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Objectives and Guidelines of the WICHE Management Information Systems Program. A Proposal for a Regional Cooperative Project Among Higher Education Institutions and Coordinating Agencies to Design, Develop, and Implement Management Information Systems and Data Bases Including Common Uniform Data Elements.

Western Interstate Commission for Higher Education, Boulder, Colo.
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The Western Interstate Commission for Higher Education (WICHE), responding to a need for systematic data collection and utilization for the effective management of increasingly complex institutions of higher education, appointed a design committee to develop a conceptual framework and guidelines for a management information systems project. The recommendations of this committee of representatives from institutions of higher education and state agencies in the West were reviewed and accepted by a larger representative committee. The substance of this report constitutes the basic recommendations of the design committee. The WICHE Management Information Systems Program is a regional cooperative 5-year project to encourage the development of management information systems with common data elements in institutions of higher education. The purpose of the information systems and data bases is to improve the capability of local institutions and agencies to allocate resources more effectively, and to provide comparable data from throughout the region and elsewhere on the cost of instructional programs by level of student, level of course, and field of study. The report presents the objectives, planned and anticipated phases of the project, and descriptions of data requirements for effective decision making on the allocation of resources. (WM)

OBJECTIVES AND GUIDELINES OF THE WICHE MANAGEMENT INFORMATION SYSTEMS PROGRAM

A proposal for a regional cooperative project among higher education institutions and coordinating agencies to design, develop and implement management information systems and data bases including common uniform data elements.

This proposal was developed by a regional design committee representing interested institutions and agencies of higher education in the West.

Western Interstate Commission for Higher Education
University East Campus Boulder, Colorado 80302

May, 1969

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FOREWORD

The WICHE Management Information Systems Program is a regional cooperative project to encourage development of management information systems with common data elements in institutions of higher education. The conceptual framework and guidelines for the project were developed by a regional design committee representing interested institutions and agencies in the West. Its recommendations were considered by a larger representative review committee and accepted as an adequate basis for proceeding to implement the project.

The recommendations of the design committee were initially contained in a document entitled "A Proposal to Design and Implement a Management Information System with Common Data Elements for Western Higher Education Institutions and Agencies," February 1968. The basic recommendations contained in that document constitute the substance of this report, Objectives and Guidelines of the WICHE Management Information Systems Program.

Implementation of the WICHE MIS Program is now well underway. The program is being supported by the U.S. Office of Education, Bureau of Research, Division of Higher Education Research. July 1, 1969, will mark the formal completion of the planning and organizational phase of the project and the beginning of the developmental phase. Already, the program's Regional Steering Committee has held its first meeting, members of the National Advisory Panel have been identified, and professional staff members recruited. Three consultant task forces have begun work to establish standard compatible data sets and to develop analytical models.

The objectives and guidelines developed by the design committee have provided a sound conceptual foundation for program development thus far. Only minor variations from the committee's original recommendations have been necessary. Outcomes of the five-year program are expected to reflect closely the goals and objectives set forth in this report.

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May, 1969

A REGIONAL COOPERATIVE PROJECT AMONG HIGHER EDUCATION INSTITUTIONS AND COORDINATING AGENCIES TO DESIGN, DEVELOP AND IMPLEMENT MANAGEMENT INFORMATION SYSTEMS AND DATA BASES INCLUDING COMMON UNIFORM DATA ELEMENTS

PROJECT OBJECTIVES

The rapid growth in size and complexity of higher education has highlighted the need for systematic collection and use of data in the effective management of colleges, universities, and state systems of higher education. Without systematic, accurate feed-back to management of the effects of its operations, an institution or system can waste its resources on ineffective or unnecessarily costly activities. Judgments about effectiveness and relative costs, however, cannot be adequately made in isolation. Hence, the need also for comparable data from other organizations of similar complexity and with similar missions.

In meeting these common needs, state coordinating agencies and concerned colleges and universities in the West have asked the Western Interstate Commission for Higher Education to bring together a highly competent staff to assume a regional leadership role in

1) designing, developing and implementing management information systems and data bases including common data elements at local and state levels including community colleges, universities, and higher educational agencies, both public and private in the West.

   The purpose of the information systems and data bases will be:

   a) To significantly improve the capability of local institutions and agencies to more effectively allocate resources.
   b) To provide the cooperating organizations, on a continuing basis, comparable data from throughout the region and elsewhere on the cost of instructional programs by level of student, level of course, and field of study.

2) A concurrent objective will be to begin the task of identifying higher institutional input-output indicators both quantitative and qualitative and relating varying educational costs to such indicators.

At the request of the cooperating organizations, the initial phases of this project will be concerned with establishing a preliminary set of common data elements, program elements and program element grids, program budget categories, and quantitative indicators; designing and implementing compatible information systems which will provide uniform data from which can be derived the costs of instructional programs by level of course, level of student and field of study. To be eligible for inclusion in the project, institutions must be willing to cooperate in these activities.

Subsequent phases of the project will be devoted to:

1) The refinement of information systems and data elements, input-output indicators, and cost relationships of the instructional program.

2) Beginning the task of identifying input-output indicators of research and external service programs.

