

Educators must develop a "computer strategy" to cover all potential needs of their district.

The Computer System: Developing a Plan for the School District

by David S. Honeyman and Janice C. Honeyman

Educators have come to accept the computer as a "fact of life" in American society. When confronted with the probability that by the year 2000 half of all jobs in factories and offices in the United States will be affected in some way by changes in office automation and information processing, many school districts are beginning to develop computer programs for their students. While the business community continues using computer technology to streamline operating efficiencies and increase effectiveness within its organizations and develops new information management technologies, many educators are only beginning to implement instructional programs related to these new, powerful tools.

Many school systems throughout the United States are struggling with issues concerning the computer technology and computer literacy programs, but most educational leaders are unfamiliar with the constantly changing terminology and technology as they apply computer utilization. While some principals are familiar with given operations and certain uses of the computer, few have a feeling for the totality of the problem as it relates to the successful implementation of computer technology within their schools.

We have many examples in education where technological innovations were introduced into school systems without proper planning and sequencing of their implementation. Educational TV, reading machines, self-directed and programmed learning projects were expensive failures in many schools. The computer, however, is not simply a technological innovation. It is rapidly becoming an instructional discipline—English, math, computer science, etc. As a result, school systems are confronted with the problem of

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instituting instructional programs which will teach children not only how to use this new technology, but how it works as well.

Models constructed as guidelines for the development of data processing, and information management facilities in business (Gibson and Nolén, 1975) can be applied to the educational setting in order to help educators visualize the process of establishing a computer "system" for their schools. The term "system" is not meant to imply that one arrangement, large or small, one type of computer, IBM or Apple, will be the best for all situations. Likewise, use of the term system is not meant to imply that 20 microcomputers in various school buildings be networked together. It does mean, however, that a school district must have a plan directed to the total picture of its computer needs for instruction, communication and administration. Educators must avoid limiting themselves to single function applications, such as teaching computer logic, programming languages, or word-processing. There must be a comprehensive plan which covers all aspects of intended computer use in the school. They must develop a "computer strategy" to cover all potential needs of their school district.

Brandt R. Allen, professor of accounting and computer applications at the Colgate Darden Graduate School of Business Administration writing in the unpublished monograph, "Computer Strategy: A Philosophy for Managing Information Processing Resources" (1982) noted the following:

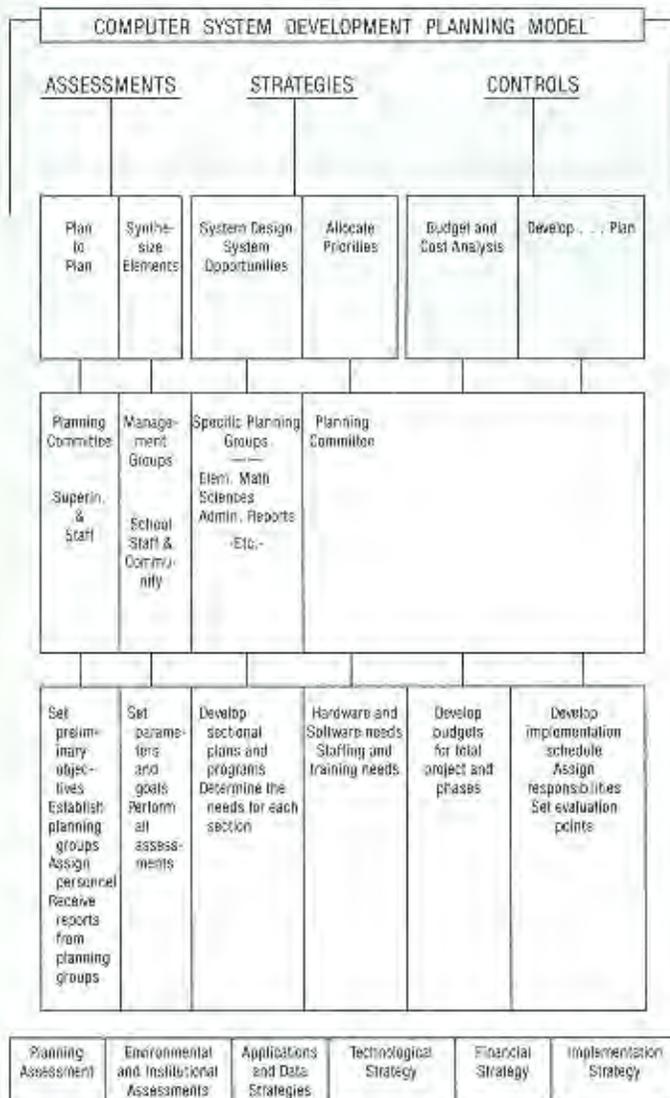
This is the 13th year of business use of computers, . . . what accounts for sustained success with computers in some firms and failure in others? Only rarely are technical factors or the brilliance or blunders of individuals the explanation; instead, the primary determinant of continued success in the use of computer technology is almost always the quality of one's strategy, policies, practices and techniques for the management of the technology . . . too often businesses (schools) simply do not know what a computer strategy is or why it's necessary.

