73-20,406

STONEMAN, James Victor, 1918-
A PROPOSED MODEL OF DATA FLOW TO BE UTILIZED IN RELATING STUDENT INPUT AND FINANCIAL ACCOUNTABILITY AT MICHIGAN STATE UNIVERSITY.

Michigan State University, Ph.D., 1973
Education, higher

A PROPOSED MODEL OF DATA FLOW TO BE UTILIZED IN RELATING STUDENT INPUT AND FINANCIAL ACCOUNTABILITY AT MICHIGAN STATE UNIVERSITY

By

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Administration and Higher Education

1973

ABSTRACT

A PROPOSED MODEL OF DATA FLOW TO BE UTILIZED IN RELATING STUDENT INPUT AND FINANCIAL ACCOUNTABILITY AT MICHIGAN STATE UNIVERSITY

By

James Victor Stoneman

In this study an attempt was made to satisfy a need at this University for a coordinated data flow that would more adequately relate performance measurements to financial responsibility. It was intended as a contribution to the efforts of those who are concerned with the creation of more effective methods for projecting, coordinating, and analyzing student enrollments, faculty requirements and related general fund items that are common to teaching departments. The constitutent parts of the system were developed separately as subsets so as to promote involvement at each stage by all levels of the organization.

The data flow began with the conceptualization of a model for projecting student headcount enrollments. Headcounts for each college were divided into three categories selected according to source: new (first-time and transfer), readmitted and returning.

The new student element was related to the number of applications received and to targets set for the Admissions Department. Readmitted students were based on historical trends and the number of applications received by the Registrar. Returning student enrollments were projected

on the basis of intra-campus migration studies. These three elements were assembled by class level within each college and used as a basis for calculating headcount growth rates.

A second module was constructed for projecting course enrollments. In this sector headcount growth rates were merged with a variable that reflected the size of the course loads carried by the different majors and the shift in course demands resulting from service requirements for majors from other colleges. Credit hours were calculated by assigning course credit values to the number enrolled in each course.

Student course demands were translated into teaching assignments and used as a basis for projecting the number of full-time equated instructors. The minimum number of variables recognized for calculating faculty requirements was: the number of teaching assignements, the proportion of teaching time to the total load carried by the faculty, the average teaching load and the average-sized section.

Performance measurements were assembled into the following equation to guard against their mathematical imbalance.

> The number of credit hours earned by students was equal to the number of credit hours taught by instructors. Credit hours earned were represented by the product of headcount enrollments times average student course loads times the average course credit value. Credit hours taught were equal to the number of instructors times the average percentage of time spent in teaching times the average credit-hour load carried by a faculty member times the average size of each class.

In the next phase, six basic performance measurements were related to general fund instructional costs and student fees. This was accomplished

through a mechanism that recognized a minimum of twelve variables. Other general fund accounts were grouped together and all of the elements were assembled into an equation using the following logic:

> General fund revenues were equal to general fund expenditures. Therefore,
> credit hours earned by students multiplied by the average tuition per hour times 1 plus State appropriation per cent times 1 plus other revenue per cent was equal to the product of credit hours taught times instructional expenditures per hour times 1 plus an overhead per cent.

This logic was expressed in over thirty variations of the basic equation. The purpose of the expansions was to provide an organized method for simulating the results of alternate policy decisions and to establish quantitative controls for use in seeking optimum combinations of the factors. The data were summarized in condensed pro forma statements of General Fund Revenues and Expenditures. Finally, a method for analyzing variances from planned objectives was described and illustrated.

Recommendations

The definitions, data sources and equations set forth should be meaningful to the planning and management process at Michigan State University. It was strongly recommended, however, that to achieve a systematic flow of coordinated data at this University, consideration should be given toward a restructuring of the responsibilities of the organizational units involved in processing the data. This action was primarily directed toward an elimination of the type of limitations that are placed on an institutional data flow by the existence of a number of autonomous and often incompatible departmental systems.

In the system recommended, each department would retain its responsibility for gathering and storing the data. However, the data itself would become the property of the entire institution and subject to institutional definitions and control. Departmental personnel who are engaged in data activities would carry a dual responsibility: a direct responsibility to the operational department and a functional responsibility to the Institutional Information Center. Such an arrangement would result in an increased depth of experience in a specialized function (e.g. student financial aids) in addition to the skills related to institutional data reporting and the presentation of financial reviews.

The end product of the study was a structured institutional information flow comprised of a series of fragmented but coordinated data systems. It was a flow through which budget differences between organizational units could be compared and appraised; a system that can become operational through a team effort at the present time in this University.

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CHAPTER I

INTRODUCTION

This thesis was an attempt to contribute to the efforts of those at Michigan State University who are concerned with the creation of more effective methods for projecting, coordinating, and analyzing student enrollments, faculty requirements, and selected related costs that are recorded in the General Fund.

It was essentially a study of budget performance measurements from their inception in the form of student headcount enrollments to their evaluation in terms of General Fund revenues and expenditures. The end product was the system that was produced by the coordination of the fragmented parts. The system has the capability of simulating the results of alternate policy decisions.

The general purpose of this dissertation was to describe the flow of information so that it would

1. insure the use of coordinated data at all organizational levels,
2. recognize college and departmental autonomy and accountability,
3. stimulate continuous involvement from the early planning stages at the department level,
4. suggest quantitative appraisal techniques that can be understood and applied at all levels, and
5. encourage mutual efforts toward a solution of the problem of meeting increasing demands with limited resources.

An immediate objective of this study was to assemble a flow that was capable of becoming operational at the present time at Michigan State

University, taking into account the capacities of currently available personnel and equipment, and the existing state of information available in reports, statistical libraries, and data banks.

The Need for This Study

The size and complexity of educational institutions have increased in recent years and will probably continue to increase in the immediate future. A variety in the number and type of academic programs, including those of an interdisciplinary nature, have also multiplied. These factors have contributed toward a separation of the academic and administrative communities. Consequently, procedures that assist in coordinating local and institutional targets should be a useful area for study.

The colleges at Michigan State University which offer similar academic programs differ appreciably on such measures as average student load, average teaching load, average course size, and type of instruction. These variations may have developed as a result of design, indecision, or perhaps as a consequence of financing. A systematic flow of data through which such differences can be compared and appraised should be useful.

A tight financial situation in higher education has forced a growing number of universities to reexamine their programs and attempt to reduce the impact of increasing costs through a combination of cost trimming and community effort. Citing a period of academic greatness under stress, President Clifton R. Wharton, Jr. stated, in his first state of the University address, that the typical university of today

is far too frequently a disorganized aggregation. "All members of the (Michigan State University) community must recognize the importance of self analysis....." An attempt to contribute toward the creation of systematic measuring devices that would encourage faculty and administrative involvement in team effort should, therefore, be a timely area for study at this University.

During the Spring of 1970, Chairman Charles Zollar (Republican from Benton Harbor) of the Senate Appropriations Committee stated that a new approach was used in determining budgets for the fiscal year 1971-1972. The Committee asked the universities to show more productivity per faculty member. When an institution must account for its activities in ways such as these, measuring devices which recognize these elements as integral parts of the internal budget process should be a proper area for consideration.

Statement of the Problem

This paper was an attempt to satisfy a need at this University for a data flow that would more adequately relate performance measurements to financial responsibility.

Basic Assumptions

A primary assumption was that all teaching departments in this Institution possessed certain similarities and differences which could be identified and measured. For example, many of the human and material resources that were required to produce a selected educational environment should be convertible into quantitative terms. In this study, many of these factors were set up as variables. Comparisons of these

factors should provide some measure of the quality of the program as well as an indication of supporting resource requirements.

It was also understood that demands on faculty members extended beyond the number of hours spent in the classroom and in student counseling. Consequently, a balancing of related factors must take into account the time, expense and energy imposed by such requirements as research and publication, professional and public services and by active participation as members of administrative committees.

Definition of Terms

An increasing emphasis by institutions of higher education on statistical analyses has contributed to the development of terminology for describing university operations. Efforts to produce inter-institutional comparisons, however, have demonstrated a need for increased refinement and standardization of definitions and classifications.

The definitions employed in this study followed those used in the 1971-1972 State of Michigan Budget Request, those suggested by the American Association of Collegiate Registrars and Admissions Officers, and those outlined in the Student Element Dictionary now being completed by the Western Interstate Commission for Higher Education (WICHE).

For purposes of this study the following definitions were assigned to the terms used.

STUDENT ENROLLMENTS

Headcount

A count of the number of different students who have completed the registration process. Term totals are completed as soon as the number becomes stabilized, but no later than the end of the second week.

Full-Time

A headcount of students who carry at least 75% of a normal load as measured in credit hours. The following minimum requirements are used at Michigan State University: undergraduates - 12; masters - 9; doctors - 6.

Course

The total number of students who are properly registered in all sections of a course. For reporting purposes term totals are completed at the end of the second week and at the term end.

Full-Time Equated

An equivalent number of students derived from the total number of credit hours generated by students each term. The following student loads are used at Michigan State University: undergraduates - 15.5; masters - 12.0; doctors - 8.0.

Fiscal-Year Equated

An equivalent number of students derived from the total number of credit hours generated by students during the four terms of a fiscal year. The following student loads are used at this University: undergraduates - 46.5; masters - 36.0; doctors - 24.0.

FACULTY

Headcount

A count of the number of different individuals who are teaching courses or who are paid from the instructional budget of the general fund.

Full-time Equivalent

The sum of the percentages of the salary paid to members from the general fund budget of a department or college.

CREDIT HOURS

Student Credit Hours

The total number of credits for which students are registered. For one course this is the number of students enrolled multiplied by the credit value of the course. One credit hour is usually assigned to a class that meets fifty minutes a week for a term.

Class Credits

The number of credits of teaching in credit courses. For example, a three-credit course taught in a two-hour lecture (two credits of teaching) and three laboratories (one-credit each) would add to five credits of teaching.

Class Hours

The number of hours of instruction in organized courses. For example, a three-credit course taught in a two-hour lecture (two hours in class) and three laboratories (each requiring two hours in class) would add to eight class hours of teaching.

Teaching Load

The sum of the class credits for classes or sections taught by an individual.

COURSES, CLASSES, AND SECTIONS

Number of Courses

The number of different courses (or course numbers) taught.

Fixed-Credit Classes

Organized classes or sections meeting for a specific number of hours per week and assigned fixed credit values.

Independent-Variable Classes

Instruction in classes taught by independent study or for variable credit.

Weighted Average Class Size

The average is calculated by weighting the enrollment in each section by the class credits for the section. Algebraically, it is the ratio of student credit hours to class credits.

REVENUES AND EXPENDITURES

Revenues

Increases in assets which do not result in reductions in other assets or increases in liabilities or reserves, and do not represent recoveries of expenditures.

Expenditures

The total charges incurred, whether paid or unpaid, that result in reductions of the net resources of a fund.

Variances

The differences between budgeted and actual revenues or expenditures. Analysis of variances provide information about their causes.

Limitations of the Study

Objective data are available to some extent in such areas as physical plant operations and auxiliary operations. Each has its counterpart

in the business world. However, budgetary needs for teaching departments are unique to educational institutions. At the present time these data are neither uniformly accumulated nor evaluated across the nation.

This study was limited to those budgetary considerations that are common to teaching departments at Michigan State University and to the various classifications of departmental expenditures that are financed from general funds. No attempt was made to separately identify such costs as supplies and services, equipment, etc. Identification was restricted to two main categories: costs that were recorded as instructional expenditures and a second group comprised of all other departmental expenditures.

Another limitation was stated in the section outlining the purpose of this study. The final product must be capable of achievement at this time at Michigan State University. It was, therefore, limited by the capacities of currently available personnel and equipment, and to the existing state of the present data storage and retrieval system.

Procedures

In this study an attempt was made to view existing conditions in a realistic manner. For this reason live data were used throughout to illustrate the data flow.

The data flow began with projections of headcount enrollments. It ended with condensed statements of general fund revenues and expenditures. The intervening elements were grouped so as to most conveniently

respond to anticipated data requirements. Internal requests are usually limited in scope. but require considerable detail. Budget appropriation requests, however, are more comprehensive in nature and relate performance measurements to resource allocations. These require a minimum of detail. Therefore, the data flow was arranged so that student headcounts, course enrollments and general fund estimates could be projected independently, given the required inputs for each.

New and readmitted student enrollment targets represented the inputs for projecting headcount enrollments. Total student headcounts, in turn, became the input for projecting course enrollments. A subset of this mechanism was a provision for calculating class credits and credit hours. When the data are required in sufficient detail, individual teaching assignments and weighted average class sizes can also be provided. The performance measurements supplied by the headcount and course enrollment mechanisms represented the input for general fund projections.

In their final form, the data were reproduced in condensed statements of general fund revenues and expenditures. Revenues were grouped into three categories: student fees, state appropriations and all other revenue. Expenditures were shown as instructional costs and all other overhead. In equation form, the factors can be readily altered to reflect the consequences of various planning decisions at the department, college or campus levels.

The cohesive element emphasized throughout the entire flow was the necessity for continuous involvement by all levels in the organization.

It is submitted that accountability for results must include participation in the establishment of targets. In addition, implementation is better accomplished by encouraging this continuous involvement from the early planning stages.

CHAPTER II

REVIEW OF THE LITERATURE

The search of the literature on the subject of a systematic projection process was approached in three parts. The first part covered the general topic of accountability. It emphasized the relevance of this type of data in solving problems confronting a university planner. In the second section, a review of recently developed models was undertaken. Finally, in a third section, selected models were analyzed in more detail for the purpose of relating their underlying assumptions to the needs at the University.

Accountability and the University

The University Publics

The university operates in a public setting. Its action and methods are of immediate interest to the general public as well as to a variety of special publics.[1] It establishes many of its goals and derives many of its characteristics in response to these interests.[2] Curriculum plans, for example, and the methods used for their accomplishment are said to be determined by social goals, national goals, parental ambitions, and the need to police the young.[3] If such a cause and effect situation should be allowed to dominate the educational environment it might well lead to situations where experimentation would

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[1] Hungate, Thad L. Management in Higher Education. New York: Colombia University, 1964, p. 164.

[2] Ibid., p. 163.

[3] Goodman, Paul. Compulsory Mis-Education and the Community of Scholars. New York: Vintage, 1966, p. 85.

be carried out by others leaving the university as a recipient of imposed change. The university itself, therefore, must create an environment of guided experimentalism and innovation.[4] This type of environment is said to prosper most effectively in an atmosphere of freedom from interference[5] -- where university autonomy is thriving.

One of the more prominent of Michigan State University's publics is the Legislature of the State of Michigan. The very limits of some of the educational programs of this University are shaped by the extent to which resources are made available by the State Legislature. If these are insufficient to accomplish long-range objectives, either the base of support is broadened, or existing plans are modified.[6]

As an agency financed by the state, the university is held to account for its plans, its operations, and its expenditures.[7] To accomplish these requirements, a systematic program of self-evaluation is expected to be undertaken. This calls for a type of skill and judgment that differs from that required from the members of other state agencies.[8]

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[4] Kerber, August and Wilfred R. Smith. Educational Issues in a Changing Society. Detroit: Wayne State University Press, 1964, p. 5.

[5] Hungate. op. cit., p. 235.

[6] American Council on Education. College and University Business Administration. Washington, D.C.: 1952, Vol. I, p. 158.

[7] Hungate, op. cit., p. 235.

[8] Ibid., p. 235.

Increasing Complexities

In recent years universities have become increasingly difficult to evaluate. Frustrating complexities in institutions of higher education have resulted from:

(1) increasing size,

(2) student disenchantment with the relevancy of educational activities

(3) administrator acknowledgement of increasing uncertainty in the decision-making process, and

(4) public concern over increasing costs.[9]

Modern management is expected to effectively cope with all of these problems and at the same time is required to find a more desirable ratio between cost and benefit.

Participation

A second problem is the difficulty encountered in implementing university plans. Implementation is best accomplished through the enthusiastic involvement of many members of the university community. However, such a community possesses a variety of interests and allegiance. Some have the point of view that no modification in the existing structure is needed.[10] Others, in their eagerness to receive sufficient funds, often become so preoccupied with how to get resources that they sometimes neglect giving careful attention to how these are

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[9] Western Interstate Commission for Higher Education. Minter, John and Ben Lawrence, eds. Management Information Systems: Their Development and Use in Higher Education. Boulder, Colorado: 1969, p. vii.

[10] Kerber, August, and Wilfred R. Smith, op. cit., p. 5.

used.[11] It is hoped that the flow of data suggested in this study may encourage a wider and more continuous faculty involvement in the planning process from the early stages.

Procedurally, individuals who are ordinarily most concerned with the preparation of the budget are the academic department heads, the deans and the Provost on the education side, and the administrative department heads and executive administrators on the business side. Individual faculty members may never be drawn into this process. Their source of information about the budget as a whole is often through rumor. Officially, a faculty member may learn only what his own salary and expense account will be for the coming year.[12]

Faculty non-involvement often results in an antagonistic attitude toward the administration and the budget process. Dodds described this attitude in the following words:

> "To many professors, the concept of administration suggests regimentation; regimentation spells restriction on freedom; and the less there is of it the better.... The very words 'economy' and 'efficiency' are apt to arouse faculty fear that participation in decision-making will be diminished. ... a certain incompatability exists between organizational law and order and the play of individualism that produces an inspiring teacher or original scholar." [13]

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[11] Russell, John Dale. Yardsticks and Formulas in University Budgeting. Boulder: Western Interstate Commission for Higher Education, 1959, p. 11.