3) Disseminating information about the project beyond the region and to develop procedures whereby, at an appropriate time, institutions and agencies outside the western region can profitably benefit from participation in the project.

The following missions are essential to the successful achievement of the project objectives and purposes and will also be undertaken by the project staff:

1) Stimulating, coordinating and conducting educational programs at various levels for all institutions and agencies who wish to develop their capability to cooperate in this project. This will include inter- and intra-campus utilization seminars in systems analysis, operations research, program budgeting and cost-benefit analysis; the use of simulation models for high-level management training in the use of these decision-making tools under a variety of institutional circumstances; the publication and distribution of staff technical reports developed in the process of establishing data definitions, program elements, system applications, input-output indicators, and program budget categories.

2) Coordinating development of data elements and information systems at the regional level with similar efforts in other regions and at the national level.

3) Coordinating the exchange of comparable higher education management data among the cooperating agencies and institutions in the West, at their direction.

The initial mission of the project is to establish the mechanisms by which these objectives will be achieved including:

1) A central professional staff headed by a director with extensive experience at a high level in the management of higher education and experience in the field of management information systems and data processing. The director will be assisted by a person with substantial experience and demonstrated ability in developing management information systems and the application of computers to their operation. These men will be assisted by appropriate specialists employed by WICHE or contributed by the cooperating organizations as they are needed.

2) A steering committee, representative of the organizations cooperating in the project, to advise the work of the central staff.

COMPELLING NEEDS

Higher institutions are increasingly called upon to account for the stewardship of their funds not only in terms of their amounts and allocation but also the benefits gained therefrom. Legislatures wish to know what the public is getting for its tax dollar. They would like to know if some ways are better than others for achieving the objectives of higher education. They would like to find ways of measuring the performance of educational programs. Institutions do a great disservice to themselves and their public and private supporters when they do not make reasonable information available concerning actual program costs and how these costs relate to the achievement of the institution's objectives.

There are also compelling internal reasons for the development of more sophisticated cost and output analyses. The resources available to colleges and universities are limited. The rising costs of maintaining existing programs, increasing numbers of students to be served, the necessity of improving quality and the demands for new and expanded services present the college administrator with an array of difficult decisions. In justifying rising budgets and deciding where to allocate scarce resources the administrator should be able to calculate the costs of various alternative courses of action and relate them to some measure of achievement of institutional objectives. Most institutions have made little progress toward such a capability.

Need for Information and Commitment to its Use

The objectives and guidelines of this project have been designed by men at the campus and state levels who need and want the data. Their institutions have already invested considerable time and dollars in this project.

Also, several individual institutions and state coordinating agencies have begun developing similar systems. They welcome the role this project can play in avoiding multiplication of incompatible systems, and in upgrading, through in-service training with a highly competent central staff, the campus and state level staffs who are already, or will be, developing and using the information systems.

Finally, successful decision-making at the management level is a matter of experienced judgment. Experience in making judgments using the management information systems and comparable cost data developed by this project can be gained through manipulation of models which simulate colleges, universities, and agencies under a variety of circumstances. One objective of the project is to conduct administrative training programs making use of the systems and the data which result from the project. Only as individual administrators have demonstrated to them the benefits of incorporating more reliable information in their decision-making judgments can there be any assurance of effective use of a "system" in the management of institutions.

Limitations of traditional finance and budgetary systems. The traditional financial and budgetary system is an essential tool in fiscal accounting but it is of limited value when evaluating the costs and benefits of institutions' programs aimed at achieving given institutional objectives.

Information generated by traditional financial and budgetary systems is usually confined to local cost factors and thereby subject to misinterpretation and misuse when institutional comparisons are made. One important reason for this is the lack of uniformity in collecting and reporting higher education costs without relating them adequately to programs and program outputs and benefits.

Key role of resource allocation functions. Financial and budgetary systems are, however, important tools in the resource allocation process. The importance of the process is evident in these assumptions:

> the resource allocation decisions are a principal function of all management
>
> management decisions are usually made under the circumstances of limited resources but unlimited demands
>
> unwise or uninformed resource allocation decisions may be costly in terms of unrealized opportunities to achieve additional objectives or selected objectives more effectively
>
> therefore, there is a need for good economic choice-making to maximize achievement of goals.

The issues raised above further demonstrate the need for analytic management tools other than the traditional accounting procedures, reports, and budget formats.

PROJECT GUIDELINES

Developing the Project Plan

At the outset the designers of this plan agreed to sharpen the objectives and guidelines of the project and leave the project design and details of implementation to a full-time professional staff employed for that purpose. This manner of developing the program plan precludes the description of specific project activities or strategies at this point. It is possible, however, to describe guidelines, project phases, and missions.

Project Organization

Overall responsibility for management of the project will reside with the Western Interstate Commission for Higher Education and its Executive Director.

The Commission consists of 39 members representing Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

The Project Director and his staff will be directly responsible to the executive officers of the Commission and through them to the Commission which approves all programs and budgets.

To accomplish the objectives of the project, a professional staff under the leadership of a project director will be located in Boulder, Colorado, headquarters of the Commission. This staff will be charged with the responsibility of executing the missions described on the following pages within the guidelines agreed upon by the cooperating organizations and stated in this proposal.

