system
committee is to be worth the effort, it obviously must represent all functions
within the school system, and any decisions reached must be democratic and
equitable. The next fundamental rule for good management concerns the computer
facility itself and the personnel involved in making it run successfully.
They both must be responsive to the committee as a whole! They cannot
effectively perform their function of serving the entire system, if in the
table of organization they are considered as a section within a department,
such as finance for example. The point is that no computer facility should
ever be placed in a position where its products and management could be
influenced or controlled by one of the previously mentioned five applications
areas, unless it is clearly understood that it would be a slave to that function.
Since one of the first computer applications is payroll, most facilities start
off under the supervision of the finance office. When they approach the stage

of a data management system, they should be responsive directly to at least
a Deputy Superintendent or else remove themselves entirely from the school
and operate as a service bureau.

If the computer facility is elevated to a department level, it stands to
reason that its staff should be capable of producing more than a few report
cards, financial statements or program evaluations. As I envision such a
facility, it assumes two primary responsibilities. One is the maintenance
of existing programs. This is the area of justification, the real payoff in a
system since it provides the payrolls, the schedules, the transcripts,
et al., that are the product of an ongoing system. Obviously it is an
important function and actually the "bread and butter" of the computer
facility. Still this is a maintenance responsibility and by itself
certainly does not justify locating computer services under the Deputy
Superintendent.

The second primary function of the facility will serve to separate the men
from the boys. This function justifies the advisory committee, justifies
a competent highly experienced director, and justifies a status associated
with upper management. I am speaking, of course, of the concept of management
consultant. In the District of Columbia for example, this function is
relegated to a unique office within the city government. They in effect,
provide management consulting services to the Mayor, police department,
public schools; in fact to all major departments. The same is applicable to
a school district on a smaller scale.   n this case they provide management
consulting services to the various assistant superintendents and directors.

Agreed, in many cases this guidance is unavailable on a local level. In fact
one major reason for the existence of consulting firms is to provide this
service. But in the selection of a director of data processing, one should be
cognizant of this responsibility and should look for an individual capable
of being able to either evaluate consultant services, or provide them himself,

and in addition be able to act as the interpreter between the educational
staff and the computer facility.  This director is not a shop foreman; he is
a planner, organizer and a consultant to his educational peers, who are looking
for innovative applications and advanced techniques providing them with the
means of producing a sound educational program.  If he has the training and
experience to serve as a consultant, so much the better.  His job is to
serve as a liaison between specialists who need information and those who
can provide it.  He must also be in a position to suggest innovative techniques
based upon his  own experience and his knowledge of the potential of his
facility and supporting staff.

Hopefully, the justifications for an advisory committee, for direct line
responsibility, and for computer functions have been made.  There remains but
one area which needs discussion - the data bases themselves.  No matter what
the planning, or what the sophistication of the staff involved, no system is
better than the data base with which it works.  The design of a data base is
extremely important.  Unfortunately it is all too often relegated to junior
staff members.  As a result, the design of data bases has not received the
attention its importance demands.  This is particularly true in the area
of personnel.  Most systems today associate a function with an individual,
and the hide-bound tradition of the one room schoolhouse    the teacher who
boards with the parents is still noticeable in many large schools, where they
attempt to maintain a patriarchal system.

An overall administrator should have no direct concern with who actually fills
a position in a school.  It is the position itself and what is accomplished
by it that should be of primary interest.  Obviously, whether the young lady
who occupies the position is a 36-22-36, or a 22-22-22, will have a tremendous
effect on the morale of male teachers in the faculty lounge; but is that really
management information to the executive who is located 50 miles away?  Administra-
tors are interested in what positions exist and what these positions should
accomplish, the sources of funds, and the effect on the student.  They should

not have to worry about the personality of the body that fills them.  That
is the immediate supervisors' responsibility.

The management information specialist should therefore relate these positions
to functions and programs.  It is his responsibility to provide the means for
educational and curriculum specialists to evaluate these positions and the
results obtained, in terms of what is being accomplished to provide education,
and a sense of value to the students who participate in the school programs.
How these students are to be trained and whether they will be prepared to
face the challenges of their environment, are the important concerns of the
educator.  Good systems management won't solve all the problems but it will
be a great step forward in the pursuit of educational objectives.

Obviously, to perform any kind of evaluation of program, administrators and
curriculum specialists must have valid information from many sources.  Because
of the volume of data, its incorporation into one computer file is not only
unwieldy but highly inefficient and expensive.  A true system data base will
incorporate many files all interconnected by various communication devices,
such that any file can interface with any other.

The implications are tremendous in a properly related information system.
Consider, for example, budgeting for new schools and their site selection.
Demographic information such as population movements, urban development, even
juvenile court records, contain valuable information relating to projected
schools and educational programs.

Such fundamental concepts as standard terminology, items of communication
between files, and file structure based on anticipated use of files are
vital to information systems.  Once established and with a programming and
analytical staff of high motivation and competence, a computer facility can
provide many times over the value of its investment in sound management

information.  Without good systems management, a sophisticated use of its outputs, and a practical, _effective_ method of collection and dissemination of information, schools will continue their exponential spiral into administrative and educational confusion.  A computer assisted Management Information System is one sound approach in reversing the trend.