[12] Millett, John D. Financing Higher Education in the United States. Columbia University Press: 1952, p. 229.

[13] Dodds, Harold W. The Academic President - Education or Caretaker? New York: McGraw-Hill Book Company, Inc., 1962, p. 69.

Ruml states this shortcoming in the following manner:

> "The individual faculty member usually does not have basic information about the way the teaching resources of the institution are being used. If information about teaching loads, course offerings and enrollments is available to administrative officers, it is likely to be distributed routinely to the faculty. Lacking this basic information, it is small wonder that the individual teacher does not see the possibilities of improving his economic status by means of an institutional program utilizing total faculty resources more efficiently."[14]

Millett wrote that while a scholar's professional endeavor is bound up with the welfare of the community, he has "little power to advance his own professional status because the advancement of the material well-being of the university is beyond his range of activity."[15]

Hungate saw the evaluation process taking place at the local level in isolation from those primarily responsible for management. He wrote that although evaluation in management in higher education is a widespread practice, "it is often sporadic, fragmented, and limited to the use and purposes of management at the local level" where there is less likelihood of a full understanding of institutional purposes.[16]

> "Under a system of decentralized management, evaluation can be expected to be most widely used at the local point of management -- the departmental or organizational unit. It will be less widely used and understood by major executives.... This lack does not permit the board to identify the strengths and weaknesses in specific aspects of programs and resources."[17]

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[14] Ruml, Beardsley, and Donald H. Morrison. Memo to a College Trustee. New York: McGraw-Hill Book Company, Inc., 1959, p. 60.

[15] Millett, John D. The Academic Community: An Essay on Organization. New York: McGraw-Hill Book Company, Inc., 1962, pp. 71-72.

[16] Hungate, Thad L., op. cit., p. 185.

[17] Ibid., p. 193.

The American Council on Education recommends that the faculty should be "consulted" when budgets are prepared. The faculty is represented by deans, department chairmen, and other academic officers. These members should be present to justify their budgets to the administrative officers who must make recommendations and decisions for the institution as a whole.[18]

In addition to this consulting role assigned to the faculty, the American Council on Education recommends that the Business Officer be given the responsibility of estimating total revenues. However, "for many revenue items, the estimates should be based upon information supplied by other administrative officials. For example...enrollment data (could be) prepared by the Registrar or Director of Admissions."[19] "The Chief Business Officer... should assume responsibility for non-academic operations.... He should also coordinate...reviews" through periodic analyses.[20] No suggestions are given on the timing, the extent, or the level of management involved in these reviews. Examples of the type of data that would be useful in budget reviews are outlined in this study.

Economy in Education

The use of measuring devices in this thesis is an attempt to relate economic and academic decisions throughout the planning stages. It is possible that present economic and financial problems have increased

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[18] American Council on Education. op. cit., p. 157.

[19] Ibid., p. 159.

[20] Ibid., p. 157.

because developments within the control of the university have weakened its ability to carry on its central educational purposes. To the extent that this may be so, financial need from external sources may not be convincingly estimated.[21] Funds may be dissipated through wastes in the administration of the program, and in the use of property and plant.[22] In times of economic crises, and sometimes during prosperous years, universities are asked to achieve greater economy and efficiency in their operations -- as an alternative to increased appropriations.[23]

Education can be said to be economical when available resources are allocated in a manner which maximizes student learning and minimizes waste in talent, potential, or materials. From an economical point of view, the average expenditure per student should increase to the point of diminishing returns as measured by achievement, earning power, and productivity.[24]

Woodburne emphasizes that policy, program, and finance are inseparable elements of management.[25] A "mechanism" is therefore required that is capable of stimulating imaginative planning and of

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[21] Ruml, Beardsley and Donald H. Morrison, op. cit., pp. xi - xii.

[22] Ibid., p. 10.

[23] Hill, David S. and Fred J. Kelley. Economy in Higher Education. 1933, p.v. Milwaukee Journal, June 24, 1965.

[24] Platt, Wm. J. "The Economic Value of Education". John C. McLennon, ed. Social Foundations of Education. New York: Macmillan, 1966.

[25] Woodburne, Lloyd S. Principles of College and University Administration. Stanford, California: Stanford University Press, 1958, pp. 40-43.

implementing these plans[26] with a sharp sense of involvement, responsibility, and accountability.[27] Perhaps some of the methods suggested in this study may be added to the efforts of others in formulating such a customized mechanism.

The Budget

In a procedural sense, the budget is a tool for internal unity because of the need to match resources with expenditures and to undertake periodic reviews. It is an instrument through which central direction can be given to a university.[28] It has been reported (Miller) that the overall support for higher education has been improved in those states which have adopted budgetary procedures.[29] Budgeting cannot insure good or responsible financial management. Its procedures and reports can, however, be useful in determining whether management is efficient and responsible.[30] It can also become an instrument of control over the future when devices are available that compare actual progress with those planned.[31] The value of budget procedures is enhanced by the existence of a flow of data that has been coordinated throughout the institution. This flow, together with some recommended applications represents the cohesive thread throughout this paper.

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[26] Ruml, Beardsley and Donald H. Morrison, op. cit., p. 68.

[27] Ibid., p. 68.

[28] Millett, John D. Financing Higher Education in the United States. Columbia University Press: 1952, p. 226.

[29] Miller, James L. Jr. State Budgeting for Higher Education - The Use of Formulas and Cost Analysis. Ann Arbor: The University of Michigan Press, 1964, pp. 94-149.

[30] Briggs, John F. A Refined Program Budget for State Budgets. Washington D.C.: The American University, 1962, pp. 4-5.

[31] Dodds, op. cit., p. 183.

Recent Information Models

The Western Interstate Commission for Higher Education (WICHE)[32]

WICHE is a public agency through which a group of states can coordinate their efforts in solving problems. It provides a common base for recording performance measurements and costs to which member institutions can translate their own characteristics that are developed under the parameters of their unique organizational structures. WICHE is, therefore, in a position to provide a total systems approach to the data structures and the reporting systems of its members.

This agency first developed a Management Information System (MIS) in 1968. It was subsequently renamed the Planning and Management Systems Program (PMS). The Program Classification Structure (PCS) was developed to provide a consistent means of organizing institutional data. The first analytical model to be constructed by PMS was the Resource Requirements Prediction Model (RRPM-1). The purpose of this model is to estimate the budget, manpower, and facilities necessary to support a given number and mix of students.

A more recent project by WICHE is the development of a student flow model. A preliminary report of this model is being circulated among member colleges.[33] A more detailed description of the model is included in the next section of this review.

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[32] The Western Interstate Commission for Higher Education. WICHE PMS Summary #1, December, 1970. Mimeograph, pp. 1, 6, 7.

[33] Lovell, C.C. Student Flow Models, A Review and Conceptualization. National Center for Higher Education Management Systems at Western Interstate Commission for Higher Education. Boulder, Colorado: August, 1971 (Preliminary Edition).

A State-Wide Model

A state-wide model was recently developed by the Office of Program Planning and Fiscal Management of the State of Washington. Although a description of this model has not yet appeared in published form, it was cited by C.C. Lovell in his preliminary report of the WICHE student flow model.[34] It is called the Higher Education Enrollment Projection Model (HEEP).

This is a Markovian model of undergraduate student projections. Data for a given year are projected and then adjusted linearly to reflect previous years' experience. The developers are expecting feedback from the various areas throughout the State of Washington to validate the methodology.

Since projections are related to past trends that have been subjected to smoothing techniques, one anticipated failure would be an inability to predict year-to-year extreme variations on a short term scale.

Large Planning Models

The majority of work involving the development of models has been in the context of a single model for an entire university. The central objective has been costing and resource allocation. Many of these models are in the conceptual state.

One of the better known examples of this type is the Comprehensive Analytical Methods of Planning University Systems (CAMPUS) developed

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[34] Ibid., p. 12-13.

by the Systems Research Group and the University of Toronto.[35] The Program Planning and Budget System (PPBS) was set up to integrate CAMPUS planning models and university information systems.[36]

This model is currently being considered for adoption at the University of Illinois. The results of the experience at this and other universities should be valuable in measuring the accuracy of the multiple regression technique used in its projections as well as the extent of the reliability of the entire model as a basis for simulating unique characteristics.

Another example of a large model was developed at Michigan State University by Koenig et al.[37] This model is primarily a research effort and has not yet been adopted by a university. Projections are made using the multiple regression mathematical technique. A more detailed description of the underlying assumptions used in this model for the development of performance measurements appears in the third section of this chapter.

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[35] Judy, Richard W. Systems Analysis for Efficient Resource Allocation in Higher Education. Seminar sponsored by the Western Interstate Commission for Higher Education and American Council on Education. Boulder, Colorado: October 1969, pp. 41-67.

[36] Judy, Richard W. A Research Progress Report on Systems Analysis for Efficient Resource Allocation in Higher Education. University of Toronto, January, 1970.

[37] Koenig, H.D., Keeney, M.G., Zemach, R.A. A Systems Model for Management, Planning, and Resource Allocation in Institutions of Higher Education. East Lansing, Michigan: Michigan State University, 1968.

University Planning Systems[38]

At the University of Utah, a major effort in forecasting has been devoted to the development of a long-range planning model. This model is actually an heirarchy of several models. Inputs include the following variables:

1. the number of full-time equivalent (FTE) students;
2. the number of full-time equivalent faculty per FTE student;
3. the average faculty salary; and
4. the number of support personnel per faculty.

A submodel is employed to predict student headcount enrollments. The new student input is based on a projection of public school enrollments and on predictions of enrollments for other higher education institutions in Utah. Upper-class enrollments are derived from survival rates applied to the incoming freshman class. Graduate enrollments are controlled by the Graduate School. A crossover study was recently completed for use in generating an induced course load matrix for each department.

Another submodel combines department enrollments with student-faculty ratios to develop instructional requirements. This number is combined with average salaries to obtain direct teaching costs. Other costs are determined by selected mathematical ratios.

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[38] Kornfeld, Leo L. Advanced Applied Management Information Systems in Higher Education: Three Case Studies. Seminar sponsored by the Western Interstate Commission for Higher Education and American Council on Education, Boulder, Colorado: October, 1969, pp. 85-93.

The data are used as a basis for internal management decisions and for reporting to the State legislature.

The academic staff has been reluctant to accept the data until the model is more fully understood. In addition, there is a strong suspicion that the data will be misused as a measurement of quality. This fear is being overcome by an assurance that a combination of quantitative data along with intuitive qualitative judgments can represent an improvement in the decision-making process.

The model at Ohio State University is known as the University Management Information and Control System (UMICS). It is used to more meaningfully analyze and reorient the information stored in the basic data files. The main purposes of the system are to forecast and control. The focal point of projections is the six-year academic plan of resource requirements.

UMICS is made up of a group of subsystems. Each of these represent an operational function of the University. Coordination in data storage and retrieval is assured by placing the data processing department under the jurisdiction of UMICS.

The University of Colorado[39] completes its plan of academic programs by means of a series of manual procedures. The first stage in the procedures is to estimate student enrollments. This is followed

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[39] University of Colorado. Guide to Academic Planning. University of Colorado: April, 1967.

by a projection of staff and facility requirements. Academic programs (instruction, research and public service) are then designed at

1. a basic program level that is compatible with the projections, and
2. optimum levels that exceed those estimates.

These procedures are repeated annually for five target years ahead. Such a period is said to be long enough to allow for facility planning and construction time, and phasing in or out of academic programs. It is also short enough so that plans can be constructed in considerable detail.

A conceptual planning model is currently being developed to reduce the preparation time required and to expand the process to further relate cost implications of the program.[40]

Ad Hoc Research Projects

One-time special-purpose studies often assume a productive role in choice of variables and in the selection of the most appropriate mathematical technique. For these reasons, selected examples of ad hoc studies are included in this review.

A series of related activities was recently studied at the University of California under a research program financed by the Ford Foundation. Five of these concerned techniques related to the projection process.

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[40] Lovell, op. cit., p. 16.

In one study,[41] the authors developed an independent trials process that related student attendance behavior to the amount of work required to complete the degree. Under this assumption, the probability of graduation was calculated as a power of the conditional probability of successfully completing a unit of work. This concept may be of value for projecting the extent of persistence in student behavioral patterns.

A second project,[42] studied two first-time freshmen cohorts or groups. Group stationarity (i.e. behavior independent of the time factor) was convincingly similar over a ten-year period for selected attendance patterns. Another aspect of this study was the presence of temporary vacation periods as a student passes through the system.

In a third study,[43] enrollments were projected by using the grade-progression ratio combined with a Markovian model proposed by Gani, Young, and Almond. A probabilistic interpretation was prepared so that this technique could be compared with other methods.

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[41] Marshall, K.T. "A Constant Work Model for Student Attendance and Enrollments". University of California, Berkeley: Research Report No. 69-1, February, 1969.

[42] Marshall, K.T., Oliver, R.M., Suslow, S.S. "Undergraduate Enrollments and Attendance Patterns". University of California, Berkeley: Report No. 4, March, 1970.

[43] Oliver, R.M., Hopkins, D.S.P., Armacost, R. "An Academic Productivity and Planning Model for a University Campus". University of California, Berkeley: Report No. 3, February, 1970.

In a fourth project[44] the results obtained at the various stages of a minimum total cost expansion program were related to total enrollment projections for the entire University of California System. That model disregarded enrollment mix, department size and mix, and restrictions from tenured faculty.

Finally, a study[45] was completed of the length of time required for the completion of the doctoral degree. This period was then related to the student's major. For this comparison, students were arranged into two cohorts:

1. University of California doctoral students, and
2. a group comprised of those students who received bachelors and masters at the University of California and doctorates at some other institution.

This grouping increased the validity of the evalution of the doctorate program at the University of California.

A More Detailed Analysis of Selected Models

The Subjective Element

The degree of success in projecting resource requirements usually varies directly in proportion to an ability

1. to recognize policies and decisions that have resource implications, and

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[44] Sanderson, R.D. "The Expansion of University Facilities to Accommodate Increasing Enrollments". University of California, Berkeley: Research Report No. 69-8, July, 1968.

[45] Hammel, Eugene. "Graduate Student Attendance and Enrollment Patterns -- Analysis of Cohort Data". University of California, Berkeley: Research Progress Report 69-2, March, 1969.

2. to realistically interpret and quantify these implications in terms of requirements.

A projection mechanism must be constructed in such a way that it can sensitively respond to these interpretations. Such a response can be more readily reflected when the appropriate variables are recognized. For this reason the underlying assumptions recognized in the following models will be reviewed for relevancy in a model to be suggested for Michigan State University.

The Gani Method[46]

This model is a mathematical matrix. It was explained by J. Gani of the Australian National University and one-time member of the Michigan State University Department of Economics.

In his method, enrollment projections are based on yearly "pass" and "repeat" rates. These were successfully related to enrollments in Australian Universities. In his article he assumed that headcount enrollments follow orderly patterns. For example, a freshman will enroll only in freshmen courses, a sophomore will register only in sophomore courses, etc. Final examinations are held annually in the Spring of the school year. Students will either pass these examinations and proceed to the courses required for the next year, or fail and repeat the year's work. The number who will not return to classes will be insignificant and was not included in his illustrations. The proportion who pass or repeat are considered to be fairly constant from

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[46] Gani, K. "Formulae for Projecting Enrollments and Degrees Awarded in Universities". Royal Statistical Journal, Series A, Volume 126, 1963, pp. 400-409.

year to year and are rather uniform throughout the country. New students enter into computations in the freshman year only. The number of students who graduate with bachelor degrees is the sole source of new students at the master level in that university.

In an effort to judge the validity of these assumptions as a basis for projecting enrollments at Michigan State University, the flow of students over a three-year period was analyzed.

The first question is the extent to which students on this campus are required to register in courses that correspond to their class levels. Table 1 shows that during the Fall terms of 1970 and 1971 students at all class levels were permitted to enroll at all course levels. This is contrary to the orderly and restricted-choice assumption reflected in the Gani model.

A second assumption in the Gani formula was that the number of students who failed to return the following year was not large, especially throughout the undergraduate years. The following schedules (Tables 2 and 3) show that students at this University are constantly interrupting their studies. This interruption occurs in significant numbers after each term of the year and at all class levels. One conclusion is clear -- a mechanism for predicting student enrollments at this University must take these interruptions into account.

A table of new students (Table 4) is sufficiently detailed to indicate that a considerable number of students enter this University at all levels during each of the four terms of the year. In the Gani formula

the assumption is made that new students enter once each year and only at the freshmen level.

The Koenig System[47]

The method of projecting headcount enrollments described by Koenig, et. al. groups enrollments into two parts:

Group I - New, readmitted and continuing students are combined into one group.

Group II - This group is made up of returning students.

Under this two-group arrangement the assumption is implied that new students, including first-time and transfer, readmitted, and continuing students fluctuate in harmony and that their supply is controlled by similar sources. This was a convenient method of grouping the new student input that resulted from the matching of tapes for two different terms. However, it results in the treatment of dissimilar types of headcount enrollments as if they represented a single homogenous group. For example, first-time undergraduates are related to the output of high schools and, to some extent, to the magnetic force projected by the image of this University. The number of new transfer students may be a measure of the attractiveness of our academic programs and facilities. The number of readmitted students may be related to the initial cause that resulted in the disruption in a student's program at this University. The number of continuing students -- those who were previously enrolled at this University and who are now returning at a higher level -- is related to the number who are expected to complete the requirements at the lower level.

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[47] Koenig, H.E., Keeney, M.G., Zemach, R.A., op. cit., pp. 111-121.