Steering Committee

A steering committee comprised of delegates from the cooperating states representing the interests of community colleges, state colleges, state universities, the private colleges and universitites, and the state

coordinating agency will advise the professional staff in fulfilling its assignment and in refining policies and objectives of the project as it evolves.

Scholarly Interests

Among the delegates from each state must be some individuals who clearly represent the scholarly interests of the academic community. The steering committee may organize itself in a manner which will make its work effective.

National Advisors

A National Advisory Panel of consultants will be identified. The role of these consultants will be to link the project with national and other regional organizations vitally concerned with these same problems.

Initial Emphasis: Costs of Instructional Programs

The initial phases of the project will be concerned with information about the costs of student instruction, including only those aspects of research and external service which are directly related to costing the various elements of student instruction.

The set of common data elements required for determining instructional costs will be so defined that participating institutions can use them for two purposes: as part of their ordinary administrative data processing system and as a basis for the computation of institutional costs and performance in comparable form.

From this initial emphasis the project will move forward to include all categories of information relevant to resource allocation on the campus and state systems.

Universality

The most important guideline is that the set of data which is collected must be of the greatest practical universality and flexibility so that all levels of institutions and any individual institution can use on a common and consistent basis those parts of it of interest to them beyond the requirements for participation. Similarly, allowance must be made for suitable aggregation of the data so that they may be used for review purposes at echelons above the campus level.

Expandability

The project will start with a small nucleus of institutions and agencies which have information systems and are ready to adopt the common data elements required for deriving instructional cost data.

At the same time, a larger number of institutions and agencies in the West will be aided by project staff in developing information systems with common data elements. At the earliest possible moment these institutions will be added to the nucleus.

As procedures for expanding the system within the region are developed and refined, they will be tested in other sections of the country. During the latter phases of the project deliberate efforts will be made to expand the network to include any institution or agency wishing to participate using the common data elements as defined by the project.

Comparable Data

The data in the system should be capable of being compiled in a variety of formats for reasonably comparable results without requiring all institutions to go to a single operating system. This requires common data element definitions (or translation algorithms) so that institutional information can be incorporated into various studies for comparisons of costs and effectiveness. Wherever possible existing definitions should be used.

Minimum Data

Minimum data to be expected from the initial phases of the project would be the following:

Cost by level of student
- Lower Division
- Upper Division
- Graduate Division
- Master's Level
- Professional
- First stage doctoral
- Second stage doctoral

And by level of course

And field of study such as
- Agriculture
- Veterinary Medicine

Biological Sciences
Mathematical Sciences
Physical Sciences
Engineering
Social Sciences
Psychology
Art Letters
Professions
Physical Education
Military Science
Vocational Technical
Special Community Junior College Fields
All Other

DATA REQUIREMENTS FOR MANAGEMENT DECISIONS

Requirements for resource allocation decisions entail a need for specialized data systems which rapidly, accurately, and routinely provide information to managers at all levels to assist them in making better decisions about preferred courses of action.

Data on input. All resources should be included in the analysis of input. This will include measures of quality as well as quantity.

Data on output. All "products" of the academic process should be identified and included in the analysis of output. The analysis will include measures of quality as well as quantity.

Data relating input to output. In relating input data to output data we must keep in mind the kinds of information that are needed by the institutions themselves and by coordinating agencies. These include:

the cost per student per year in particular fields of study

the cost per degree in particular fields of study

the cost of adding students to a particular field of study

the cost of programs at particular levels of quality

the cost of expanding existing programs or institutions

the cost of establishing new programs or institutions

beneficial side effects on the institution itself

relationships between inputs and their associated costs and outputs and their associated benefits

relationships between costs and sources of funding

values added to the student, knowledge, and public service.

Information System and Subsystem

The university or college can be considered as a single information system. However, several major information subsystems are identifiable and should be developed separately with integration provided where the subsystems overlap. The data of all the subsystems, however, should be defined with management use in mind, and the data should be stored in such a manner that data in all of the subsystems may be readily retrieved

and related to each other. The major information subsystems appear to be the following:

Information components related to output
- Instructional Program
- Research Program
- External Service Program
  - Including information on
    - program objectives
    - level of program activity
    - program output

Information subsystems related to input
- Student Records
- Personnel Records
  - Faculty
  - Supporting Staff
- Facilities
- Major supporting equipment
- Finance

Examples of the kinds of items to be included in management information data files are listed in Appendix A.

Identifying and Measuring Output

Illustrative of the type of data we believe are indicative of quantitative and qualitative outputs of the process of higher education are the following:

Student Instructional Program

- Full-time equivalent students
- Student credit hours
- Student contact hours (by level)
- Academic awards (degrees, certificates)
- Quantitative measures of intellectual achievement
- Rate of employment in local community
- Peer judgments (Standing in the Cartter report)
- Characteristics of first employment
- Degree of success in employment
- Rate of acceptance of students as transfers
- Rate of participation in community, civic and political affairs
- Degree of conformance to institutional objectives
- Rate of salvage of disadvantaged learners
- Rate of salvage of unemployables
- Rate of admission to apprenticeship programs
- Degree of user satisfaction
- Rate of admission of graduates to graduate and professional schools
- Rate of graduates placed in national fellowship programs
- Rate of elections of graduates to learned societies

Research Program

Research findings and application (new knowledge and technical advancement)
Awards for research findings
Rate of graduates continuing in research scholarship
Social contributions of research

External Service Program

Solutions to community and regional problems: industrial, social, economic (research output can apply here, also)
Many student instructional program output indicators apply here to University Extension activities.