The planning process for computerization within the school district should follow patterns similar to that of any management control system. Such systems usually include consideration of the following: environmental and institutional assessments; strategic planning and decision making; and defining the control system to be used for project evaluations (Allen, 1982). While the technology and applications exist which will facilitate the development of any and all types of computer systems without a comprehensive plan and set of management practices aligned with that plan, the introduction and *effective* use of computers within the organization may fail (Witherington, 1981). Figure 1 summarizes these stages as they might be applied to a public school setting. Details of the processes involved are discussed below.

Assessments

Planning to plan and the decision to implement: During the initial stages of the planning process it is important that members of the steering committee be identified and given direction by the superintendent. The decision to implement programs utilizing computer technology must be made early in the planning process, and school districts must be willing to pay the price, both in dollars and in effort, to guarantee a successful program. Membership on the steering committee should be kept to a minimum and should include

FIGURE 1.



three to five persons having ultimate responsibility for the decisions to be made during the planning process. It will be their duty to outline the preliminary steps of the planning process. They will establish the management planning groups and the specific planning groups which will have responsibility for performing the environmental and institutional assessments, developing implementation schedules, and designing the numerous applications and data strategies for the program. The steering committee, which sets the time lines for these planning groups, assigns personnel and receives and evaluates those reports which ultimately form the district action plan.

The first step in the planning process involves a thorough analysis of the environmental and institutional needs as they relate to a computer strategy (Allen, 1982). The details of these studies will indicate the types of programs that will be required to successfully operate the computer system, and generally answer the question, "What do we want the system to do?" It is important that representatives from the school system and the community be assigned to management planning groups to perform these assessments. Those individuals which will be affected by change should participate in this aspect of the process.

Environmental Assessments: Many educators currently express the opinion that computer literacy will be a necessary skill for future employment. As seen above, the use of the computer is expanding within the business world, and our young people have a right to expect that their educational programs will prepare them for the future. But what will those needs be? Will office employees and factory workers need to know computer logic, or Fortran or Cobol? Will they need to know about interactive uses of the computer and artificial intelligence, or will it be more important to know how banks produce their monthly statements, and how prices are recorded at the grocery store with the universal product code and optical mark reading equipment? School districts must determine which aspects of the new technology are important for their students as they enter the working world or go on to further education.

These needs will vary from location to location. Industrial and urban settings will offer different opportunities for young people than rural, farm environments. The needs of college bound students will differ from students entering the work force at the completion of their high school education. A comprehensive assessment of such needs should indicate the nature of the instructional program for the district.

A vocational education center which began a data processing operation several years ago is having trouble placing its graduates. While their students are excellent programmers in Cobol, many new business installations use newer fourth-generation data base languages which no longer require maintenance programmers. This has reduced the number of available jobs in this field. New technologies have created the need for new skills and this center has not kept pace.

As such, these environmental assessments, which must be continuously monitored, indicate the overall needs of the students and help clarify the responsibility of the schools to provide for those needs. The results of these assessments will outline the types of courses needed for the instructional program and the applications which are needed to meet those recommendations. This will form the instructional component of the application strategy.

Institutional Assessments: As an operating entity, the school district itself can benefit from the efficient and effective use of the computer. Once an external assessment indicates those programs needed for the benefit and well-being of the students, one can look at the school system and define its goals and objectives such that the computer can assist in its daily operations. Such an evaluation would include questions of community and parent communication, teacher perceptions of the use of the computer for instructional management programs, and building principal assistance for many of the daily business and record-keeping problems associated with operating a school. Such an assessment would show needed information flows required to maintain daily transactions and detail the types and quantities of data involved. An accurate and detailed picture of data flows in and through the school district provides later planning groups, i.e., the specific planning groups, with information which will form the basis for the data strategies and administrative applications to be developed later in the planning process.