MICHIGAN STATE UNIVERSITY
East Lansing Campus

DISTRIBUTION OF STUDENT CREDIT HOURS BY COURSE AND CLASS LEVELS
Fall Terms

Table 1

	CLASS OF STUDENT ATTENDING COURSE										Total Credit Hours
	UNDERGRADUATE						GRADUATE				
	Frsh.	Soph.	Jr.	Sr.	Spec.	Total	Gr.Pro.	Mas.	Dr.	Total	
FALL 1970											
Course Level											
001-099	6770	2770	402	91	1107	11140	3	759	101	863	12003
100-299	102887	96658	57721	21545	1213	280024	34	1086	535	1655	281679
300-499	3695	19654	69475	85695	2125	180644	570	10804	2745	14119	194763
500-699	10	25	295	33	46	409	6625	146	147	6918	7327
800-999	75	106	405	1478	404	2468	277	29782	17901	47960	50428
Total	113437	119213	128298	108842	4895	474685	7509	42577	21429	71515	546200
Fall 1971											
Course Level											
001-099	9497	1062	429	60	1533	12581		413	78	491	13072
100-299	114242	81023	63660	22723	6353	288001	9	1161	443	1613	289614
300-499	4022	17251	74740	86237	2186	184436	402	9138	2613	12153	196589
500-699			33	59	34	126	8839	180	151	9170	9296
800-999	19	41	465	1578	553	2656	255	29840	16416	46511	49167
Total	127780	99377	139327	110657	10659	487800	9505	40732	19701	69938	557738

MICHIGAN STATE UNIVERSITY
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NON-RETURNS WHO DID NOT GRADUATE
COMPARED WITH THE TOTAL NUMBER ENROLLED DURING THE TERM
Fall 1968 through Summer 1971

Table 2

	UNDERGRADUATES						GRADUATES				Total
	Frsh.	Soph.	Jr.	Sr.	Spec.	Total	Gr.Pro.	Mas.	Dr.	Total	Students
Fall to Winter											
% of Fall 1968	6.4	6.5	6.2	8.9	50.9	7.3	1.4	18.8	11.5	15.0	8.8
1969	5.9	6.1	5.7	8.6	44.9	6.8		16.3	9.7	13.0	8.0
1970	6.3	6.6	5.7	6.1	42.2	6.7	1.1	15.5	10.8	13.2	8.0
1971	7.0	7.3	6.3	10.3	31.2	8.3	9.9	16.0	13.9	14.9	9.6
Winter to Spring											
% of Winter 1969	6.6	6.6	5.6	13.3	33.7	8.2	1.0	15.8	8.5	12.1	8.9
1970	5.7	6.3	5.3	5.1	43.4	6.1	.9	11.3	7.7	9.5	6.8
1971	5.9	7.0	5.8	6.8	34.9	6.8	.8	11.5	7.0	9.4	7.4
Spring to Summer											
% of Spring 1969	85.9	81.0	67.2	29.6	69.6	64.9	20.2	34.5	27.2	30.9	58.0
1970	86.2	76.2	60.6	28.5	67.0	61.4	18.7	33.8	27.7	30.8	55.0
1971	85.0	80.0	62.5	28.8	67.6	61.0	19.0	34.2	27.5	31.0	54.5

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PER CENT OF TOTAL NEW STUDENTS WHO DID NOT RETURN
AFTER THE FIRST TERM OF ENROLLMENT
Fall 1968 through Summer 1971

Table 3

	UNDERGRADUATE			GRADUATE				
	First-time	Transfer	Total	Gr.Pro.	Mas.	Dr.	Total	Total Students
Fall to Winter								
% of Fall 1968	4.7%	8.9	5.6	3.8	12.5	5.0	10.6	6.3
1969	5.0	7.3	5.5		12.5	7.4	11.4	6.5
1970	5.4	8.6	6.1	2.5	9.7	6.0	8.6	6.6
Winter to Spring								
% of Winter 1969	21.4	15.1	17.4		18.0	4.1	16.5	17.0
1970	21.7	19.5	20.1		14.9	4.0	13.6	17.9
1971	26.3	13.2	17.0		15.4	11.1	15.0	16.3
Spring to Summer								
% of Spring 1969	75.7	60.9	67.6		47.9	57.9	46.4	60.5
1970	66.1	56.8	60.0	2.5	50.2	34.4	41.7	52.1
1971	70.0	56.0	60.8		50.4	40.0	37.4	50.4

MICHIGAN STATE UNIVERSITY
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DISTRIBUTION OF NEW STUDENT ENROLLMENTS BY TERMS
Fiscal Year 1970-1971

Table 4

	TERM				Fiscal
	Summer	Fall	Winter	Spring	Year
UNDERGRADUATE					
First-Time	5.7%	88.0	3.6	2.7	100.0
Transfer	18.7	53.9	17.4	10.0	100.0
Total	10.1	76.6	8.2	5.1	100.0
GRADUATE					
Grad. Prof.		45.1		54.9	100.0
Master	29.5	48.6	13.1	8.8	100.0
Doctor	24.6	57.6	5.7	12.1	100.0
Total	27.2	50.0	11.1	11.7	100.0
EAST LANSING CAMPUS	14.5	69.7	9.0	6.8	100.0

New student admissions can be directly related to progress reports of the number of applications received, admissions that have been granted, and the number who have paid advance deposits. These reports should become an integral part of the projection process.

A second assumption refers to the basis for projecting the number of returning students. It is suggested that on this Campus a Spring-to-Fall relationship represents a more effective basis for the transition tables rather than the Fall-to-Fall relationship described in the model.

The data illustrated in the transition tables would also be more useful for projecting returning students if separate columns were provided for the special undergraduate class (class 5) and for graduate professionals (classes 8 and 9). These classes have been merged with seniors and masters. However, their numbers fluctuate independently. The restriction in these tables to six columns (freshmen, sophomores, juniors, seniors, (and specials), masters, (and professionals) and doctors) is understood to be caused by the limited capacity in MUSCIN2, the program that precedes the operation of STUVEC. Unfortunately, this data processing limitation could result in serious miscalculations of college projections.

Finally, although the program specifications are listed in considerable detail in the study, the language in which it was written is not acceptable to the system 360 or 370 equipment that is in operation in the Administrative Data Processing Department at this University. This Department is the custodian of the headcount enrollment data

bank. Significant conversion expenses would be required to adapt these data to the equipment used in the model.

There is no provision in this model for projecting course enrollments. These were not considered as a prerequisite for calculating credit hours.

Credit hours are projected by means of an induced course load matrix. This method reflects a crossover of enrollments (from student to teaching college) in terms of student credit-hour loads. Difficulty would be encountered in projecting graduate professional and special undergraduate credit hours in this model since classes have been merged with masters and seniors. In addition, the level of detail in the model severely limits the usefulness of these calculations. The smallest academic unit is the college.

Faculty requirements are estimated by means of historical faculty credit-hour loads applied to the total number of credit hours projected. The mechanism for allocating teaching expenditures operates in the same manner i.e. by calculating historical unit costs per credit hour and relating these to the credit-hour projections.

In the final report of this model no attention is given to the relative merits of choosing alternative distributions of credit hours, faculty or total expenditures. For example, credit hours can be distributed by student colleges, or by the teaching college administering the course, or by the teaching college absorbing the faculty's salary. The implication in the report is clear. The mechanism would operate

equally well with any one of these three. The choice is assigned to the user.

NCHEMS Enrollment Prediction Model

This model is in the process of development by the National Center for Higher Education Management Systems at WICHE (the Western Interstate Commission for Higher Education). It is known as the NCHEMS Enrollment Prediction Model.[48]

It is designed to address the need for a mechanism for predicting student headcount enrollments. Its authors believe that "the model design will attempt to address the most pressing problem in higher education enrollment for the largest proportion of the institutions".[49] A special feature of this model is that it is limited in scope to the enrollment prediction process. The model operates as a self-contained entity within a larger inter-related system. "Virtually no existing model (until this one), has been developed in conjunction with ongoing systems or (in) packages of related models."[50] Although considerable effort has been expended during the past few years on the development of student flow models, the majority of these have viewed the headcount enrollment process as a contributing element in a broader model primarily designed for costing and resource allocation. The large portion of these more extensive models have been either "strictly conceptual" or they represent "ad hoc studies without a focus on continued use".[51]

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[48] Lovell, op. cit.

[49] Ibid., p. 29.

[50] Ibid., p. 1

[51] Ibid., p. 2.

A problem of equal importance at this University concerns a second model for converting headcount enrollments into course enrollments. This stage of enrollment predicting is given little consideration as a practical application of the NCHEM model. The author stated that "a level of detail sufficient to handle individual course requirements is not presently envisioned".[52]

The NCHEMS Enrollment Prediction model divides the flow of students into two major components (1) the processes by which the student enters and leaves the institution and (2) the process by which students move between major fields of study and progress through the various levels.

The new student input module groups students according to their entering status. The following types are recognized:

1. New Admissions
   (a) New Freshmen (b) Transfers (c) New Graduate Students
2. Previously Enrolled Students
   (a) Departed in Good Standing (b) Other

The following types are recognized in the output model:

Departing students who are

(a) transferring to another institution

(b) dropping out on their own initiative, or

(c) forced out

(1) for academic reasons

(2) for other reasons

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[52] Ibid., p. 35.

Technical difficulties may be encountered in the limitations set by the program. For example, the maximum number of levels allowed is seven. At this University the minimum number would be eight and preferably nine. If it is desirable to project the number of students in each major, the potential number on the East Lansing Campus would far exceed the maximum capacity of the program.

The distribution of new students by majors is based on historical experience. At this University, the choice of major is a reflection of the admission decision. This is governed by maximum levels determined by the departments. These limits vary by term and by year. A provision for intercepting the new student input flow into the majors would, therefore, be required. This control should be available in the admissions module, since different criteria may govern the flow of returning students.

Computations of the number of students who will enroll in a particular major are completed in the "basic module".

The user of this model is required to supply all transition probabilities. These ratios would normally follow prior years' experience and would be calculated from historical samples. A special process is arranged to allow for modification of rates in exceptional circumstances.

There is a number of alternative mathematical methods suggested for estimating the appropriate values for transitional probabilities. The five techniques listed in the study were: least squares, exponential smoothing, mean over N years, last year's ratio and conjecture.

It was also suggested that the technique chosen would depend, in part, on how far into the future the projections are to be made. "Near-time estimates can generally be done with reasonable accuracy on a three-year sample, using means of the data or exponential smoothing. For long range projections, a technique that accounts for trends or cyclic behavior is usually desirable."[53] The tables shown in the following chapters of this thesis indicate that the selection of any one of these methods would have resulted in misleading projections.

Comments on the Literature

Much of the effort covered by the literature relates to a search for the mathematical methodology that most precisely fits the circumstances. In short, it is becoming a problem of a choice in statistical techniques. It is entirely possible that the popularity of the technique may be associated with the ease of application. The fear is that an over-sophisticated mathematical technique may allow the estimation process to dominate the projection problem.

A logical approach is suggested by Wayne Smith of the Office of Advanced Planning at UCLA.[54] He found that no single projection technique was applicable to every department or major. Each set of circumstances dictated its own technique.

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[53] Ibid., p. 69.

[54] Smith, Wayne. "A Student Flow Model" Mimeograph. Los Angeles, California: Office of Advanced Planning, University of California at Los Angeles, 1970.

A further comment is related to the influential position often assigned to a data processing oriented approach to solutions of management problems. There is the suspicion that knowledge of the capabilities of the hardware and software may condition the thinking of the planners in their selection of alternative solutions. The caution is that a highly sophisticated data processing model may allow processing techniques to dominate the projection problem.

A final comment concerns the procedures employed in the development and implementation of the projection process. Throughout the review of the literature it was clear that model development and implementation rested solely with central administrators. This limited communication structure does not invite an active participation by the very members planned to be measured by the process. Their lack of involvement may further contribute to an atmosphere of suspicion. This could result in an increased reluctance to be held accountable for results.

Hungate stated[55] that "the real harm that may be cumulative is the bypassing of faculties in management, so that they are not brought to participate and understand and hence to be committed to the institutional process".

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[55] Hungate, Thad L., op. cit., p. 237.

CHAPTER III

PROJECTING STUDENT HEADCOUNT ENROLLMENTS

Introduction

The data flow in this paper began with projections of student headcount enrollments. It is suggested that these enrollments can be more accurately projected if the number at each class level is divided into groups according to their source.

The Selected Basic Student Groups

The following three groups were selected:

New Students

The number in this group was derived from factors that were external to this University. This was the number that would be directed to this Institution and would depend upon the extent to which the image projected by this University was sufficiently powerful to attract students.

Readmitted Students

These students were previously enrolled at this University, but had not registered during the immediately preceding term. Their numbers were related to non-current student files at this University and to the probability that the student would return to active studies in a particular term. No study of these students has been undertaken at this University according to the records on file. This may be explained by the fact that their numbers were relatively small when compared with those coming from other sources.

Returning Students

The number of students in this category may be derived from current records. It was essentially a study of (1) intra-campus migration of majors, and (2) progress from one class level to another.

For this study new and returning students were further divided into subgroups. The purpose of this refinement was to more clearly relate the numbers to their source.

A. NEW STUDENTS

I. Undergraduate Level

1. First time in any college (FTIAC)

2. Transfers from an undergraduate program in another college

II. Graduate Level

1. First time in any graduate program

2. Transfers from a graduate program in another college

B. READMITTED STUDENTS

Due to the relatively small number in this group, it was not reclassified into subgroups.

C. RETURNING STUDENTS

The number of variables or subgroups in this category would vary according to the level of detail required.

I. At the campus level these groups could be merged into two types:

(1) Returning students who were enrolled at the same class level during the previous term, and

(2) Returning students who were enrolled at a different (and lower) class level during the previous term

II. At the college level these students were organized into four groups. Those who were previously enrolled

(1) at the same class level, and in the same college

(2) at the same class level, but in a different college

(3) at a different class level, but in the same college

(4) at a different class level, and in a different college

These four mutually exclusive groups may be illustrated as follows:

	Same College	Different College
Same class level	1	2
Different class level	3	4

III. To project enrollments at the curriculum level, the four groups must be further expanded as follows:

Returning students who were previously enrolled

(1) at the same class level, in the same college, and in the same curriculum

(2) at the same class level, in the same college, but in a different curriculum

(3) at the same class level, in a different college

(4) at a different class level, in the same college, and in the same curriculum

(5) at a different class level, in the same college, but in a different curriculum

(6) at a different class level, in a different college

These groups can be illustrated as follows:

	Same College		Different
	Same Curr.	Diff. Curr.	College
Same class level	1	2	3
Different class level	4	5	6

IV. Projections of majors would require an even greater expansion of detail. These categories can be illustrated as follows:

	Same College			
	Same Curriculum		Different	Different
	Same Major	Diff. Major	Curriculum	College
Same class level	1	7	2	3
Different class level	4	8	5	6

To determine the extent to which independent enrollment patterns exist for new, readmitted and returning students, East Lansing Campus enrollments were analyzed for the Fall terms of 1966 through 1971.

Enrollments were then converted into index numbers using the Fall of 1966 as the base. The data illustrated in Figure 1 show that enrollments in each of these categories did follow separate growth patterns. The decrease in input during the Fall of 1970 was the direct result of decisions to limit total campus enrollments. This position was subsequently relaxed and the flow immediately returned to its previous level of activity.

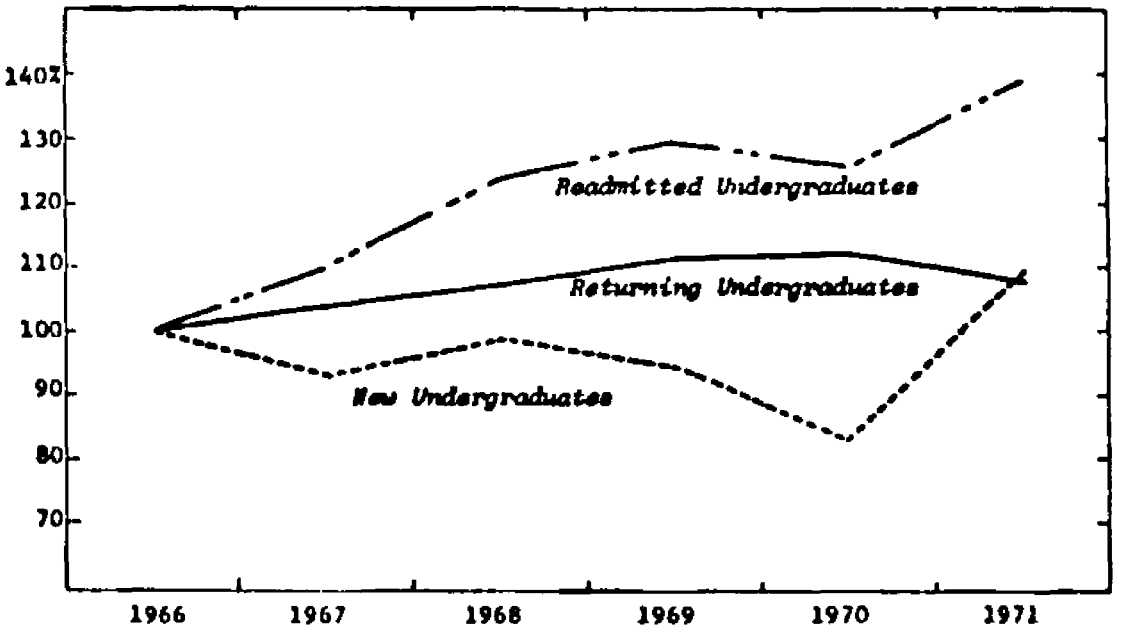
In the remainder of this section, historical enrollments in each of these three categories were analyzed separately and organized to fit the projection process.