Identifying and Measuring Quality

Identifying and measuring the quality of educational outputs is difficult. Agreement on indicators, terms, measures and measuring techniques can only be achieved slowly. But significant efforts have been made and will continue to be made; for example, Cartter's study An Assessment of Quality in Graduate Education.

Major Higher Education Program Models

The following diagrams suggest the focal points of resource allocation decisions and suggest the nature and requirements of a different set of tools more useful to the resource allocation process. (Several excellent studies recently made of the higher education management information system have developed much more elaborate charts indicating the relationships between significant elements of the higher education organization. They are noted in Appendix B. Note particularly the relationship of output data to input data and the comprehensive nature of data requirements for effective resource allocation decision-making. This indicates the need for a comprehensive management information system.

These diagrams are also illustrations of the three major programs in a complex university and with differing emphases the programs of two-year, four-year colleges and colleges with master's programs.

It can be observed in the first diagram that research activity and external service activities (e.g., hospitals, clinics, laboratory schools, etc.) also are resources for student instruction. Similarly, instructional activity is a resource when considering the diagrams for research and external services outputs.

DIAGRAM 1

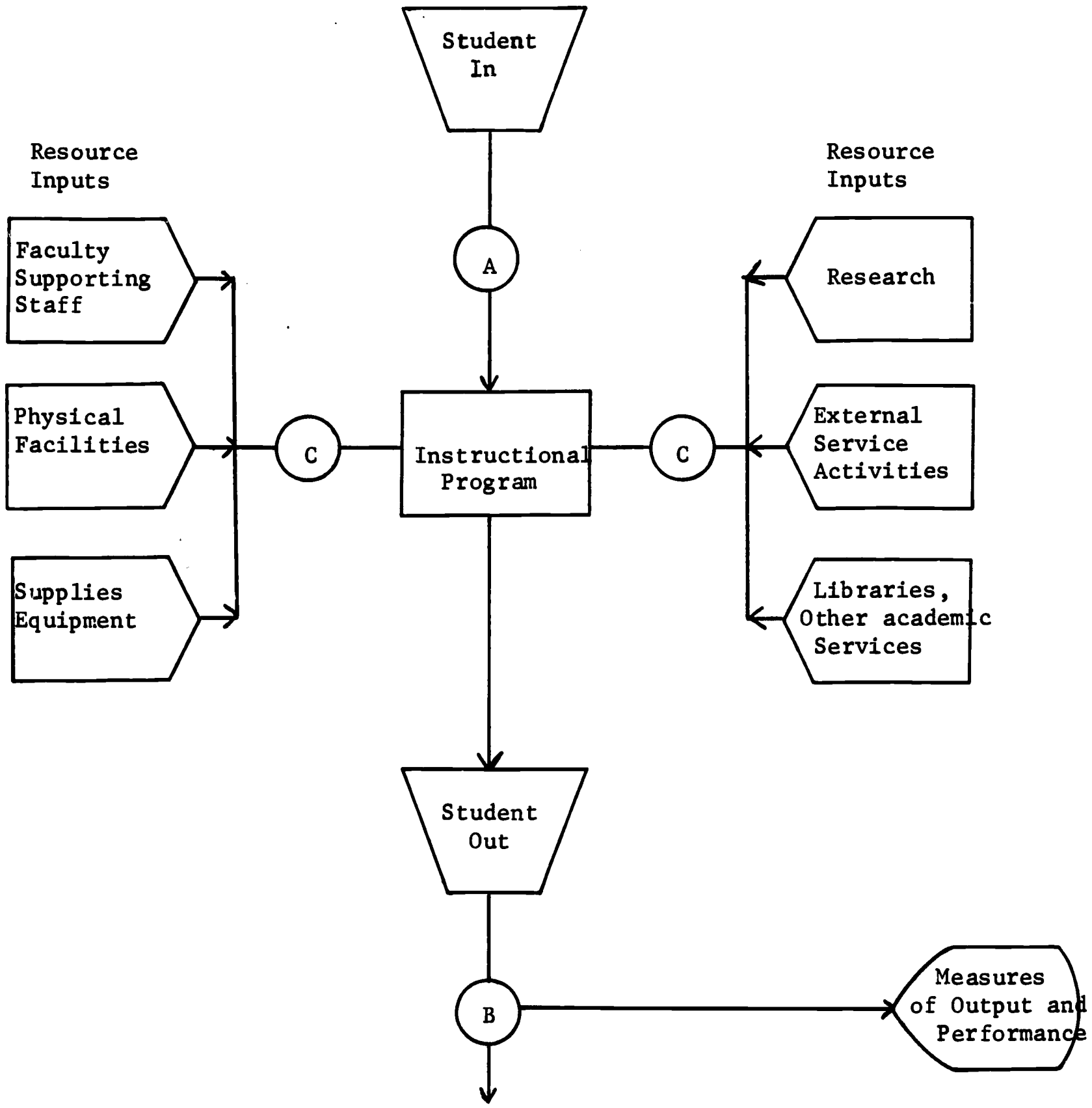

Student In
Resource Inputs
Faculty Supporting Staff
Physical Facilities
Supplies Equipment
A
C
Instructional Program
C
Resource Inputs
Research
External Service Activities
Libraries, Other academic Services
Student Out
B
Measures of Output and Performance

