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ABSTRACT

Management Information Systems (MIS), originally developed in the areas of accounting, management science, and computer processing, are now being applied to decision-making in educational settings. Definitions of MIS are numerous and often vague, but management systems (as distinguished from other information systems) should promote real-time management, incorporate computer-assistance, and support the decision-making process. Real-time management refers to management that occurs throughout all stages of an activity or program with feedback occurring continuously. Computer-assistance is essential to this process, and all activity should be designed to support decision-making. Most community colleges have utilized computers solely in operations functions--payrolls, student records and financial transactions. MIS can also be successfully utilized to implement administrative decisions and policies (control function), as well as aid in long-range planning and policy development (management function). The development of complete management information systems that can handle all these administrative areas--management, control and operations--requires joint effort of management personnel and systems analysts to identify goals and objectives and design a system adequate to meet those goals. (DR)

MANAGEMENT INFORMATION SYSTEMS, PLANNING, AND PUBLIC COMMUNITY COLLEGES

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Introduction

As enrollments decline and inflation soars, administrative decision-making is taking place in an environment of increasing uncertainty. One approach to reversing this trend toward uncertainty has been the application of Management Information Systems (MIS) to the educational setting. Florida has invested considerable resources to that end. Accordingly, the authors have conducted several case studies in selected Florida community colleges and have offered some insight into definitions, functions, applications and challenges associated with MIS.

Management Information Systems (MIS): Definition and Functions

Management Information Systems (MIS) refers to a concept and an "orientation toward which an information system design moves rather than being an absolute state" (G. B. Davis, Management Information Systems: Conceptual Foundations, Structure and Development. New York: McGraw-Hill, Inc., 1974, p. 7). Since MIS is not an absolute state, it is somewhat difficult to define what exactly is meant by MIS. And, for the same reason, the lack of an absolute state, it is increasingly important to define MIS. Unfortunately, most definitions in the literature do not illuminate the difference between MIS and just another information system--

an important difference if one is to attempt to design a MIS. To point, Enger offered the following definition:

> A management information system is a management-oriented system characterized by information elements structured into a dota base serving the information requirements of policy and operating management. (N. L. Enger, Putting MIS to Work: Managing the Management Information System. New York: American Management Association, 1969).

This definition offers little beyond self-evident definition. Most other definitions one finds are equally vague. Thus, another approach to understanding the concept of MIS is to examine critical elements which may differentiate MIS from simple information systems.

Three such elements are real-time management, computer assistance, and decision-making support. Real-time management refers to management in concert with ongoing events. The distinction between formative and summative evaluation clarifies the point. Formative evaluation occurs throughout all stages of a program with feedback occurring constantly. Summative evaluation occurs at the conclusion of the program. If decisions are to be made in real-time, then the process must be formative. In order to accomplish this, computers are often needed for their rapid information turnaround capabilities as well as their abilities to store large amounts of data. Real-time management is virtually impossible unless computer assistance is available--an MIS is impossible without computer assistance. Finally, MIS is

utilized to aid decision-making by management. Information systems not utilized for decision-making support are not MIS. To make the point further, if information gathered in MIS is not utilized in decision-making, the title MIS is inappropriately applied.

These elements also characterize what MIS is supposed to do. In short, MIS is to provide management with a real-time mode of information processing which supports decision-making. The use of computers allows this and, also, allows the utilization of complex mathematical and statistical models to further sharpen decision-making capabilities.

Another approach to understanding MIS is to look at its history. Davis (op.cit., 1974, p. 8) maintained that MIS grew from developments in four areas: managerial accounting, management science, management theory and computer processing. In a sense, MIS can be thought of as a marriage of these fields. Additionally, the growth of systems analysis and general systems theory have had obvious implications for MIS. MIS certainly draws upon all of the techniques of systems analysis--cost-analysis, simulation, linear programming, gaming theory, modeling, along with imaginative use of statistics. In the late-1970's, MIS is still unfolding as contributions from other disciplines and theories continue to add to MIS sophistication and capabilities.