Historical Student Headcount Enrollments

New Students

Applications for courses on the East Lansing Campus are processed in three different locations: The English Language Center located in the Center for International Programs, the Agricultural Institute of Technology located in Agriculture Hall and by the Office of Admissions and Scholarships located in the Administration Building. The flow of these data was illustrated in Figure 2.

More than ninety-eight per cent of the applications are processed by the Office of Admissions and Scholarships. The interdepartmental nature of the entire data was outlined in the flow chart in Figure 3.



	UNDERGRADUATE						GRADUATE					
	1966	1967	1968	1969	1970	1971	1966	1967	1968	1969	1970	1971
HEADCOUNT ENROLLMENTS[1]												
New-first-time	7159	6854	6986	6689	5590	6896						
-transfer	1854	1584	1940	1807	1833	2938						
Total	9013	8438	8926	8496	7423	9834	2132	1942	1440	1922	1769	1898
Readmitted	811	892	1004	1051	1021	1121	494	443	631	590	552	500
Returning	20405	21226	21831	22658	23169	22065	4727	5285	5596	5506	6014	5635
Total	30229	30556	31761	32205	31613	33020	7353	7670	7667	8018	8335	8033
INDEX PER CENT												
New-first-time	100.0	95.7	97.6	93.4	78.1	96.3						
-transfer	100.0	85.4	104.6	97.5	98.9	158.5						
Total	100.0	93.6	99.0	94.3	82.4	109.1	100.0	91.1	67.5	90.2	83.0	89.0
Readmitted	100.0	110.0	123.8	129.6	125.9	138.2	100.0	89.7	127.7	119.4	111.7	101.2
Returning	100.0	104.0	107.0	111.0	113.5	108.1	100.0	111.8	118.4	116.5	127.2	119.2
Total	100.0	101.1	105.1	106.5	104.6	109.2	100.0	104.3	104.3	109.0	113.4	109.2

Note: 1) Data excludes Agr. Technology and English Language Center students.

MICHIGAN STATE UNIVERSITY
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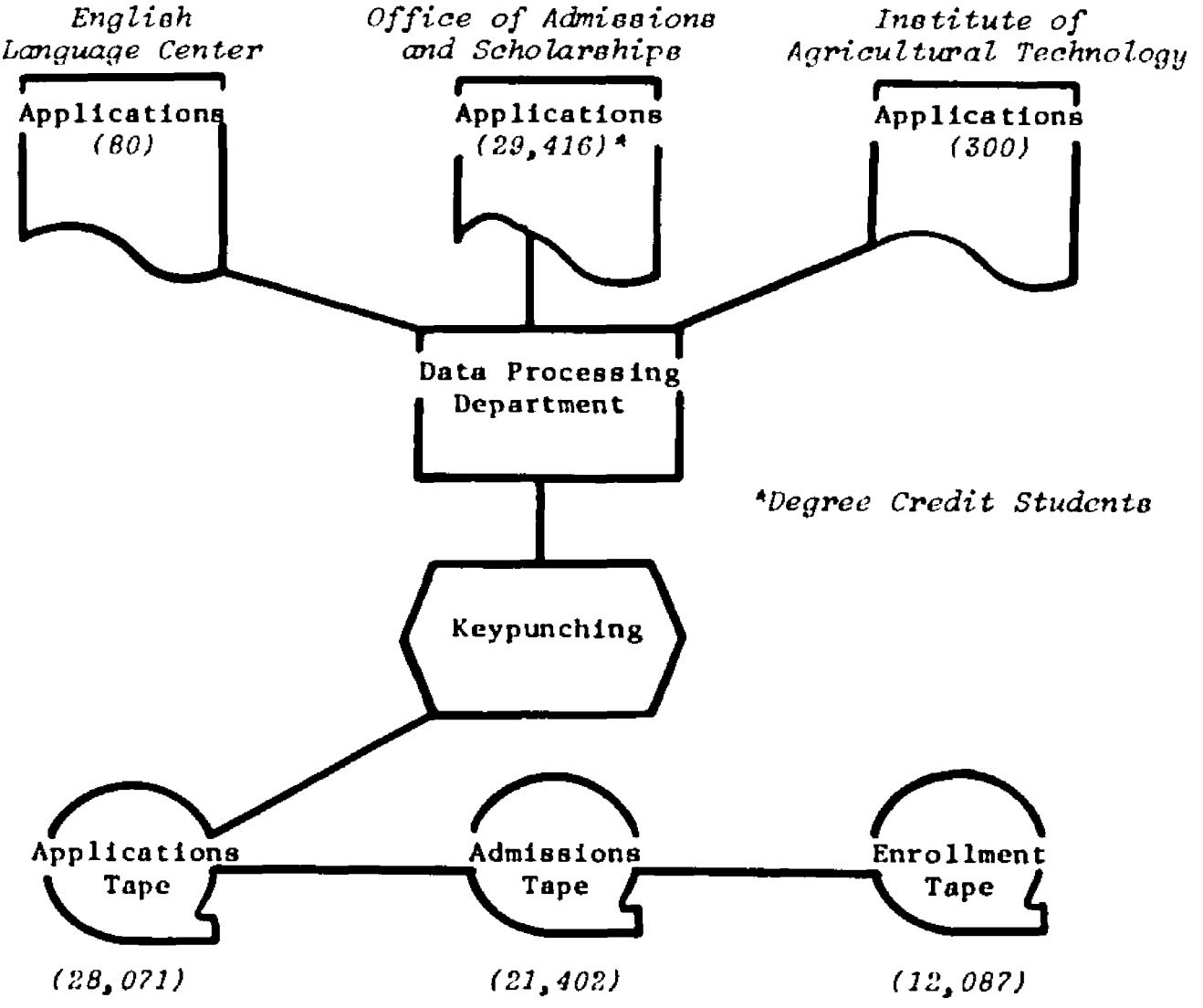
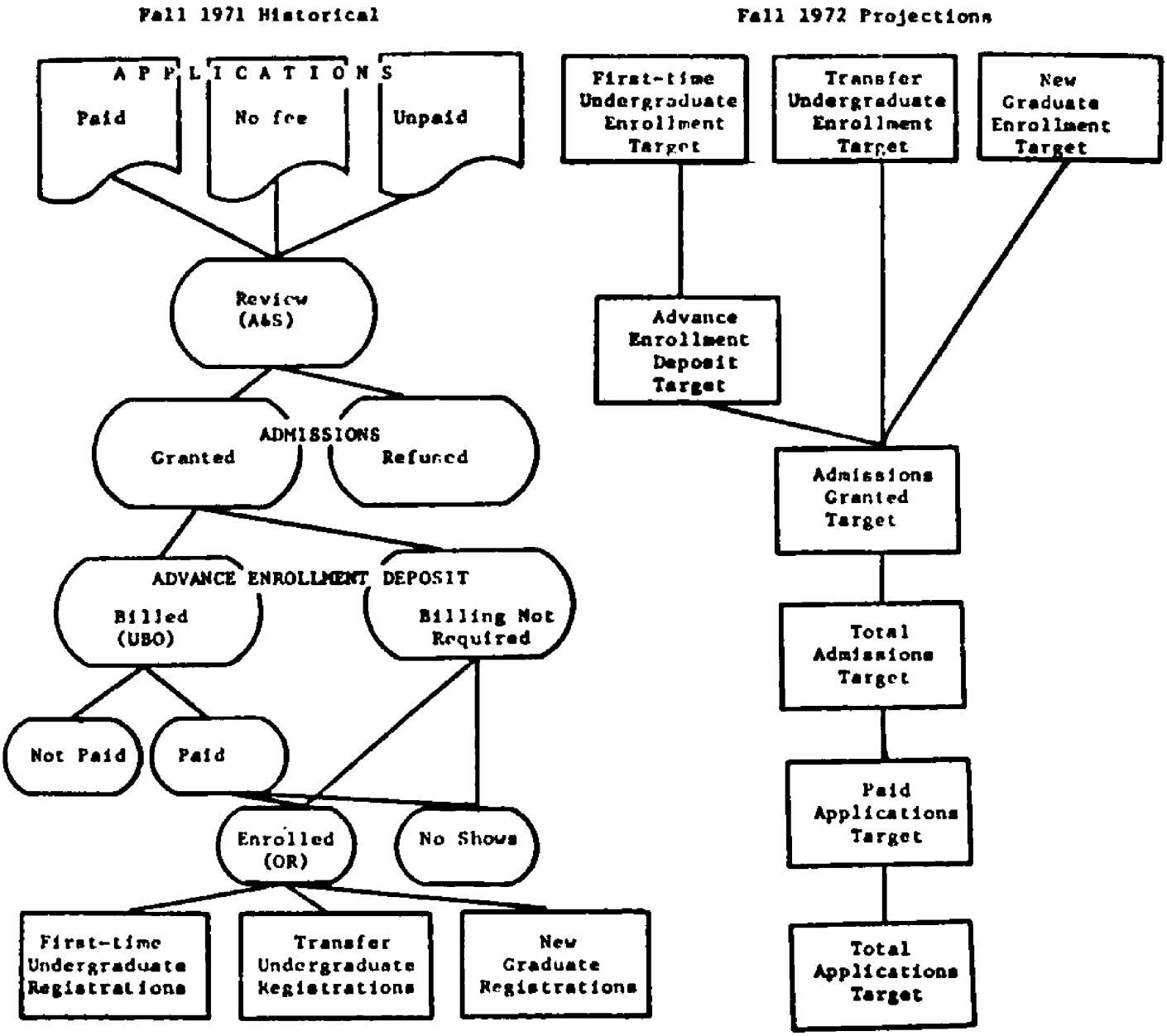
STUDENT HEADCOUNT ENROLLMENT BY SOURCE

Figure 1



FLOW OF NEW STUDENT ENROLLMENTS
East Lansing Campus
Fall 1971

Figure 2



Legend. A&S = Office of Admissions & Scholarships
UBO = University Business Office
OR = Office of the Registrar

FLOW CHART OF NEW DEGREE-CREDIT STUDENTS
East Lansing Campus
Fall Terms

Figure 3

The data are centrally stored on Data Processing Department tapes and disks. This information is first recorded on an applications tape. By maintenance overlay procedures it is periodically transferred to an admissions tape. The latter record becomes the basis for creating the fees receivable ledger in the University Business Office and for the registration packets used by the Office of the Registrar.

Targets for future years have traditionally started with projections of headcount enrollments. From this base, the number of admissions and subsequently the number of applications necessary to produce those enrollments are estimated. These become tentative targets for the Office of Admissions and Scholarships. A statistical illustration of this process for first-time undergraduates was shown in Table 5. With the exception of the portion relating to the advance enrollment deposit, the procedure is the same for transfer undergraduates and new graduates. The deposit, however, is a requirement of first-time undergraduates only.

The enrollment target should be approved well in advance of the visitation program by the admission counselors. These visits begin annually during September and are completed by the Thanksgiving Recess. The number and structure of the incoming freshmen class is directly related to the number of schools visited during that period and to the image projected by the counselors.

A planned admission procedure would also include the balancing of many secondary factors in an effort to produce the most appropriate student input mix for the University. Secondary mixes include:

MICHIGAN STATE UNIVERSITY
Office of the Registrar
Evaluation & Research

SUMMARY OF ADMISSION DATA
East Lansing Campus[1]

Fall Terms[2]

Table 5

FIRST TIME IN COLLEGE	TOTAL NUMBER 1966	1967	1968	1969	1970	1971	1972 (Target)	PER CENT DISTRIBUTION 1966	1967	1968	1969	1970	1971	1972 (Target)
APPLICATIONS														
Paid	15597	14683	14312	14986	13598	14502	14613	*217.9*	*214.2*	*204.9*	*224.0*	*243.2*	*210.3*	*227.8*
No Fee Charged	218	95	74	96	122	148	141	*3.0*	*1.4*	*1.0*	*1.5*	*2.2*	*2.1*	*2.2*
Total Applied	15815	14778	14386	15082	13720	14650	14754	*220.9*	*215.6*	*205.9*	*225.5*	*245.4*	*212.4*	*230.0*
Unpaid	198	680	809	884	668	875	801	*2.8*	*9.9*	*11.5*	*13.2*	*12.0*	*12.7*	*12.5*
Total Received	16013	15458	15195	15965	14388	15525	15555	*223.7*	*225.5*	*217.5*	*232.7*	*257.4*	*225.1*	*242.5*
ADMISSIONS														
Granted														
Cancellations	3677	4191	4142	4521	4297	5808	4972	*51.4*	*61.1*	*59.3*	*67.6*	*76.9*	*84.2*	*77.5*
Deferred Registrations	167	143	151	99	105	196	128	*2.3*	*2.1*	*2.1*	*1.5*	*1.9*	*2.7*	*2.0*
Eligible for this Term	7341	6949	7013	6722	5674	7066	6543	*102.5*	*101.4*	*100.4*	*100.5*	*101.5*	*102.5*	*102.0*
Total Granted	11185	11283	11306	11342	10076	13060	11643	*156.2*	*164.6*	*161.8*	*169.5*	*180.3*	*189.4*	*181.5*
Advance Enrollment Deposit														
Paid (Net after refunds)[3]		7097	7201	6957	5696	7286	6543		*103.5*	*103.1*	*104.0*	*101.9*	*105.7*	*102.0*
Unpaid		4186	4105	4385	4380	5774	5100		*61.1*	*58.7*	*65.6*	*78.4*	*83.7*	*79.5*
Total Granted	11185	11283	11306	11342	10076	13060	11643	*156.2*	*164.6*	*161.8*	*169.5*	*180.3*	*189.4*	*181.5*
Denied	4630	3495	3080	3740	3644	1590	3111	*64.7*	*51.0*	*44.1*	*55.9*	*65.1*	*23.1*	*48.5*
Total Applied	15815	14778	14386	15082	13720	14650	14754	*220.9*	*215.6*	*205.9*	*225.5*	*245.4*	*212.5*	*230.0*
ENROLLMENTS														
No Shows	182	95	27	33	84	170	128	*2.5*	*1.4*	*.4*	*.5*	*1.5*	*2.5*	*2.0*
Registered	7159	6854	6986	6689	5590	6896	6415	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Total Eligible	7341	6949	7013	6722	5674	7066	6543	*102.5*	*101.4*	*100.4*	*100.5*	*101.5*	*102.5*	*102.0*

Notes: 1) Totals exclude Agr. Technology and English Language Center students.
2) Final counts as recorded on September 30.
3) These totals do not include cancellations when deposits are forfeited.

1. the class level mix,
2. the geographic mix,
3. the age mix, and
4. the sex mix.

Consideration may also be given to balancing the representations relating to the economic strata, the race mix, rural-urban concentrations, the number of scholars and interpretations of this University's responsibilities toward the vocational-career orientation under the Land Grant Institution tradition.

Failure to recognize these factors at the executive level during the early stages could result in a first-come arrangement wherein the University might lose control over its own environment.

Enrollment projecting is a continuous process in which estimates are continually revised as time passes and as additional information is made available. A type of summary progress report for first-time undergraduates at the total campus level was shown in Table 6. Details by majors would be useful for planning at the college and departmental levels.

Readmitted Students

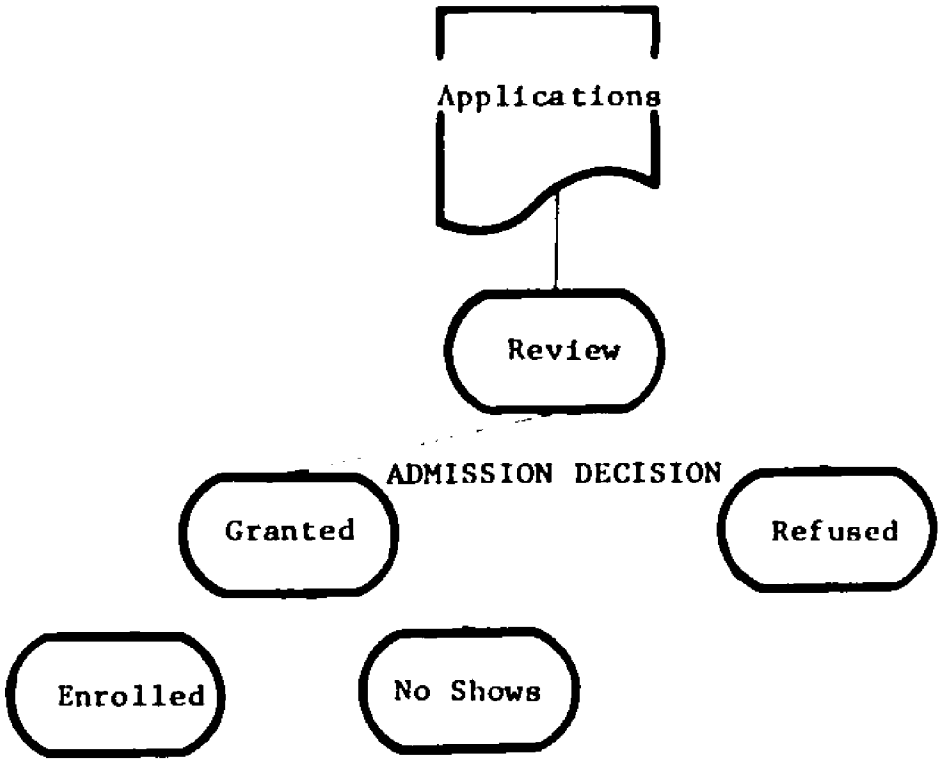
The readmission process is carried out in the Office of the Registrar. The decision to readmit a student, however, is the sole prerogative of the college of the student's major. The flow of these data was outlined in Figure 4.