DIAGRAM 2

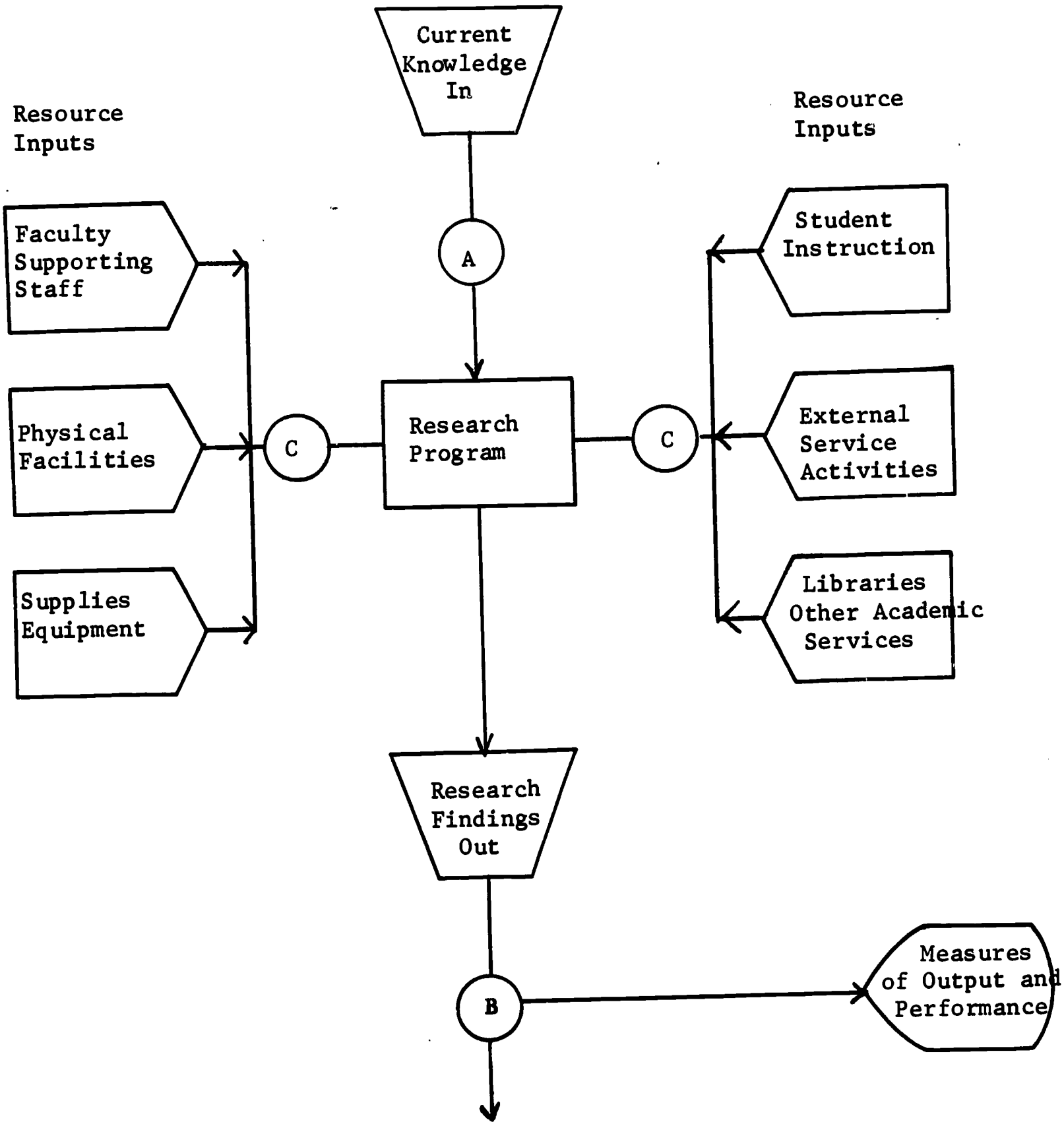
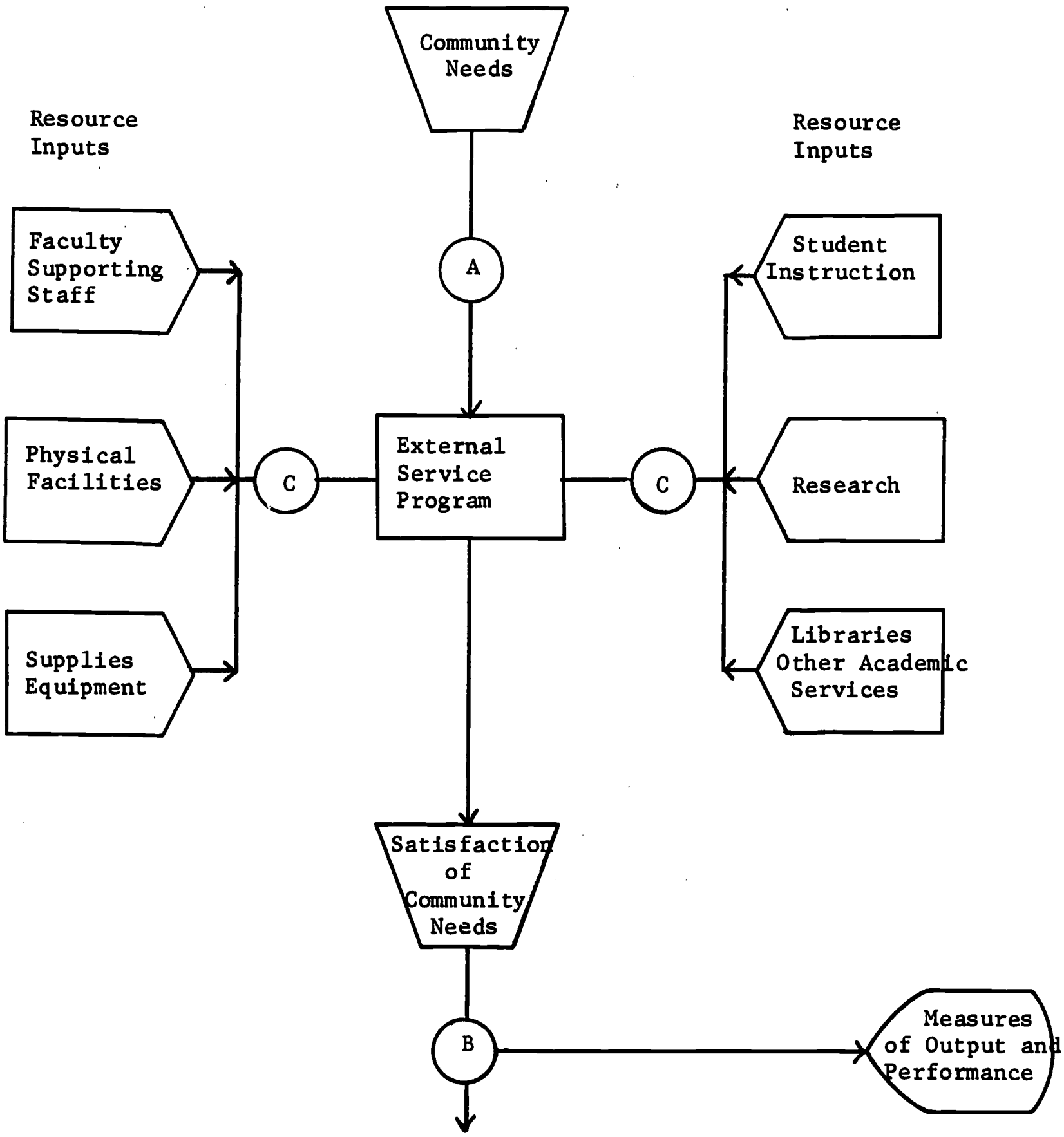