Another large school division realized that the computer could provide accurate and concise data on their attendance figures and decided to contract with a local computer service center to provide such a service. It was assumed that such an arrangement would

greatly simplify the record keeping and reporting required by the state. A bright and industrious data processing manager made assurances that this project was basically simple and guaranteed its success. However, there was no plan or time sequence developed for this project. The following September building principals were *informed* of the new system and told that they would participate. They had not been consulted or informed and there was measurable antagonism toward using the new system. By Christmas of that year, the October attendance report was still incomplete and by March everyone was doing his or her year's attendance figures in order to prepare the year-end report by hand.

Strategies

During this phase of the planning process, details of the various strategies to be used during implementation are developed. This includes analyses of the applications to be used and developed for both instruction and management, the data needs of the organization and the control mechanisms which will be implemented for accountability and as measures of performance. In addition, the technology required to do those applications will be evaluated. Herein lies the key to a successful schoolwide computer system. Since most school districts will have varying needs and expectations for their system, the planning phase must incorporate as many of these variables as possible. A single, unified systemwide strategy must be developed.

A school district of approximately 10,000 students bought 12 microcomputers for its middle schools. Due to a lack of planning and control over this project, individual building principals received equipment from a variety of vendors and simply gave the units to their teachers. What followed was an attempt by the school division to teach teachers how to use these new "toys." However, few teachers were interested in learning how to use them, and since there was no one at the building level interested in developing applications and using them, they were soon relegated to storage and used primarily for games during free time. Had there been a detailed plan for introducing these computers in the schools, the results would have been different.

Applications Strategy: Following the guidelines noted by the environmental and institutional assessments, the school system planners must question applications; for what reasons will the computer be used and how? Here the specific planning groups assigned by the steering committee must investigate the thousands of uses to which the computer can be applied. Decisions must be made concerning which applications will be used for (1) instructional purposes, and (2) operations and management.

1. Instruction: How will we design our K-12 instructional program? Do we need to develop scope and sequence charts for the new computer curriculum in order to avoid duplication and allow teachers to monitor the effectiveness of various aspects of the program? Do we want to teach programming and computer logic? Do we want to play games? Do we want teachers to include computer use in the regular classroom, such that the teacher sets up an "answer sheet" and students feed in data from science experiments, math problems, or questions of English sentence structure, and process the numbers to get a result? Are we concerned with delivering courses covering computer literacy to all students and, if so, how do we define literacy?

These and other equally important questions must be resolved before computers are introduced. Do we teach how the computer works or how to work with the computer? Many leading educators feel that one must teach programming and logic to students in order for them to know how the computer works. This, however, is time consuming and allows only a few students to work with available computer resources at a given time. Other educators say that all students should be taught to use commercial application programs such as word processing and data bases which can be applied to a variety of instructional situations. It is the instructional strategy which defines these needs and outlines a course of action to be taken by the school district.

2. School Operations: Usually the benefits of microcomputers in assisting with the daily operation of the school go unrecognized. Word processing can facilitate the preparation of announcements, newsletters and attendance lists. Accounting packages and spread sheets can assist in the maintenance of general ledger and fund accounts, and the various reports for pupil enrollment, transportation, etc., can be generated, stored and updated. Trends in test scores and other measures of "accountability" can be developed and used for analysis of student performance at the classroom, building and district levels. Again, the school system must decide what it needs and the planning groups must detail those expectations.

Data Strategy: The needs for a data strategy is apparent when one considers the number of reports which must be processed by the school district almost daily. Some of these were mentioned previously, and it is important that the computer system be able to meet these user needs. If the production of designated reports or the generation of certain student records is done easier by hand, obviously the computer will not be utilized. Likewise, if the information generated is not constant and relevant, it will be of little use to those who will receive it. A school district planning to automate its administrative functions must perform a thorough investigation of all possible sources of data being generated within the school district. Such a "data audit" would include detailed descriptions of the data requirements from each of the districts functional areas including attendance, student records, food service, bus scheduling, student and athletic activities, personnel, purchasing, etc. Following the definition of these data descriptors, the flow of information for the district can be mapped and appropriate computer applications designed.

Organizational Strategy: The organizational strategy must answer questions similar to the following: If the computers will be purchased by the school system, who assumes ownership of the equipment? How will the equipment be configured and how will financial support be allocated? Who is responsible for hardware maintenance and expansion (new disk drives, modems, printers, cards, expanded memory, etc.). Who is responsible for renovations to existing facilities? Will the district purchase existing commercial software, or will custom software be developed? If custom software is to be developed, who will do the job, and who will write the software specifications. In addition, questions must be asked concerning room schedules and the location of the computers, how many students will be using them, and what utilization rates should be expected (hours of computer time per day). How will the district train its administrators and teachers? How will the district adapt to the changing role of the teacher? Will differentiated staffing plans revolve around computer technology such that the master teacher becomes the manager

of a technological classroom with 30 to 40 students participating in computer assisted instruction? These and other questions must be answered by the organizational strategy.