MICHIGAN STATE UNIVERSITY
East Lansing Campus

SUMMARY OF ADMISSION DATA
ADVANCE ENROLLMENT DEPOSITS PAID

Table 6

		Fall 1967			Fall 1968			Fall 1969			Fall 1970			Fall 1971		
		No. of Stud.	% of Total	% of Enrolled	No. of Stud.	% of Total	% of Enrolled	No. of Stud.	% of Total	% of Enrolled	No. of Stud.	% of Total	% of Enrolled	No. of Stud.	% of Total	% of Enrolled
FIRST-TIME UNDERGRADUATES																
October	-Cumulative	132	1.9	1.9	114	1.6	1.6	99	1.4	1.5	236	4.1	4.3	57	.8	.8
November	-Month	2064			1351			1345			1130			1051		
	-Cumulative	2196	30.9	32.0	1465	20.3	21.0	1445	20.8	21.6	1366	24.0	24.4	1108	15.2	16.1
December	-Month	988			920			1784			1083			804		
	-Cumulative	3184	44.9	46.5	2385	33.1	34.1	3229	46.4	48.3	2449	43.0	43.8	1912	26.2	27.7
January	-Month	3058			2520			2163			2047			2175		
	-Cumulative	6242	88.0	91.1	4905	68.1	70.2	5392	77.5	80.6	4496	78.9	80.4	4087	56.1	59.3
February	-Month	1023			1788			1297			919			1790		
	-Cumulative	7265	102.4	106.0	6693	92.9	95.8	6589	96.1	100.0	5415	95.1	96.9	5877	80.7	85.2
March	-Month	373			759			661			568			958		
	-Cumulative	7638	107.6	111.4	7452	103.5	106.7	7350	105.6	109.9	5983	105.0	107.0	6835	93.8	99.1
April	-Month	-258			-26			-168			61			266		
	-Cumulative	7380	104.0	107.7	7426	103.1	106.3	7182	103.2	107.4	6044	106.1	108.1	7101	97.5	103.0
May	-Month	-353			-371			-291			37			-28		
	-Cumulative	7027	99.0	102.5	7055	98.0	101.0	6891	99.1	103.0	6081	106.8	108.8	7073	97.1	102.6
June	-Month	50			57			65			-85			85		
	-Cumulative	7077	99.7	103.3	7112	98.8	101.8	6956	100.0	104.0	5996	105.3	107.3	7158	98.2	103.8
July	-Month	18			30			2			-293			106		
	-Cumulative	7095	100.0	103.5	7142	99.2	102.2	6958	100.0	104.0	5703	100.1	102.0	7264	99.7	105.3
August	-Month	2			40			-2			-7			22		
	-Cumulative	7097	100.0	103.5	7182	99.7	102.8	6956	100.0	104.0	5696	100.0	101.9	7286	100.0	105.7
September	-Month				19			1								
	-Cumulative	7097	100.0	103.5	7201	100.0	103.1	6957	100.0	104.0	5696	100.0	101.9	7286	100.0	105.7
Total Enrolled		6854		100.0	6986		100.0	6689		100.0	5590		100.0	6896		100.0



FLOW CHART OF READMITTED DEGREE-CREDIT STUDENTS
East Lansing Campus
Fall 1971

Figure 4

The procedures followed for projecting the number of readmissions are similar to those outlined for new student enrollments in the preceding section.

1. The number of applications received to date are first extended to the annual basis.

2. This estimate is then converted to the number who are granted readmission and to the number who are subsequently registered.

The type of progress reporting that has been useful for these projections was illustrated in Table 7.

MICHIGAN STATE UNIVERSITY
Office of the Registrar
Evaluation & Research

READMISSION APPLICATIONS RECEIVED
East Lansing Campus[1]
Fall Terms

Table 7

	Fall 1968			Fall 1969			Fall 1970			Fall 1971		
	No. of Students	% of Total	% of Enrolled	No. of Students	% of Total	% of Enrolled	No. of Students	% of Total	% of Enrolled	No. of Students	% of Total	% of Enrolled
UNDERGRADUATE												
To July 5	527	*44.1*	*52.5*									
12	590	*49.4*	*58.8*	N/A								
19	646	*54.1*	*64.3*	720	*54.6*	*54.6*	N/A			N/A		
26	720	*60.3*	*71.7*	778	*59.0*	*74.0*	796	*57.4*	*78.0*	738	*50.6*	*65.8*
To August 2	780	*65.3*	*77.7*	880	*66.7*	*83.7*	876	*63.2*	*85.8*	838	*57.5*	*74.8*
9	873	*73.1*	*87.0*	945	*71.6*	*89.9*	960	*69.2*	*94.0*	929	*63.7*	*82.9*
16	940	*78.7*	*93.6*	1067	*80.9*	*101.5*	1036	*74.7*	*101.5*	1050	*72.0*	*93.7*
23	1020	*85.4*	*101.6*	1126	*85.4*	*107.1*	1127	*81.3*	*110.4*	1183	*81.1*	*105.5*
30	1096	*91.7*	*109.2*	1215	*92.1*	*115.6*	1237	*89.2*	*121.2*	1287	*88.3*	*114.8*
To Sept. 6	1130	*94.6*	*112.5*	1219	*92.4*	*116.0*	1289	*92.9*	*126.2*	1342	*92.0*	*119.7*
13	1179	*98.7*	*117.4*	1289	*97.7*	*122.6*	1321	*95.2*	*129.4*	1388	*95.2*	*123.8*
20	1195	*100.0*	*119.0*	1319	*100.0*	*125.5*	1387	*100.0*	*135.8*	1485	*100.0*	*130.1*
Total Enrolled	1004	*84.0*	*100.0*	1051	*79.7*	*100.0*	1021	*73.6*	*100.0*	1121	*76.9*	*100.0*
No Shows	191	*16.0*		268	*20.3*		366	*26.4*		337	*23.1*	
Refused	46			50			46			50[e]		

Note: 1) Totals exclude Agr. Technology and English Language Center students.

e = estimated

Returning Students

Projections of returning students were based on prior year trends. Experience patterns for these calculations can be more clearly identified when students are classified into the groups described at the beginning of this chapter. Not all of the historical ratios shown in Table 8 fit into identifiable patterns. Uncertainty also exists regarding the longevity of present patterns. Consequently, studies of student flow become a continuous matter.

Tables 9 and 10 showed that the number who transferred into the College of Natural Science and into the History major during the Fall of 1971 was relatively insignificant when compared with the number who remained. This was representative of the pattern for all colleges on the East Lansing Campus. A depth study of inter-college or inter-major migration, therefore, would not provide an explanation for the larger inconsistencies in the term-to-term flow.

In Table 11 enrollments from the three groups (new, readmitted and returning) were assembled for each class level. Growth rates were then calculated. These rates were used later as an element for projecting course enrollments.

Projecting Student Headcount Enrollments

In the previous section, historical data on headcount enrollments were organized according to source and selected ratios were calculated. In the following pages, the actual projections that were completed for the

STUDENT HEADCOUNT ENROLLMENTS
East Lansing Campus

Table 8

	Fall 1968		Winter 1969		Spring 1969	Fall 1969		Winter 1970		Spring 1970	Fall 1970		Winter 1971		Spring 1971	Fall 1971
RETURNING UNDERGRADUATES																
FR-Prev.diff.class			117		191	65		239		71	63		117		65	44
-Prev.Freshmen			7711		6958	1883		7271		6626	1566		6128		5556	1348
Total		79.7	7828	83.7	7149	25.0	1948	7510	86.5	6697	22.6	1629	6245	85.7	5621	23.0	1392
Total Freshmen	9670		8317		7518	9152		7846		6922	7773		6559		5886	8922
SO-Prev. Freshmen		12.8	1198	7.6	514	60.6	4538	1275		630	68.1	4301	1102	8.5	565	3679
-Prev. Sophomores			5743		5647	2501		5911		6031	2653		5897		5758	2238
Total		75.4	6991	78.3	6261	29.5	7039	7189	75.6	6661	28.5	7021	6999	75.7	6323	26.7	5917
Total Sophomores	7618		7231		6496	7818		7590		6505	7786		7365		6570	6596
JR-Prev. Sophomores		18.5	1413	15.7	1132	57.6	3353	1359	14.4	1196	69.2	3394	1378	14.3	1095	57.2	3367
-Prev. Juniors			5739		5455	3327		6027		5915	3702		6345		6132	3804
Total		74.0	7152	72.3	6587	67.5	6680	7416	78.6	7111	50.0	7096	7723	73.8	7227	43.7	7171
Total Juniors	7758		7567		7026	8171		7942		7400	8554		8305		7650	9386
SR-Prev. Juniors		18.6	1445	21.8	1629	55.3	2774	1915	19.7	2325	59.6	4933	1650	19.8	2113	55.2	3724
-Prev. Seniors			5565		6035	4217		5728		6379	4314		6198		6767	4761
Total		80.0	7010	84.0	7655	53.3	6957	7656	80.3	7977	52.0	7244	7848	81.9	8410	54.7	7509
Total Seniors	6954		7182		7909	7320		7541		8290	7558		8152		8708	7824
SP-Prev.diff.class			16		16	33		29		60	54		35		55	51
-Prev. Specials			119		120	87		134		177	190		235		258	212
Total		43.8	135	48.2	136	34.4	120	163	44.9	237	38.7	244	270	52.3	313	38.2	263
Total Specials	281		249		253	301		394		491	476		493		555	934
UNDC Rolled-Returning			29116		27758	22774		29544		29553	23234		29035		27894	22244
-Total	32281		30526		29182	32802		31311		30009	32179		30877		29347	33619
RETURNING GRADUATES																
GR.PRO.-Prev.diff.class			6		49	127		7		61	118		1		3	22
-Prev. Gr.Pro.			295		296	208		310		266	221		389		343	293
Total		83.8	301	97.7	345	59.3	335	317	83.9	327	59.9	339	390	88.8	346	85.8	315
Total Gr.Pro.	352		303		351	361		317		369	443		395		445	550
MAS-Prev.diff.class			81		89	125		99		100	171		80		101	240
-Prev. Masters			2911		3047	3543		3552		3659	3100		3908		3920	3027
Total		70.2	2992	81.0	3136	62.8	2668	3651	80.3	3759	68.3	3271	3988	82.2	4021	62.9	3267
Total Masters	4149		3763		4049	4640		4457		4539	5054		4768		4813	4831
DR-Prev.diff.class			66		64	130		96		30	70		96		55	77
-Prev. Doctors			2684		2691	2268		2595		2654	2157		2445		2491	2093
Total		86.7	2750	90.8	2755	75.0	2399	2691	80.0	2684	72.5	2227	2541	80.7	2546	72.5	2170
Total Doctors	3167		2965		3025	3017		2949		2977	2840		2745		2854	2676
GRADUATE-Returning			6043		6236	5401		6659		6760	5837		6919		6913	5757
-Total	7668		7031		7425	8018		7723		7835	8332		7908		8144	8033
CAMPUS-Returning			35159		34074	28175		36203		35363	29073		36004		34807	27994
-Total	39949		37557		36607	40820		39034		37844	40511		38785		37491	41652

SCHEDULE OF RETURNING STUDENTS
COLLEGE OF NATURAL SCIENCE
East Lansing Campus

From Spring and Summer 1971 to Fall 1971

Table 9

		Current Term Class Level									
		Undergraduate						Graduate			Total
		Fresh.	Soph.	Jr.	Sr.	Spec.	Total	Gr.Pro.	Mas.	Dr.	Total	Students
STUDENTS WHO RETURNED TO THIS COLLEGE												
	Fresh.	162	502				664					
	Soph.		243	378			621					
Previous	Jr.			354	260		614					
Term	Sr.				478	4	482	19			19	
Class	Spec.	6				17	23					
Level	Gr.Pro.											
	Mas.							256	8		264	
	Dr.								470		470	
	Total	168	745	732	738	21	2404	275	478		753	
STUDENTS WHO CHANGED TO THIS COLLEGE												
	Fresh.	1	12				13					
	Soph.		8	57			65					
Previous	Jr.			6	3		9					
Term	Sr.				4	3	7	3			3	
Class	Spec.					1	1					
Level	Gr.Pro.											
	Mas.							1	1		2	
	Dr.											
	Total	1	20	63	7	4	95	4	1		5	
SUMMARY												
A. Previously Enrolled in this College												
	Same class	162	243	354	478	17	1254	256	470		726	1980
	Different class	6	502	378	260	4	1150	19	8		27	1177
	Total	168	745	732	738	21	2404	275	478		753	3157
B. Previously Enrolled in a Different College												
	Same class	1	8	6	4	1	20	1			1	21
	Different class		12	57	3	3	75	3	1		4	79
	Total	1	20	63	7	4	95	4	1		5	100

Source: R3110

SCHEDULE OF RETURNING STUDENTS
COLLEGE OF ARTS & LETTERS
HISTORY MAJOR
East Lansing Campus

From Spring and Summer 1971 to Fall 1971

Table 10

		Current Term Class Level										
		Undergraduate						Graduate				Total
		Frsh.	Soph.	Jr.	Sr.	Spec.	Total	Gr.Pro.	Mas.	Dr.	Total	Students
STUDENTS WHO RETURNED TO THIS MAJOR												
	Frsh.	17	32				49					49
	Soph.		22	43			65					65
Previous	Jr.			64	54		118					118
Term	Sr.				83		83					83
Class	Spec.	1				2	3					3
Level	Gr.Pro.											
	Mas.								52	5	57	57
	Dr.									67	67	67
	Total	18	54	107	137	2	318	-	52	72	124	442
STUDENTS WHO CHANGED TO THIS MAJOR												
	Fr.		1				1					1
	Soph.		2	12			14					14
Previous	Jr.			1			1					1
Term	Sr.				1		1		6		6	7
Class	Sp.											
Level	Gr.Pro.											
	Mas.								2		2	2
	Dr.											
	Total	-	3	13	1		17	-	8		8	25
SUMMARY												
A. Previously Enrolled in this Major												
Same class		17	22	64	83	2	188		52	67	119	307
Different class		1	32	43	54		130			5	5	135
Total		18	54	107	137	2	318	-	52	72	124	442
B. Previously Enrolled in a Different Major												
Same class			2	1	1		4		2		2	6
Different class			1	12			13		6		6	19
Total		-	3	13	1		17	-	8	-	8	25

Source: R5310

STUDENT HEADCOUNT ENROLLMENTS ASSEMBLY SHEET
Fall Terms

Table 11

	EAST LANSING CAMPUS					COLLEGE OF NATURAL SCIENCE					HISTORY MAJOR				
	Fall 1969	% Change	Fall 1970	% Change	Fall 1971	Fall 1969	% Change	Fall 1970	% Change	Fall 1971	Fall 1969	% Change	Fall 1970	% Change	Fall 1971
FRSH.-First time	6915		5840		6798	1183		965		934	84		54		39
Transfer	128		85		474	9		11		44	1				4
Readmitted	201		223		208	12		15		16	4		4		1
Returning	1948		1629		1392	205		207		169	29		14		18
Total	9192	-84.6	7777	-114.1	8872	1409	-85.0	1193	-97.1	1163	118	-61.0	72	-86.1	62
SOPH.-Transfer	481		447		392	45		40		44	15		11		8
Readmitted	298		318		293	22		17		20	5		6		2
Returning	7039		7024		5913	778		859		765	84		90		57
Total	7818	-99.6	7789	-84.7	6598	845	-108.4	916	-90.5	829	104	-103.9	107	-68.6	67
JR. -Transfer	1117		1167		1887	137		123		204	34		32		39
Readmitted	374		302		328	31		29		35	9		8		5
Returning	6680		7095		7171	699		685		795	118		108		120
Total	8171	-104.8	8564	-100.6	9386	867	-98.5	837	-123.5	1034	161	-91.9	148	-110.8	164
SR. -Transfer	91		77		73	16		9		11	2		2		1
Readmitted	242		249		248	26		29		21	4		6		8
Returning	6987		7244		7505	708		732		745	142		131		138
Total	7320	-103.4	7570	-103.4	7826	750	-102.7	770	-100.9	777	148	-93.9	139	-105.8	147
SPEC.-First time	91		67		452	1				73					4
Transfer	40		74		113	3		7		1	1				
Readmitted	50		91		55	4		9		14	2		2		2
Returning	120		244		314	17		16		25	3		4		2
Total	301	-158.1	476	-198.2	934	25	-128.0	32	-353.1	113	6	-100.0	6	-133.3	8
Total Undergraduates	*32802*	-98.1	*32178*	-104.5	*33516*	*3836*	-96.3	*3753*	-104.3	*3916*	*537*	-87.9	*472*	-84.9	*448*
MAS.- New	1540		1325		1339	152		111		132	27		23		22
Readmitted	432		457		195	21		20		15	4		5		5
Returning	2668		3271		3267	216		305		261	45		70		60
Total	4640	-108.9	5053	-95.0	4801	389	-112.1	436	-93.6	408	76	-88.9	98	-88.8	87
DR. - New	363		365		327	123		107		82	12		11		16
Readmitted	256		248		179	17		9		19	9		5		4
Returning	2398		2227		2170	516		500		479	74		65		72
Total	3017	-94.1	2840	-94.3	2676	656	-93.9	616	-94.2	580	95	-85.3	81	-113.6	92
CR. -New	19		79		232										
PRO. Readmitted	7		24		9										
Returning	335		339		313										
Total	361	-122.4	442	-125.8	556	-		-		-	-		-		-
Total Graduates	*8018*	-104.0	*8335*	-98.4	*8033*	*1045*	-100.7	*1052*	-93.9	*988*	*169*	-105.9	*179*	-100.0	*179*
TOTAL	40820	-99.2	40511	-102.9	41649	4941	-97.2	4805	-102.1	4904	706	-92.2	651	-96.3	627

Fall term of 1972 were presented. These were subsequently compared with the actual number enrolled for the term.