Current Knowledge In
Resource Inputs
Resource Inputs
Faculty Supporting Staff
A
Student Instruction
Physical Facilities
C
Research Program
C
External Service Activities
Supplies Equipment
Libraries Other Academic Services
Research Findings Out
B
Measures of Output and Performance

DIAGRAM 3


Community Needs
Resource Inputs
Resource Inputs
Faculty Supporting Staff
A
Student Instruction
Physical Facilities
C
External Service Program
C
Research
Supplies Equipment
Libraries Other Academic Services
Satisfaction of Community Needs
B
Measures of Output and Performance

A general higher education model could also be constructed using these same resource inputs for a program whose objective would be the benefit of society. The outputs of such a program would include an educated population, new knowledge, advancement of technology, professional and trained manpower, and more effective approaches to the solution of social problems. These are the results members of state legislatures and congress are concerned about. Perhaps this project can establish a framework wherein a realistic estimate of the impact of such broad social programs can be made.

Institutional Programs and Program Budgeting

Instruction, research and public service are the three major program categories of universities while liberal arts colleges focus primarily upon instruction.

Supporting program elements are libraries, plant maintenance and operation, student services, general administration, institutional research, organized activities and auxiliary enterprise activities.

A primary use of the program building blocks would be to build program budgets, relating program activities to institutional goals and highlighting the principal resource allocation decisions.

The building blocks of major programs must be uniformly defined which will allow individual institutions to organize them as they wish yet allow reorganization and comparison by institutions which organize their programs in a slightly different manner.

Institutional Goals

Colleges and universities have multiple goals. Therefore, we would stress the necessity for the administration of an institution to articulate institutional goals and do so in a manner which facilitates the relating of program activities and resources to objectives. This is basic to the program budgeting and cost/benefit approach. These relationships should also be made clear in an academic plan for the institution.