District administrators must be made aware of the expenses associated with the development a computer system. The need for intensive planning is obvious when considering the purchase of a \$200,000 IBM system 4300 for business operations and financial analysis. However, buying little "Apples" for the schools appears to be a relatively uncomplicated project. They cost about \$1,000 each, and most high school principals could afford to purchase several from general funds without going to the central administration of approval. But the purchase of the computer is just the beginning of the expenses associated with its operation. It is quite easy to spend an additional \$5,000 to \$8,000 on add-ons: packaged software, a printer, a plotter, additional memory, etc. It is not uncommon to hear stories of individuals with limited computer experience who have purchased a basic computer for \$2,000 and within six months have spent an additional \$5,000 on the system. Proper planning and a detailed organizational strategy are necessary to avoid unanticipated expenses which can destroy a viable, on-going project.

Technological Strategy: Controlling the growth and proliferation of microcomputers in the schools and giving direction to a growing computer system are important considerations in choosing technology. The availability of repair and technical assistance is often a controlling factor in the type of hardware to be purchased or leased. Problems which arise from regular use of the computer must be remedied quickly or users will avoid developing new programs for fear that the "thing" will be down when they need it most.

Extensive research must also be done to match the expressed needs of the school district with available technology. It must be realized from the beginning that there are major incompatibilities among software packages and different computers; there are even many subtle differences in machines within the same computer manufacturer.

One principal bought a personal computer with a printer and a popular software package to assist him in preparing data and develop graphs concerning student performance in various special projects occurring at his school. He soon discovered that he could analyze the data but could not print it without another special software package. In addition, he found that his printer did not do graphics unless he installed a special "card" in his computer.

In general, standardization of software programs is very low, and, whereas one may think they will do similar tasks, in fact, they do not. Of 10 faculty members at a major graduate business school who currently own personal computers, there are seven different word processing packages being used.

The computer system plan must provide guidance and leadership for the users. Just as schools have an instructional plan which includes processes for the selection of textbooks and instructional materials, the computer system must be developed with the users in mind. The technological strategy must consider present and future uses, expandability, and the computer's capacity to be applied to a variety of situations, i.e., its flexibility. Too often computers are purchased with a limited purpose in mind and once that level is obtained no growth occurs.

Control

The term control means different things to different

people. The computer system must be controlled. Applications must be governed, new purchases approved and priorities set. There must be periodic review of the system in order to monitor its growth and development. Results must be measured and evaluations done on a continuing basis. In order to do this, responsibilities must be assigned. Users must be aware of the totality of the program and its sequencing, from elementary to high school. They must know the expectations and ways in which the program will be evaluated. Criteria for on-going evaluation can include measures of efficiency, cost/student, effectiveness, numbers of students educated, and utilization rates hours/week/school, but teachers and administrators must be informed.

User groups should be developed under the leadership of individuals in a position to provide assistance and guidance. Usually this will be the building principal. As instructional leader of the building and its programs, this person must assume the leadership role. It is through this office that requests will be made for additional software and similar equipment. Class schedules will have to be adjusted in order to allow students and teachers access to the computers. Teachers will have to be given time to practice and learn about the uses of the computer, all of which will require the support and approval of the principal.

The computer "system" within the school must be encouraged and supported by every staff member. Four or five teachers in various schools cannot make a system. They can be the principal users and faculty leaders in the use of the computer, but success will be dependent upon total faculty involvement and cooperation. This can only be generated by supportive administrative personnel.

Implementing and operating a computer system can be a challenging experience. The benefits of such a system are difficult to measure, and the costs of bringing the system up and running can be more than many districts can afford at one time. A detailed plan can indicate sequences and phases for implementation of the project over a given period of time by showing at which grades the system should be started, and the costs associated with each step in the process. Proper planning and phased implementation of the project can assure greater levels of success than previously thought possible.

Structuring a computer system simply asks: What do we want to do? What are the needs of students, teachers and administrators which must be met? Who will be doing what? And, what technology do we need to do it? Without a computer strategy and proper controls to govern its operations, structuring the program within the schools and resolving problems and conflicts can lead to insurmountable obstacles which can destroy the project. Without a comprehensive plan, the only "winners" will be the computer manufacturers and sales people—and the losers will be the students.

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