The New Student Variable

The new student variable was further divided into the following subsections:

1. first-time undergraduates,
2. transfer undergraduates, and
3. new masters and doctors.

Graduate professional enrollments were projected separately in consultation with the planning personnel of the three Colleges of Medicine and the Office of the Provost. The overriding factor in projecting enrollments in these colleges was the availability of funds and facilities. Non-degree students in the Agricultural Technology program and the English Language Center were also projected separately.

The projections that are illustrated in this part were completed at three different times during the year. The primary purpose in describing these three sets of projections is to indicate the variation that may result from the different degrees of reliability in the data base. The dates chosen were:

1. January 31, 1971 - At this time a majority of the applications had been received from first-time undergraduates.
2. April 30, 1971 - At this time actual enrollment data for the Spring term of 1971 became available for use as a basis for calculating Fall term returning students.
3. July 31, 1971 - The data available on this date was typical of the base used for the projections included in the State Budget Request.

Projections were limited to the entire East Lansing Campus. The procedures followed, however, would be similar to those used for college, curriculum or major projections. The three tables (12, 13 and 14) that follow related applications, admissions, tuition deposits, and enrollments for the Fall terms of 1967 through 1970. These data were used as a guide for projecting Fall 1971 new student enrollments. The admission categories were chosen because of their acceptability as measurements of progress by the Office of Admissions and Scholarships.

The tables showed that the number of applications received during the last five years had been fairly constant, notwithstanding an increase in the number of high school graduates in the State. The number represented a fixed-size reservoir from which candidates were chosen. The majority of applications received from Fall term first-time undergraduates were on hand by the Christmas holiday. At any time thereafter, a significant number of applicants were awaiting an admission decision. Therefore, the number of net admissions, while sometimes considered to be a more accurate basis for projecting enrollments, was also a reflection of the workload pace deliberately chosen by admissions counselors.

The number of enrollment deposits paid is often considered to be the best single enrollment indicator. However, deposits are restricted to first-time undergraduates. Since the deposit is dependent upon a favorable admission decision, the number received is also subject to the workload limitation noted above. In addition, this indicator is affected by general economic conditions and the tightness, during the Spring season, of the dollar.

ADMISSION EXPERIENCE TABLES
East Lansing Campus
Fall Terms

Table 12

	Paid Applications Received				Net Admissions Granted				Advance Enrollment Deposits Paid				Term Enr'l
	January 31	April 30	July 31	September 30	January 31	April 30	July 31	September 30	January 31	April 30	July 31	September 30	September 30
FIRST-TIME UNDERGRADUATES													
Fall 1967													
Number of Students	13545	14397	14625	14683	10038	8961	7084	6949	6242	7380	7095	7097	6854
% of Total Year	92.3	98.1	99.6	100.0	144.5	129.0	101.9	100.0	88.0	104.0	100.0	100.0	
% of Applications	100.0				74.1				46.1				
		100.0				62.2				51.6			
			100.0				48.4				48.6		
				100.0				47.3				48.3	46.7
% of Enrollments	197.6	210.1	213.4	214.2	146.5	130.7	103.4	101.4	91.1	107.7	103.5	103.6	100.0
Fall 1968													
Number of Students	12946	13961	14256	14312	9493	9521	7055	7013	4905	7426	7142	7201	6986
% of Total Year	90.5	97.6	99.6	100.0	135.4	135.8	100.6	100.0	68.1	103.1	99.2	100.0	
% of Applications	100.0				73.3				38.0				
		100.0				66.2				51.3			
			100.0				49.5				50.1		
				100.0				49.0				50.3	48.8
% of Enrollments	185.3	199.8	204.1	204.9	135.9	136.3	101.0	100.4	70.2	106.3	102.2	103.1	100.0
Fall 1969													
Number of Students	13769	14856	14963	14986	9952	9552	6755	6722	5392	7182	6958	6957	6689
% of Total Year	91.5	99.1	99.8	100.0	148.1	142.1	100.5	100.0	77.5	103.2	100.0	100.0	
% of Applications	100.0				72.3				39.2				
		100.0				64.3				48.3			
			100.0				45.1				46.5		
				100.0				44.9				46.4	44.6
% of Enrollments	205.8	222.1	223.7	224.0	148.8	142.8	101.0	100.5	80.6	107.4	104.0	104.0	100.0
Fall 1970													
Number of Students	12661	13343	13546	13598	8215	8461	5616	5674	4496	6044	5703	5696	5590
% of Total Year	93.1	98.1	99.6	100.0	144.8	149.1	99.0	100.0	78.9	106.1	100.0	100.0	
% of Applications	100.0				66.9				35.5				
		100.0				63.4				45.3			
			100.0				41.5				42.1		
				100.0				41.7				41.9	41.1
% of Enrollments	226.5	238.7	242.3	243.3	147.0	151.4	100.5	101.5	80.4	108.1	102.0	101.9	100.0

ADMISSION EXPERIENCE TABLES
East Lansing Campus
Fall Terms

Table 13

	Paid Applications Received				Net Admissions Granted				Term Enr'l
	January 31	April 30	July 31	September 30	January 31	April 30	July 31	September 30	September 30
TRANSFER UNDERGRADUATES									
Fall 1967									
Number of Students	1071	3171	4153	4351	154	894	1620	1786	1584
% of Total Year	24.6	72.9	95.4	100.0	8.6	50.1	90.7	100.0	
% of Applications	100.0				14.4				
		100.0				58.3			
			100.0				89.0		
				100.0				41.0	36.4
% of Enrollments	67.6	200.2	262.2	274.6	9.7	56.4	102.3	112.8	100.0
Fall 1968									
Number of Students	1511	3129	4146	4401	190	1103	2106	2314	1940
% of Total Year	34.2	71.1	94.3	100.0	8.2	47.7	91.0	100.0	
% of Applications	100.0				16.5				
		100.0				35.3			
			100.0				80.8		
				100.0				58.8	44.1
% of Enrollments	59.3	181.3	213.8	226.9	9.8	56.9	108.6	119.2	100.0
Fall 1969									
Number of Students	1253	3329	4117	4172	206	1163	2054	2151	1807
% of Total Year	30.0	79.8	98.7	100.0	15.2	54.1	95.5	100.0	
% of Applications	100.0				16.4				
		100.0				34.8			
			100.0				69.8		
				100.0				51.8	43.3
% of Enrollments	69.3	184.2	227.8	230.9	11.4	64.3	113.7	119.0	100.0
Fall 1970									
Number of Students	1579	3758	4158	4205	193	1131	2052	2230	1833
% of Total Year	37.6	89.4	98.9	100.0	8.7	50.7	92.0	100.0	
% of Applications	100.0				12.2				
		100.0				30.1			
			100.0				49.4		
				100.0				53.0	43.6
% of Enrollments	86.1	205.0	226.8	229.4	10.5	61.7	111.9	121.7	100.0

ADMISSIONS EXPERIENCE TABLES
East Lansing Campus
Fall Terms

Table 14

	Paid Applications Received				Net Admissions Granted				Total Enrollments at September 30		
	January 31	April 30	July 31	September 30	January 31	April 30	July 31	September 30	Masters-Doctors	Gr.Pro.	Total
NEW GRADUATES											
Fall 1967											
Number of Students	3087	5816	6876	7444	1015	2819	3263	3808	1930	12	1942
% of Total Year	41.5	78.2	92.4	100.0	26.7	74.0	85.7	100.0			
% of Applications	100.0				32.9						
		100.0				48.5					
			100.0				47.5				
				100.0				51.2	25.9		
% of Enrollments	159.9	301.3	356.3	385.7	52.6	146.1	169.1	197.3	100.0		
Fall 1965											
Number of Students	2423	4792	5673	6371	624	2148	2755	3379	1414	26	1440
% of Total Year	38.0	75.2	89.0	100.0	18.5	63.6	81.5	100.0			
% of Applications	100.0				25.8						
		100.0				44.8					
			100.0				48.6				
				100.0				53.0	32.2		
% of Enrollments	171.4	338.9	401.2	450.6	44.1	151.9	194.9	239.0	100.0		
Fall 1969											
Number of Students	2545	5085	6230	7044	482	2180	2804	3719	1903	19	1922
% of Total Year	36.1	72.2	88.4	100.0	21.0	58.6	75.4	100.0			
% of Applications	100.0				18.9						
		100.0				43.8					
			100.0				65.0				
				100.0				52.8	37.0		
% of Enrollments	133.7	267.2	327.4	370.2	25.3	114.6	147.3	195.4	100.0		
Fall 1970											
Number of Students	2719	5168	6498	6880	520	1979	2628	3387	1690	79	1769
% of Total Year	39.5	75.1	94.4	100.0	15.4	58.4	77.6	100.0			
% of Applications	100.0				18.1						
		100.0				38.3					
			100.0				40.4				
				100.0				49.3	34.6		
% of Enrollments	160.9	305.8	384.5	407.1	30.8	117.1	155.5	200.4	100.0		

Enrollment patterns and flows from one stage in the admission process to another may, therefore, be subjected to artificial restrictions. As a result, the normal hazards of estimating the size of the student input are increased as a result of internal routines, personality problems and changes in management, in addition to the more obvious reasons of known policy changes and frequency of counseling trips to feeder institutions.

January 31, 1971 Projection (Shown as Fall 1971_1)

The number of applications received by January 31st in each of the three new student subsections varied significantly. The following proportions of the total for the Fall of 1970 were received by January 31, 1970:

First-time undergraduates	93.1%
Transfer undergraduates	37.6
New masters and doctors	39.5

The degree of reliability for projections was directly related to the proportions of applications received. On January 31st, insufficient data was available for projecting two of three parts of the new student variable. It was clear at this time that if past percentages continued, the target for first-time undergraduates would not be realized. It was also clear that the base for projecting transfer undergraduates and new masters and doctors was still uncertain. The data used in these projections appear in Table 15. These projections were first summarized for comparison with the targets established during the month of May 1970.

NEW STUDENT ENROLLMENT PROJECTIONS
East Lansing Campus
Fall 1971[1]
(as of January 31, 1971)

Table 15

	Paid Applications Received		Net Admissions Granted		Advance Enrollment Deposits		Term Enrollments at September 30			
	January 31	September 30	January 31	September 30	January 31	September 30	Degree Credit	Agr. Tech.	Eng. Lang. Center	Total
FIRST-TIME UNDERGRADUATES										
Fall 1971[1]										
Number of Students	12726	13833	9543	6582	4087	5240	5900	279	60	6239
% of Total Year	92.0	100.0	145.0	100.0	78.0	100.0				
% of Applications	100.0		75.0		32.1					
		100.0		47.6		40.8	42.6			
% of Enrollments	216.7	234.5	161.7	111.8	69.3	88.8	100.0			
TRANSFER UNDERGRADUATES										
Fall 1971[1]										
Number of Students	1882	6273	406	3638			2739			2739
% of Total Year	30.0	100.0	11.2	100.0						
% of Applications	100.0		21.6							
		100.0		58.0			43.7			
% of Enrollments	68.7	229.0	14.8	132.8			100.0			
							Master-Doctor		Gr.Prof.	Total
NEW GRADUATES										
Fall 1971[1]										
Number of Students	2770	7289	406	2383			1822		247	2069
% of Total Year	38.0	100.0	17.0	100.0						
% of Applications	100.0		14.7							
		100.0		32.8			88.0			
% of Enrollments	168.0	400.0	22.3	131.1			100.0			

During this stage preference was given to the number of applications received as the most reliable indicator for projections.

	Projection	Target
First-time undergraduates	5,900	6,700
Transfer undergraduates	2,739	2,300
New masters and doctors	1,822	1,850
Total	10,461	10,850

April 30, 1971 Projection (Shown as Fall 1971_2)

During the latter part of February, activities in the Office of Admissions and Scholarships were accelerated. The results of this increased pace began to appear in the number of admissions granted by April 30. During the Fall of 1970 the following proportion of applications were received by April 30:

First-time undergraduates	98.1%
Transfer undergraduates	89.4
New masters and doctors	75.1

Projections at this time were expected to more reliably reflect enrollments for the Fall of 1971. The following totals summarized the April 30 projections shown in detail in Table 16.

	Projection	Target
First-time undergraduates	7,307	6,700
Transfer undergraduates	3,995	2,300
New masters and doctors	1,685	1,850
Total	12,987	10,850

At this time, the decision was made by the Office of the Provost not to curtail the increased admission momentum. Previous targets for the Fall term of 1971 were, therefore, suspended.

NEW STUDENT ENROLLMENT PROJECTIONS
East Lansing Campus
Fall 1971_2
(as at April 30, 1971)

Table 16

	Paid Applications Received		Net Admissions Granted		Advance Enrollment Deposits		Term Enrollments at September 30			
	April 30	September 30	April 30	September 30	April 30	September 30	Degree Credit	Agr. Tech.	Eng. Lang. Center	Total
FIRST-TIME UNDERGRADUATES										
Fall 1971_2										
Number of Students	14083	14370	10703	7381	7101	6763	7307	279	70	7656
% of Total Year	98.0	100.0	145.0	100.0	105.0	100.0				
% of Applications	100.0		64.0		50.4					
		100.0		51.4		47.1	50.8			
% of Enrollments	192.7	196.7	146.5	101.0	97.2	92.6	100.0			
TRANSFER UNDERGRADUATES										
Fall 1971_2										
Number of Students	4082	4859	2493	4794			3995			3995
% of Total Year	84.0	100.0	52.0	100.0						
% of Applications	100.0		61.1							
		100.0		98.7			82.2			
% of Enrollments	102.2	121.6	62.4	120.0			100.0			
							Master-Doctor	Gr.Prof.		Total
NEW GRADUATES										
Fall 1971_2										
Number of Students	5323	7193	1820	3122			1685	247		1932
% of Total Year	74.0	100.0	58.3	100.0						
% of Applications	100.0		34.2							
		100.0		43.4			33.4			
% of Enrollments	315.9	426.9	108.0	185.3			100.0			

July 31, Projection (Shown as Fall 1971_3)

The potential number of new students, as reflected in the number of applications received by July 31, 1970, was as follows:

First-time undergraduates	99.6%
Transfer undergraduates	98.9
New masters and doctors	94.4

At this time, past experience indicated that net admissions granted would most closely approximate the number of new student enrollments. Preference was, therefore, given in Table 17 to this basis as the most reliable indicator for Fall 1971 projections.

Projected headcount enrollments for the entire student variable were summarized below. These enrollments appeared in the State Budget Request.

NEW STUDENTS		
(a) Degree Students		
First-time in college	6,949	Students
Transfer undergraduates	3,150	
Masters and Doctors	1,636	
Graduate Professionals	247	
(b) Non-Degree Students		
Agricultural Technology	279	
English Language Center	60	
Total New Student Headcount Projections	12,321	Students

NEW STUDENT ENROLLMENT PROJECTIONS
East Lansing Campus
Fall 1971[3]
(as at July 31, 1971)

Table 17

	Paid Applications Received		Net Admissions Granted		Advance Enrollment Deposits		Term Enrollments at September 30			
	July 31	September 30	July 31	September 30	July 31	September 30	Degree Credit	Agr. Tech.	Eng. Lang. Center	Total
FIRST-TIME UNDERGRADUATES										
Fall 1971[3]										
Number of Students	14439	14482	7199	7127	7264	7264	6949	279	60	7288
% of Total Year	99.7	100.0	101.0	100.0	100.0	100.0				
% of Applications	100.0		49.9		50.3					
		100.0		49.7		50.3	68.0			
% of Enrollments	207.8	208.6	103.6	103.6	104.6	104.5	100.0			
TRANSFER UNDERGRADUATES										
Fall 1971[3]										
Number of Students	4975	5030	3529	3676			3150			3150
% of Total Year	98.9	100.0	96.0	100.0						
% of Applications	100.0		70.9							
		100.0		73.1			85.6			
% of Enrollments	157.9	159.7	112.0	116.7			100.0			
							Master-Doctor	Gr.Prof.	Total	
NEW GRADUATES										
Fall 1971[3]										
Number of Students	6324	6656	2521	3274			1636	247	1883	
% of Total Year	95.0	100.0	77.0	100.0						
% of Applications	100.0		39.9							
		100.0		46.8			86.8			
% of Enrollments	386.8	406.8	154.1	200.1			100.0			

The Readmission Variable

The method used for projecting the new student variable was again followed for readmitted students. The July 31, 1971 estimate that appeared in the State Budget Request was summarized below.