Faculty Workloads

Reasonably accurate data on salaries paid professors is now collected but there is incomplete data on faculty workload. If we can get data on this, we will have answered many of the major questions related to

costs of programs. "The Henle Report"* suggests a useful approach to this problem and we recommend it for consideration.

Exchange of Data

For internal administrative purposes and external policy development, institutions and agencies will inevitably compare programs. A common data reporting system will increase the ease and sophistication of such comparisons. Clarifying the relationships between program activities, costs and objectives can help avoid the now frequent "apples and oranges" errors in comparative studies.

Frequently unnecessary amounts of work are involved because of the slightly different form of data requests from another institution, a state agency or the Office of Education. The implementation of compatible systems of data reporting would alleviate this situation to a significant degree.

Costs - Benefits

Management needs to know the relationship between costs and whatever criteria of effectiveness or benefit they establish as the basis for efficient allocation of resources. The information systems will provide these data. It should be stressed, however, that the data and its analysis do not establish the effectiveness or benefit criteria.

Referring again to the diagrams, the difference between IN (A) and OUT (B) may be interpreted as "value added" or "benefits" to either the student, knowledge, or the public. Relating the amounts of resources used in a program (C) to the difference between IN and OUT (B-A) may possibly yield a cost/benefit index. (B-A/C)

At this stage there is little agreement as to what exactly should be measured or how, when considering the outputs of a program.

Value added is a concept important to determining cost/benefit. While it is difficult to identify and measure, the attempt must be made. Is it true, for example, as some research findings suggest, that the quality of an institution's graduates is determined largely by the quality of student it admits rather than by "adding values" to the person during his student years?

Competent Staff Analysis: The Key

Collecting these types of data will be of little benefit to an institution or agency unless trained staff are available to conduct appropriate

*Systems for Measuring and Reporting the Resources and Activities of Colleges and Universities, National Science Foundation, 1967, pp 91-117.

analyses for administrative decision-making. We recognize that many institutions in the West are not adequately staffed for these functions at this time. Therefore, we stress this implication of a data reporting system and urge strengthening of this capability along with the development of the system itself.

ANTICIPATED PROJECT PHASES

On the following pages are outlined the phases through which the project will prceed and the missions it plans to accomplish. Phase I, for which funding is now being requested, can be described in reasonable detail.

Phase I, June 21, 1968 to June 20, 1969

Mission. Initiate and phase-in the project

1) Recruit a project director and with his aid recruit the remaining members of the professional staff.

2) Identify the participating organizations, define their roles and establish procedures for communication, coordination, and advising.

3) Inventory the state of the art among the cooperating organizations (data definitions used, data collected, information systems used, level of computer capability, etc.).

4) Assess training needs of institutions and initiate selected training programs on organizing for development and maintenance of management information systems within institutions.

5) Review current literature and research on theoretical knowledge of educational outputs as they relate to inputs.

6) Establish procedures for the performance of the major functions of the project:
defining uniform data elements, program elements, program element grids, program budget categories, quantitative indicators; developing and implementing information systems.

7) Begin activities in these areas.

Within the development of an information system, four steps can be identified:

Step 1, on a conceptual level, development of a framework of the management information system. This should be developed

at two levels: (a) the level of information requirement and data relationships in the internal and external information system and (b) the level of administrative process requirement and procedural relationships in the internal and external information systems.

Step 2, definition of variables to be included in the system. The definitions must be in operational terms. The staff objective is to work on the relationship of these data in developing reliable management information systems. Staff ought not to generate a whole new set of definitions. Definitions in current use would be retained as they seem to be compatible with the objectives of what this program seeks to do.

Step 3, a sufficient management analysis of the administrative process in order to assure that the basic data required by the program are collected routinely as a result of the regular administrative process.

Step 4, computer application at the central staff level by systems analysts and programmers. Adaptations and application at the institutional level would be optional but recommended.

8) Cultivate cooperation among cooperating organizations and keep others informed of progress

Anticipated Outcomes

By the end of Phase I, the details of organization and procedures for coordinating and performing the work will have been established.

An initial effort to define the common uniform data elements to be collected and shared will have been made.

A detailed plan for Phase II, based on the "state of the art" and training needs surveys and initial efforts will have been drawn up and approved by the cooperating organizations.

Phase II, June 1969 - June 1972

Mission. Accomplish project objectives for the region

During this, the developmental phase of the effort, management information systems with common sets of uniform data elements will be designed, tested, and used.

Part 1:

Beginning with data required to derive the cost of instructional programs by level of student and course and field of study, a limited number of information systems in representative institutions will be developed and tested.

Concurrently, work will be initiated on input-output indicators, both quantitative and qualitative, and their relation to educational costs.

Part 2:

As quickly as the information system components and data elements can be developed and tested, their use will be expanded to all institutions in the region who are capable of implementing them.

Concurrently, training programs will be developed and conducted to prepare administrators and staff to implement the information systems and make effective use of the data in resource decision-making processes.

At this stage work will begin on developing common sets of uniform data elements in the other two major higher education programs, research and external service.