Specific Types and Development of MIS Systems

Many community colleges either have their own computer systems or have computer time available to them. The computers are being used extensively and well for faculty and student research. To a somewhat lesser degree they are being used for processing college records. Little use is being made for supplying the administration with the information needed for planning and decision making.

Information needed for a college to function can be divided into three levels: (1) information for management decisions and planning, (2) information for control, and (3) information for operations (R. Van Dusseldorp, "Some Principles for the Development of Management Information Systems," in Management Information Systems in Higher Education: The State of the Art. Edited by C. B. Johnson and W. G. Katzenmeyer. Durham, N.C.: Duke University Press, 1969, pp. 29-41.)

The lowest level, information for operations, consists of the information needed for clerical functions--payroll, student records, financial transactions, and the like. Most community colleges, but not all, have utilized computers in this area.

The middle level, information for control, involves information needed to implement administrative decisions and policies. For example, a community college computer system could generate data analysis on the student racial composition

to determine if administrative racial goals are being met.

The highest level, management decisions and planning, involves the use of information in formulating management decisions as well as developing policies and plans.

To date, most of the effort to improve information systems with the aid of the computer has been directed toward applications at the operations level.

Filling the void calls for efforts to develop management information systems. As we have seen, a management information system is an organized method of providing management with information needed for decisions, when it is needed and in a form which aids understanding and stimulates action.

The development requires a joint effort of management personnel and information specialists. Only management itself knows what decisions it must make and what information it needs for decision making.

The steps in the development of an information system may be listed as follows:

1. Specification of goals and objectives of the system.
2. Specification of fixed system requirements.
3. Development of the system to fulfill the goals and objectives as efficiently as possible.
4. Compromise as necessary.

5. Test of the system.

6. Revision as necessary.

7. Implementation.

8. Evaluation.

9. Repeat of Steps 108. (Van Dusseldorp, op. cit., 1969)

The most important, difficult, and neglected step is the first one--specification of the goals and objectives of the system. Goals and objectives are simply other terms for what are called the outcomes of the system. In order for the final system to provide the appropriate management information, this step must be performed by management.

Management should also perform the second step, that of specifying the fixed system requirements. This includes determining inputs to the system and procedures which cannot be altered--elements that must be included to comply with legal or other requirements.

The third step, the development of the system, should be the responsibility of systems analysts. The systems analysts design the input to the system and the system procedures in such a way as to yield the goals and objectives set by management as efficiently as possible.

The next step, that of compromise, involves both management and systems analysts. Often, the system needed to yield the required outcomes will be too expensive or require too much effort to implement.

All the remaining steps require a joint effort of management and systems analysts. With these steps there is not so much danger of management assuming too much responsibility as there is of systems analysts doing too much.

It is not financially feasible to develop a management information system separate from information systems for operations and control. Much of the information needed for management can be obtained as a by-product of operations and control systems. Thus the systems for the three levels--operation, control, and management--should be developed together with the operations systems feeding information into the control and management systems and the control system feeding information into the management system. The operations and control systems then form a data base from which some information for management may be drawn.

If each department is permitted to operate an information system of its own independent of other departments and of the college administration, it will not be possible to build a management information system to meet the needs of the college as a whole. This independent systems approach has been used frequently.

Three ways of approaching the development and implementation of management information systems have been identified and attempted.

Most common has been the applications approach. With this approach one application at a time is identified, developed, and implemented. This is done in the order of priority set by the administration, or more commonly, in an order determined according to the cooperation and attitude of the managers in charge of the various applications.

A second approach is to design the entire information system--operations, control, and management--in advance and then implement it all at once.

The third and most workable approach to the implementation of a management information system is a combination of the two aforementioned approaches.

Case Studies of MIS Systems in the Florida Community College System

The authors reviewed the status of MIS in Florida's community colleges and found a variety of MIS applications. At one extreme of the continuum, there was the college that was struggling to use computers to develop and maintain traditional business records.