READMITTED STUDENTS	
(a) Degree Students	
Undergraduates	
(1500 applications x 86.6% who will enroll)	1182 Students
Masters and Doctors	
(470 applications x 97.2% who will enroll)	457
(310 applications x 80.0% who will enroll)	248
Graduate Professionals	8
(b) Non-Degree Students	
Agriculture Technology	51
English Language Center	-
Total Readmitted Student Headcount Projections	1946 Students

The Returning Student Variable

Projections of the number of returning students rest upon the premise that historical trends can be established. These should be altered to reflect policy changes, etc. to form the basis for estimating the returning student variable for future periods. Due to a significant student turnover each term on the East Lansing Campus, and to the increasing input in the Winter, Spring, and Summer terms, the most reliable base for calculating Fall term returning students was the population in attendance during the immediately preceding Spring term. Enrollments for the Spring term of 1970 were available by April 30.

In Table 18, Fall 1971 projections were related to the Spring term of 1971. In these illustrations, three different percentage relationships

RETURNING STUDENT ENROLLMENT DATA
East Lansing Campus
Spring and Fall Terms

Table 18

	Actual Spring 1969	% Returning	Actual Fall 1969	Actual Spring 1970	% Returning	Actual Fall 1970	Actual Spring 1971	% Returning	Projections Fall 1971[1]	% Returning	Projections Fall 1971[2]	% Returning	Projections Fall 1971[3]
RETURNING UNDERGRADUATES													
FRESHMAN													
Prev. diff. class			66			64			64		65		64
Prev. Freshman			1923			1595			1349		1425		1339
Total		25.6	1989		23.0	1659		28.0	1413	24.3	1490	22.8	1403
Total Freshman	7518		9192	6923		7777	5864						
SOPHOMORE		60.4			63.3			63.3		61.8		63.5	
Prev. Freshman			4540			4382			3712		3624		3726
Prev. Sophomore			2501			2663			2536		2536		2554
Total		38.5	7041		38.6	7045		38.6	6248	38.6	6160	38.9	6280
Total Sophomore	6496		7818	6905		7789	6570						
JUNIOR		51.7			49.3			49.3		50.5		51.6	
Prev. Sophomore			3356			3404			3239		3318		3388
Prev. Junior			3329			3712			3840		3741		3843
Total		47.5	6685		50.2	7116		50.2	7079	48.9	7059	50.2	7231
Total Junior	7006		8171	7400		8564	7650						
SENIOR		39.6			38.7			39.7		39.7		40.0	
Prev. Junior			2771			2941			3037		3037		3057
Prev. Senior			4220			4331			4546		4598		4438
Total		53.6	6991		52.2	7272		52.2	7583	52.6	7635	51.0	7495
Total Senior	7909		7320	8290		7570	8708						
SPECIAL													
Prev. diff. class			35			58			58		47		54
Prev. Special			94			202			228		218		233
Total		37.2	129		41.1	260		41.1	286	39.3	265	42.0	287
Total Special	253		301	491		476	555						
UNDERGRADUATE													
Returning		78.3	22835		77.8	23352		77.0	22609	77.0	22609	77.3	22696
Total	29182		32802	30009		32176	29347						

RETURNING STUDENT ENROLLMENT DATA
East Lansing Campus
Spring and Fall Terms
Table 18 (Continued)

	Actual Spring 1969	% Returning	Fall 1969	Actual Spring 1970	% Returning	Fall 1970	Actual Spring 1971	% Returning	Fall 1971[1]	Projections % Returning	Fall 1971[2]	% Returning	Fall 1971[3]
RETURNING GRADUATES													
MASTER													
Prev. diff. class			129			177			177		153		173
Prev. Master			2615			3204			3398		3254		3295
Total		64.6	2744		70.8	3381		70.8	3575	67.6	3407	68.5	3468
Total Master	4069		4640	4539		5053	4813						
DOCTOR													
Prev. diff. class			132			72			72		102		69
Prev. Doctor			2295			2206			2139		2165		2097
Total		75.9	2427		74.1	2278		74.7	2211	75.0	2267	73.7	2166
Total Doctor	3025		3017	2977		2840	2886						
MASTER-DOCTOR													
Returning			4910			5659			5786		5674		5634
GRAD. PROF.													
Prev. diff. class			127			118			118		123		83
Prev. Grad. Prof.			208			237			286		275		232
Total		69.3	335		64.2	355		64.2	404	61.8	398	53.1	315
Total Grad. Prof.	351		361	369		442	445						
GRADUATE													
Returning			5506			6014			6190		6072		5949
Total	7424		8018	7885		8335	8144						
CAMPUS													
Returning			28341			29366			28799		28681		28752
Total	36607		40820	37894		40511	37491						

were calculated. For the Fall 1971_1 projection, the actual rates for the preceding year were used. In the Fall 1971_2 estimate, the average rate for the two preceding years were used. For Fall 1971_3 projections, a combination of rate trends and subjective judgment was used.

Collection of Enrollment Variables

The headcount enrollment variables were assembled in this section in three stages.

In the first schedule, Table 19, enrollments were arranged according to source: undergraduate degree students were identified separately from those not earning degree credit and graduate professionals were separated from projections for masters and doctors. In the second assembly sheet, Table 20, all enrollments were merged and identified by input variable. Table 21 identified students by input variables within class level.

HEADCOUNT ENROLLMENT VARIABLES
ASSEMBLY SHEET #1
East Lansing Campus
Fall Terms

Table 19

	Actual				Alternate Projections					
	Fall 1969		Fall 1970		Fall 1971[1]		Fall 1971[2]		Fall 1971[3]	
	Students	%	Students	%	Students	%	Students	%	Students	%
UNDERGRADUATE										
Degree Credit:										
New-First-time	6689	20.4	5590	17.4	5900	18.1	7307	20.7	6949	20.2
-Transfer	1807	5.5	1833	5.7	2739	8.4	3995	11.3	3150	9.2
Readmitted	1051	3.2	1021	3.3	1021	3.1	1030	2.9	1182	3.4
Returning	22658	69.1	23169	72.0	22431	68.7	22431	63.5	22522	65.5
Non-Degree Credit:										
Agr. Tech.	482	1.5	483	1.5	483	1.5	483	1.4	480	1.4
English Lang. Center	115	.3	80	.2	80	.2	90	.3	84	.2
Total Undergraduate	32802	100.0	32176	100.0	32654	100.0	35336	100.0	34367	100.0
GRADUATE										
Master-Doctor										
New	1903	23.7	1690	20.3	1822	20.5	1685	19.5	1636	19.1
Readmitted	583	7.3	705	8.4	600	6.8	650	7.5	705	8.3
Returning	5171	64.5	5498	66.0	5786	65.3	5674	65.5	5634	65.9
Total	7657	95.5	7893	94.7	8208	92.6	8009	92.5	7975	93.3
Grad. Prof.										
New	19	.2	79	.9	247	2.8	247	2.8	247	2.9
Readmitted	7	.1	24	.3	8		8	.1	8	.1
Returning	335	4.2	339	4.1	404	4.6	398	4.6	315	3.7
Total	361	4.5	442	5.3	659	7.4	653	7.5	570	6.7
Total Graduate	8018	100.0	8335	100.0	8867	100.0	8662	100.0	8545	100.0
TOTAL CAMPUS	40820		40511		41521		43998		42912	

HEADCOUNT ENROLLMENT VARIABLES
ASSEMBLY SHEET #2
East Lansing Campus
Fall Terms

Table 20

	Actual				Alternate Projections					
	Fall 1969		Fall 1970		Fall 1971$_1$		Fall 1971$_2$		Fall 1971$_3$	
	Students	%	Students	%	Students	%	Students	%	Students	%
UNDERGRADUATE										
New-First-time	7050	21.5	5924	18.4	6239	19.1	7656	21.7	7288	21.2
-Transfer	1813	5.5	1833	5.7	2739	8.4	3995	11.3	3150	9.2
Readmitted	1104	3.4	1067	3.3	1067	3.3	1076	3.0	1233	3.6
Returning	22835	69.6	23352	72.6	22609	69.2	22609	64.0	22696	66.0
Total	32802	100.0	32176	100.0	32654	100.0	35336	100.0	34367	100.0
GRADUATE										
New	1922	24.0	1769	21.2	2069	23.3	1932	22.3	1883	22.0
Readmitted	590	7.4	552	6.6	608	6.9	658	7.6	713	8.4
Returning	5506	68.6	6014	72.2	6190	69.8	6072	70.1	5949	69.6
Total	8018	100.0	8335	100.0	8867	100.0	8662	100.0	8545	100.0
CAMPUS										
New	10785	26.4	9526	23.5	11047	26.6	13583	30.9	12321	28.7
Readmitted	1694	4.2	1619	4.0	1675	4.0	1734	3.9	1946	4.5
Returning	28341	69.4	29366	72.5	28799	69.4	28681	65.2	28645	66.8
Total	40820	100.0	40511	100.0	41521	100.0	43998	100.0	42912	100.0

HEADCOUNT ENROLLMENT VARIABLES
ASSEMBLY SHEET #3

East Lansing Campus
Fall Terms

Table 21

	Actual			Alternate Projections					
	Fall 1969	Change From 1969	Fall 1970	Change From 1970	Fall 1971$_1$	Change From 1970	Fall 1971$_2$	Change From 1970	Fall 1971$_3$
FRESHMAN-First-time	6915		5840		6179		7304		6869
Transfer	128		85		409		550		559
Readmitted	160		193		193		200		250
Returning	1989		1659		1413		1490		1403
Total	9192	-84.6	7777	-105.4	8194	-122.7	9546	-116.8	9081
SOPHOMORE-Transfer	481		447		350		564		338
Readmitted	296		297		297		300		319
Returning	7041		7045		6248		6160		6280
Total	7818	-93.6	7789	-88.5	6895	-90.8	7024	-89.1	6937
JUNIOR-Transfer	1117		1167		1815		2666		1019
Readmitted	369		281		281		325		302
Returning	6685		7116		7079		7059		7231
Total	8171	-104.8	8564	-107.1	9175	-117.4	10050	-111.5	9552
SENIOR-Transfer	91		77		67		100		97
Readmitted	238		221		221		200		269
Returning	6991		7272		7583		7635		7495
Total	7320	-103.4	7570	-104.0	7871	-104.8	7935	-103.8	7861
SPECIAL-First-time	91		67		60		350		419
Transfer	40		74		98		115		137
Readmitted	41		75		75		51		93
Returning	129		260		286		265		287
Total	301	-158.1	476	-109.0	519	-184.1	781	-196.6	936
Total Undergraduate	32370	-96.1	32176	-101.5	32054	-109.8	33335	-106.8	32367
MASTER-New	1540		1325		1428		1321		1348
Readmitted	356		347		382		414		457
Returning	2744		3381		3575		3407		3468
Total	4640	-108.9	5053	-106.6	5385	-101.8	5142	-104.4	5273
DOCTOR-New	363		365		394		364		288
Readmitted	227		197		218		236		248
Returning	2427		2278		2211		2267		2166
Total	3017	-84.1	2840	-88.4	2823	-101.0	2867	-95.1	2702
GR.PRO.-New	19		79		247		247		247
Readmitted	7		8		8		8		8
Returning	335		355		404		398		315
Total	361	-122.4	442	-149.1	659	-147.7	653	-129.0	570
Total Graduate	8018	-174.0	8335	-106.4	8867	-103.9	8682	-102.5	8545
TOTAL CAMPUS	40820	-99.2	40511	-108.6	41521	-108.6	43953	-105.9	42912

CHAPTER IV

PROJECTING STUDENT COURSE ENROLLMENTS

Introduction

The central purpose of a university is carried on in the classroom between the instructor and his students. References to the number in each class are common to both faculty and administrators. Still, many enrollment models including those covered in the Review of the Literature, relate headcounts directly to credit-hour production thereby completely bypassing the course enrollment stage. In those models, studies of class size and room utilization are undertaken as separate research projects and are not considered as an essential stage in the budget projection process.

An example of such a view is found in the State of Michigan Budget Questionnaire. Little use is found in that document for course enrollments as a measure of performance. Another example is the Koenig Model for resource allocation. In both instances, headcount enrollments are related directly to credit hours with no reference whatever to course enrollments.

The view followed in this study is that course enrollments represent a logical common ground between faculty and administrative planners. It is at this stage that participation in the planning process can be most stimulating and relevant to the teaching faculty, to space planners, and to central administration.

The Course Scheduling Process

Before discussing some of the bases for projecting course enrollments it may be appropriate to first summarize the current steps for scheduling courses and the timetable used.

I. Courses that have been approved by the University Curriculum Committee are first listed in the University Catalog. The catalog is published annually and frequently indicates the term in which a course will be offered.

II. Courses and sections to be offered are published each quarter in the Time Schedule of Courses and Academic Handbook. Approximately two terms before a course is offered, the Office of the Registrar prepares a work sheet listing the courses and sections last offered during that term. The departments are requested to update these work sheets as required and return them to the Registrar at least fifteen weeks before the term begins. Each department projects course enrollments independently. No effort has been made to coordinate these projections with the headcount enrollment projections that had been included in the State Budget Report. College data on new student admissions are not available in reports from the Office of Admissions and Scholarships.

III. During the fifth week of the preceding term, students are given the opportunity to early enroll. Class lists and summary tabulations are subsequently prepared and are forwarded to the departments. Each department assumes the responsibility of

reviewing these lists and deleting those students who may not be acceptable. Revised tabulations are then prepared to exclude the deletions. Section-size tabulations compare the number of class cards issued with the number ordered. The room capacity of each assigned classroom is supplied by the Office of Space Studies and listed in the report.

Beginning with the Winter quarter of 1972, the University Curriculum Committee established minimum enrollment standards. Requests for permission to list exceptions to these standards must be approved between the early and regular enrollment periods.

IV. After the regular two-day registration period is completed, class lists and summary tabulations are again distributed to the colleges. Decisions on the withdrawal of courses or sections should be implemented immediately.

V. Subsequent studies of class sizes are completed by the Office of Institutional Research and are available late in the term. During the second week of the term additional data processing tabulations are distributed by the Office of the Registrar.

A Planning Model for Projecting Enrollments

A model for projecting course enrollments should serve at least two main purposes. It must first be useful as a planning tool. This objective can be better accomplished when course enrollments are clearly

related to headcount enrollments and to credit hours produced and are projected in a uniform manner throughout the Campus. In addition, the data on students who are attending a particular course should distinguish between those students who are majoring in that same teaching college and those who are from other student colleges.

A second requirement of this model is that it should include a capacity for systematic reporting. These reports should be useful to college administrators, department planners, the Space Utilization Office, and budget-conscious central staff administrators.

A problem faced in the previous chapter on headcount enrollment projecting was the selection of a logical flow of activity that would maximize the participation of faculty planners in the enrollment process. Headcount enrollment projections are traditionally calculated by central staff administrators. Projections of course enrollments, however, have been left almost entirely to faculty planners. As a result, many different methods are used. The typical basis currently used for estimating course enrollments is the enrollment experience in the courses held during the same term of the previous year. The number of courses or sections that failed to materialize is seldom studied by anyone outside of the teaching college. The central administrative staff have attempted to assure a minimum level of fiscal responsibility through a type of delayed police action. Sections that have failed to attract a minimum number of students are singled out as targets for criticism.

In the "Procedures for the Implementation of the University Curriculum Committee Guidelines" dated November 10, 1971, it was recommended that: (1) Projected enrollments should be based on previous enrollment patterns, (2) exceptions to the minimum level guidelines will be processed between the fifth week of the previous term (the early enrollment period) and the first day of classes in the current term, and (3) section cancellations should be implemented immediately after completion of the regular registration period.

Unfortunately, on the first day of classes, financial resources should have already been allocated, faculty committed, and space already reserved. The following considerations are, therefore, suggested

1. that a demand should be demonstrated before a course or section is listed in the time schedule for the term, and
2. that the basis for gauging this demand should be a coordinated system for projecting course enrollments.

It is further suggested that the size of a course or section is insufficient grounds to warrant its cancellation, notwithstanding the current fiscal stringencies placed upon this University. The "size mix" within a department or college should rest upon academic considerations. Departments and colleges should be free to exercise discretionary powers by balancing small-sized seminars with large lectures. It may also be academically sound to offer a variety of section sizes at each level of instruction so that new freshmen, for example, may be exposed to small as well as large-scale instructional methods. Under a system whereby the fiscal responsibility of a department or college is measured in terms of the average size for the entire department or

college, these units could discharge their responsibilities while preserving a larger degree of autonomy.

The use of campus-wide coordinated course enrollment projections as a common ground for faculty and administrator discussions could represent a contribution to the growing number of management tools in this University. Hard decisions regarding the feasibility of offering some courses would be given a larger perspective since the projected enrollment would be based on a campus-oriented model instead of on a variety of departmentally-oriented methods. In addition, these decisions would be assigned to the planning stage. More important, however, would be the strengthening of participation and involvement of faculty and administration at this level of the enrollment process.

Proposed Method for Projecting Course Enrollments

The Headcount Growth Rate

In the model for projecting course enrollments developed by J. Saupe, students were grouped by student college within each course. Dr. Saupe was encouraged in pursuing this approach by the interest shown in an article entitled "Predicting Course Enrollments" published in College and University, Spring 1963.