Part 3:

Staff will carefully evaluate the success of the project in preparation for demonstration in institutions and states outside the West.

Detailed plans will be made to expand the project and its impact during the third and final phase.

The development of new systems and refinement of existing ones in western institutions will continue.

Work on input-output indicators and their relation to educational costs; the work on qualitative measures of output will be intensified.

During all parts of Phase II, activities devoted to maintaining enthusiastic cooperation, disseminating project results, coordinating with national developments will continue:

Publication of progress and technical reports
Regular meetings of regional steering committee
Consultations with appropriate national consultants
Users seminars

Anticipated Outcomes

Many institutions in the West will have developed and implemented management information systems including common sets of uniform data elements.

Administrators and staff will have been trained in the development and use of management information systems and their application to such decision-making tools as program budgeting and cost/benefit analysis. Institutions and state coordinating agencies will be collecting and exchanging comparable data on the costs of instructional programs by level of student, level of course, and field of study.

A concrete plan for expanding the project beyond the West will have been developed.

A substantial amount of work will have been completed on developing uniform data elements related to the research and external service programs.

Phase III, June 1972 - June 1973

Mission. Expand the project to selected states outside the West and phase out the regional project

Part 1:

Plans to disseminate the results of the project to states and institutions beyond the West will be implemented

Part 2:

Final reports will be prepared and the project as described here will be closed out.

Anticipated Outcomes of the Five-Year Project

1) Management information systems will have been developed and implemented in cooperating organizations which produce the kinds of data campus decision-makers want and need to make better resource allocation decisions and for reporting comparable data to other organizations and agencies.

2) Comparable data on the costs of instructional programs by level of student, level of course, and field of study will have been made available, for the first time, on a continuing basis, for all types of higher education institutions.

3) The feasibility and usefulness to higher education of management tools such as program budgeting and cost/benefit analysis will have been tested across a variety of institutions.

4) A substantial number of administrators and professional staff in higher institutions and state coordinating agencies will have been trained in the use of these management tools in the process of developing, implementing and improving their management information systems.

5) Significant steps will have been taken toward compatible higher education information systems, nationwide.

Appendix A

SUGGESTED SPECIALIZED INFORMATION SYSTEMS

Information Sub-systems Related to Output

- Education program data
  - Data on program objectives
    - By academic field
    - By level of instruction
      - direct objectives
      - indirect objectives
      - joint objectives
  - Level of program activity by field and level of instruction
    - Number and kind of personnel assigned
    - Enrollments
    - Student credit hours
    - Weekly contact hours of faculty and class preparation per contact hour
    - Number of majors served
    - Weekly student contact by type of instruction
    - Service load induced by non-majors
    - Space used and utilization frequency distribution by room sizes
    - Class size frequency distribution and means
    - Courses/sections offered with course spread of class sectioning
    - Extent by type of academic support to faculty
    - Use of innovative practices in instruction (i.e., independent study, programmed learning, closed-circuit television, etc.) and input requirements for each
  - Program output by field
    - Full-time equivalent students
    - Student credit hours
    - Student contact hours (by level)
    - Academic awards (degrees, certificates)
    - Quantitative measures of intellectual achievement
    - Rate of admission of graduates to graduate and professional schools
    - Rate of graduates placed in national fellowship programs
    - Rate of election of graduates to learned societies
    - Rate of election of graduates to Who's Who
    - Peer judgments
    - Characteristics of first employment
    - Rate of acceptance of students as transfers
    - Degree of conformance to institutional objectives
    - Relationship of activity indicators to approved academic plans

- Research program data
  - Number and kinds of projects
  - Dollar volume
  - Personnel involved
  - Output value

External service program data (including training programs)
- Number and kinds of projects
- Dollar volume
- Personnel involved
- Output value

Information Sub-systems Related to Input

Student data
- Number and sources of students
- Student goals
- Socio-economic background
- Achievement at point of entry
- Predicted success at point of entry
- Performance within the institution
- Achievement at exit
- Achievement at subsequent points

Personnel data
- Faculty
  - Source and initial conditions of employment
  - Personal and professional characteristics
  - Official assignments
  - Types and amounts of compensation
  - Performance
  - Conditions of departure
- Supporting staff
  - Source and initial conditions of employment
  - Personal and professional characteristics
  - Official assignments
  - Types and amounts of compensation
  - Performance
  - Conditions of departure

Facilities data
- Assigned space by functions
- Types of uses
- Intensity of use
- Projections of need
- Unit and total cost of construction
- Maintenance cost
- Convertability indicators

Major supporting equipment data
- Kinds of equipment (e.g., computers, linear accelerators, nuclear reactors, astronomical observatory equipment, general library collections)
- Unit costs: acquisition and operating
- Utilization rates
- Obsolescence/wear-out rates

Financial accounting data

- Collection, identification, assignment, and classification of expenditures and transactions by:
  - Object of expenditure
  - Program and program element
  - Source of funds for each program
  - Function
  - Organization structure
- Provide for allocation of budgeted funds
- Pay external obligations
- Pay personnel
- Provide required degree of legal accountability
- Provide for feed-back to budgeting process

Appendix B

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