The more common situation was the community college where administrators relegated institutional research to the coordination and transmission of various state, federal and private reports. This activity more closely resembles the second category of MIS development, i.e., information for

control which involves information needed to implement administrative decisions and policies. Lower-level personnel completed the data and/or stored the information in a computer system. It is a common criticism of college administrators today that community colleges are being burdened with excessive numbers of reports that are required. More importantly, many of the new reports or standard reports are in fact mere changes in format of existing reports. That is, old information is being requested in a new rearrangement. As well, there is lack of coordination of definitions of terms in the reports and good dissemination of the information.

Some community colleges have been more innovative in using MIS in administrative decision-making as opposed to traditional record collection tasks.

McCabe discussed several cost analysis systems in use at Miami-Dade Community College. These systems combined enrollment, staff, and productivity measures to plan for internal changes. (R. H. McCabe, Academic-economic Planning Systems. Paper presented at CAUSE/M-DCC/SCUI Workshop on Advanced Planning and Management Systems in Education, Miami Beach, 1978). At one Seminole Community College, the director of institutional research performed the "records" functions, but he felt very strongly that the two functions, records collection and transmission, and

"developmental" (creative uses of MIS as management tools) should be kept together. The director had used MIS as a management tool extensively at the college.

This college was organized around the departmental level and, for the purposes of budget analysis and control, this area, the instructional, allowed for more flexibility and planning than the service sector of the budget, e.g., library, print shop. The instructional area consisted of three divisions: continuing education, occupational, and academic. Then there are four further divisions in the academic, three in the occupational, and three more in the continuing education. The director's contacts stopped at the divisional level--there were few contacts with faculty members.

The director had developed and worked with a modified budget simulator which allocated X number of dollars for all instructional costs for Y productivity. In other words, the basic relationship between costs and specific income for evaluation purposes, i.e., the total, assuming costs are expressed as negative, should be greater than or equal to zero. Given this relationship, equations, using cost and income elements, could be written and solved for any element. From this basic perspective, relationships among elements could be cast in algebraic terms in order to model actual cost behaviors and relationships. This process could be

programmed for computer assistance for simulation and modeling purposes. (J. Miner, The Cost/Income Component of Program Evaluation. Educational Resources Information Center, 1976. [ERIC #ED 122 896])

This particular algebraic relationship was expanded into a computer-based simulation, Staff/Enrollment Exploration System (SEES), by one of the authors, Steve Ritch. SEES was installed in all of the member colleges of the Florida Community College Inter-Institutional Research Council (IRC). To date, the model was being used for planning and monitoring of budget and staffing alternatives.

Challenges

MIS promises quite a bit if one looks at its definition and functions. Unfortunately, MIS has not always delivered results equal to its promise. In the introduction to American Council on Education (ACE) and Western Interstate Commission for Higher Education (WICHE) publication Management Information Systems: Their Development and Use in the Administration of Higher Education, Mintor and Lawrence identified several problems associated with MIS. These points are paraphrased into general and specific problems (J. Minter and B. Lawrence, Management Information Systems: Their Development and Use in the Administration of Higher Education. Boulder, Colorado: Western Interstate Commission for Higher Education, 1969):

General

1. Cost--was it worth the cost to collect and analyze the data?

2. Could the problem bearing analysis be properly identified?

3. Many MIS designs sprang from decentralized information systems which already existed. Therefore, coordination was fragmented.

4. Lack of communications existed between developers of the system and users of the system.

Specific

1. Managers continued to use intuitive judgment.

2. Managers maintained "hidden agendas" with regard to system-wide objectives.

3. Lack of resources to develop, test, and implement MIS.

4. Lack of qualified personnel.

5. Industrial models did not fit educational models.

While these problems are pervasive they are not unsolvable. Some solutions may be fairly clear while others may be more difficult. In most cases, the problems are a function of misunderstandings and misapplications of a still evolving concept. The advantages of MIS, particularly given retrenchment and retooling, demand that careful attention be given to solution of these problems.