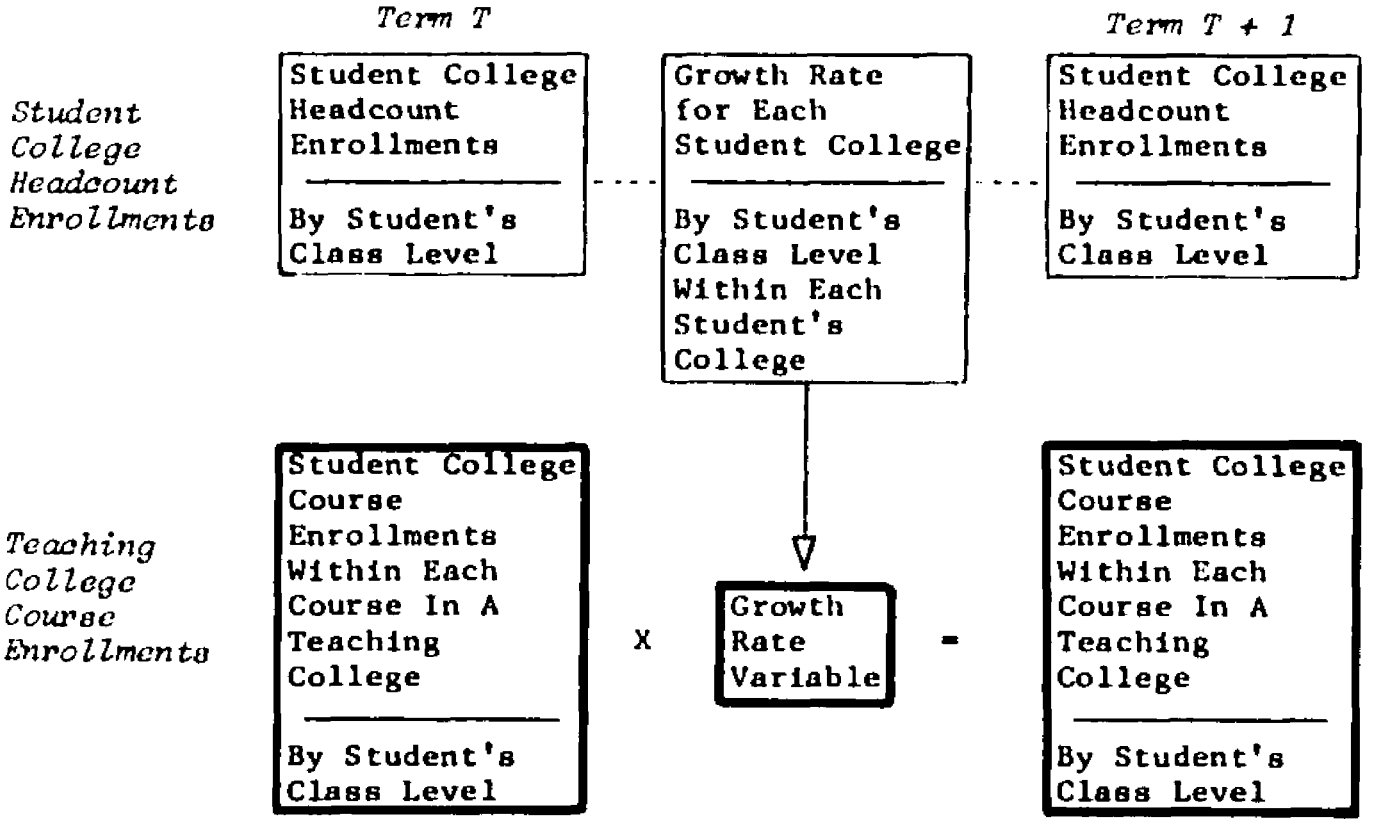
Dr. Saupe proposed that course enrollments can be projected on the basis that student representation in a teaching college will remain fairly constant, but that their numbers will vary in direct proportion to the growth rate in headcount enrollments for a student's college.

For example, if the number of freshmen majors from the College of Business increased by ten per cent, all course enrollments of College of Business freshmen would correspondingly increase by ten per cent. This position is restated as follows:

(a) The pattern of courses followed by the majors in a student's college will be similar to that chosen by students in those majors during the same term of the previous year.

(b) Therefore, the increase in the number of majors from a selected student's college is a valid measure of the increase in their course enrollments.

This proposition is illustrated in the following flow chart (Figure 5).



FLOW CHART OF THE FIRST METHOD FOR PROJECTING COURSE ENROLLMENTS
East Lansing Campus

Figure 5

The tables that follow were designed to test the validity of these statements. In Table 22 detailed calculations for freshmen were illustrated. This was followed in Table 23 by a summary of all students enrolled in the selected course. If the proposition was correct, the headcount growth rate would have accounted for the entire change in course enrollments from the base term to the projected term. An examination of the data in these tables disclosed that the headcount growth rate did not explain the complete change.

The analysis in Table 24 disclosed that changes in the number of course enrollments were also affected by a change in the course patterns selected by students. Student loads varied considerably among the colleges.

An example of the extent of the change in these course loads was shown in Table 24 for majors from the College of Natural Science. The schedule shows that the average number of courses carried by all Natural Science freshman majors was 4.64. About half of these (2.12) were Natural Science courses, 1.04 were University College courses and the remainder was spread over twelve different teaching colleges.

The Student Course Load Variable

The course enrollment change factor was, therefore, expanded to the following:

> The growth rate experienced in a student college, expressed as a per cent of change in headcount enrollments, multiplied by the change in the percentage of students who enrolled in a selected course will approximate the total rate of change in the total number enrolled in a course.

The flow chart was revised (Figure 6) and the data were retested in Tables 25 and 26.

THE FIRST METHOD OF PROJECTING COURSE ENROLLMENTS

Teaching College: NATURAL SCIENCE
Course: MATHEMATICS 108
East Lansing Campus
Fall Terms

Table 22

	Fall 1969 Actual	% Change in Headcount	Fall 1970 Projected	Error Class Enr'l	Error % of 1970 Actual	Fall 1970 Actual	% Change in Headcount	Fall 1971 Projected	Error Class Enr'l	Error % of 1971 Actual	Fall 1971 Actual
FRESHMEN											
Student College:											
Agr. & Nat. Resources	72	*80.9*	65	*6*	*10.8*	59	*140.6*	83	*-4*	*-4.6*	87
Arts & Letters	6	*75.0*	5	*2*		3	*104.4*	3	*-7*	*-70.0*	10
Lyman Briggs	21	*76.9*	16	*7*	*77.8*	9	*176.1*	16	*-22*	*-57.9*	38
Business	98	*86.3*	85	*17*	*25.0*	68	*119.3*	82	*-14*	*-14.6*	96
Communication Arts	4	*71.5*	3	*2*		1	*113.8*	1	*-4*	*-80.0*	5
Education	14	*71.3*	10	*1*	*11.1*	9	*96.4*	9			9
Engineering	83	*73.2*	61	*20*	*48.8*	41	*94.5*	39	*-11*	*-454.5*	50
Human Ecology	12	*76.8*	9	*-4*	*-30.8*	13	*126.2*	16	*1*	*6.7*	15
Human Medicine	23	*134.6*	29	*14*	*93.3*	15	*111.3*	17	*-17*	*-50.0*	34
James Madison	-	*77.1*	-	*-1*	*-100.0*	1	*115.4*	1	*1*		-
Justin Morrill	2	*101.9*	2			2	*101.5*	2	*-5*	*-71.4*	7
Natural Science	253	*85.0*	215	*-11*	*-4.9*	226	*87.1*	219	*-86*	*-28.2*	305
Osteopathic Medicine	-		-			-		-			-
Social Science	18	*84.1*	15	*-8*	*-28.6*	21	*133.3*	28	*-3*	*-9.7*	31
Veterinary Medicine	70	*97.3*	68	*10*	*17.2*	58	*174.2*	101	*6*	*6.3*	95
No Preference	184	*97.3*	179	*-11*	*-5.8*	190	*111.4*	212	*-50*	*-19.1*	262
TOTAL	860	*88.8*	762	*66*	*6.4*	716	*115.8*	829	*-215*	*-20.6*	1044

THE FIRST METHOD OF PROJECTING COURSE ENROLLMENTS
Teaching College: NATURAL SCIENCE
Course: MATHEMATICS 108
East Lansing Campus
Fall Terms

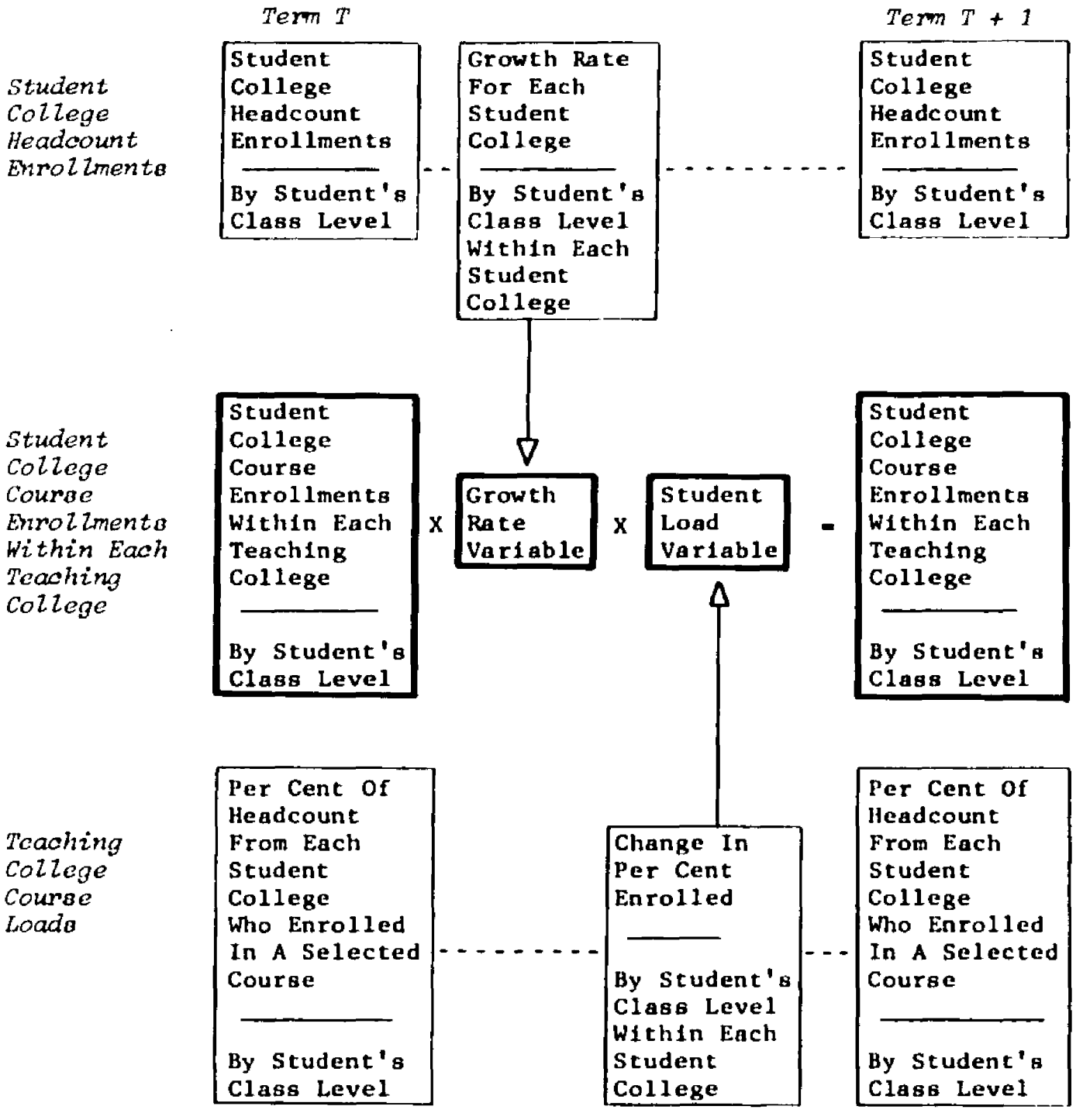
Table 23

	STUDENT CLASS LEVEL				
	Freshman	Sophomore	Junior	Senior	Total
Fall 1969 Actual Enrollments	860	118	103	27	1108
Fall 1970 Actual Enrollments	716	102	90	32	940
Fall 1970 Projected Enrollments	762	119	103	29	1013
Error-Course Enrollments	*46*	*17*	*13*	*-3*	*73*
-% of 1970 Actual	*6.4*	*16.7*	*14.4*	*-9.4*	*7.8*
Fall 1971 Actual Enrollments	1044	137	119	95	1395
Fall 1971 Projected Enrollments	829	85	104	32	1050
Error-Course Enrollments	*-215*	*-52*	*-15*	*-63*	*-345*
-% of 1971 Actual	*-20.6*	*-38.0*	*-12.6*	*-66.3*	*-24.7*

CALCULATION OF STUDENT COURSE LOADS
Student College: NATURAL SCIENCE
East Lansing Campus
Fall 1970

Table 24

	FRESHMAN		SOPHOMORE		JUNIOR		SENIOR		SPECIAL		MASTER		DOCTOR	
	No. of Course Enr'l	Course Enr'l per Major	No. of Course Enr'l	Course Enr'l per Major	No. of Course Enr'l	Course Enr'l per Major	No. of Course Enr'l	Course Enr'l per Major	No. of Course Enr'l	Course Enr'l per Major	No. of Course Enr'l	Course Enr'l per Major	No. of Course Enr'l	Course Enr'l per Major
TEACHING COLLEGE														
Agr. & Nat. Res.	10	.01	14	.02	29	.03	45	.06	1	.03	19	.04	10	.02
Arts & Letters	374	.31	394	.43	327	.38	247	.32	5	.16	26	.06	14	.02
Lyman Briggs	16	.01									2	.01		
Business	21	.02	73	.08	76	.09	68	.09	1	.03	6	.01	3	.01
Communication Arts	17	.01	16	.02	6	.01	6	.01			1			
Education	801	.67	122	.13	156	.19	273	.35	6	.18	57	.13	21	.03
Engineering	92	.08	119	.13	77	.09	73	.09	2	.06	31	.07	22	.04
Human Ecology	7	.01	21	.02	17	.02	3							
Human Medicine									2	.06	3	.01		
James Madison	-													
Justin Morrill	4				1									
Natural Science	2542	2.12	1877	2.05	2082	2.50	1612	2.10	49	1.54	792	1.82	1048	1.70
Osteopathic Medicine	-													
Social Science	236	.28	215	.23	207	.25	238	.31	2	.06	12	.03	9	.01
Veterinary Medicine	14	.01	164	.18	125	.15	234	.30	15	.47	126	.29	71	.12
University College	1240	1.04	876	.96	301	.36	104	.14	2	.06				
All University	84	.07	26	.03	21	.03	25	.03	2	.06	6	.01	7	.01
TOTAL	5558	4.64	3917	4.28	3425	4.09	2928	3.80	87	2.73	1081	2.48	1205	1.96
Total Number of Nat. Sci. Majors	*1198*		*916*		*837*		*770*		*32*		*436*		*616*	



FLOW CHART OF THE SECOND METHOD FOR
PROJECTING COURSE ENROLLMENTS
East Lansing Campus

Figure 6

THE SECOND METHOD FOR PROJECTING COURSE ENROLLMENTS
Teaching College: NATURAL SCIENCE
Course: MATHEMATICS 108
East Lansing Campus
Fall Terms

Table 25

	Fall 1968 Actual	% Change Head-Count	% Change Student Load	Fall 1969 Projected	Fall 1969 Actual	% Change Head-Count	% Change Student Load	Fall 1970 Projected	Fall 1970 Actual	% Change Head-Count	% Change Student Load	Fall 1971 Projected	Fall 1971 Actual
FRESHMEN													
Student College:													
Agr. & Nat. Resources	66	*104.1*	*105.1*	72	72	*90.9*	*90.3*	59	59	*140.6*	*104.6*	87	87
Arts & Letters	4	*98.6*	*150.0*	6	6	*75.0*	*66.7*	3	3	*104.4*	*318.6*	10	10
Lyman Briggs	28	*97.9*	*76.8*	21	21	*76.2*	*55.3*	9	9	*175.1*	*240.5*	38	38
Business	120	*80.7*	*94.4*	98	98	*88.3*	*80.3*	68	68	*119.9*	*117.8*	96	96
Communication Arts	2	*110.6*	*183.3*	4	4	*71.5*	*36.4*	1	1	*113.8*	*425.0*	5	5
Education	19	*92.1*	*79.2*	14	14	*71.3*	*89.6*	9	9	*96.4*	*105.9*	9	9
Engineering	83	*96.9*	*102.8*	83	83	*73.2*	*67.9*	41	41	*94.5*	*128.9*	50	50
Human Ecology	11	*85.9*	*128.6*	12	12	*76.6*	*140.0*	13	13	*126.2*	*98.1*	15	15
Human Medicine					23	*124.6*	*58.2*	15	15	*111.3*	*203.8*	34	34
James Madison									1	*115.4*			
Justin Morrill					2	*101.9*	*87.5*	2	2	*101.5*	*371.4*	7	7
Natural Science	243	*108.1*	*96.3*	253	253	*85.0*	*105.0*	226	226	*97.1*	*139.1*	305	305
Osteopathic Medicine	-			-	-			-	-			-	-
Social Science	15	*107.1*	*114.3*	18	18	*84.1*	*137.5*	21	21	*133.3*	*112.1*	31	31
Veterinary Medicine	90	*112.7*	*89.0*	70	70	*97.3*	*85.3*	58	58	*174.2*	*84.0*	95	95
No Preference	228	*82.2*	*98.0*	184	184	*97.3*	*106.2*	190	190	*111.4*	*123.8*	262	262
TOTAL	909	*98.9*	*94.8*	835	860	*88.6*	*93.8*	715	716	*115.8*	*125.9*	1044	1044

THE SECOND METHOD FOR PROJECTING COURSE ENROLLMENTS
Teaching College: NATURAL SCIENCE
Course: MATHEMATICS 108
East Lansing Campus
Fall Terms

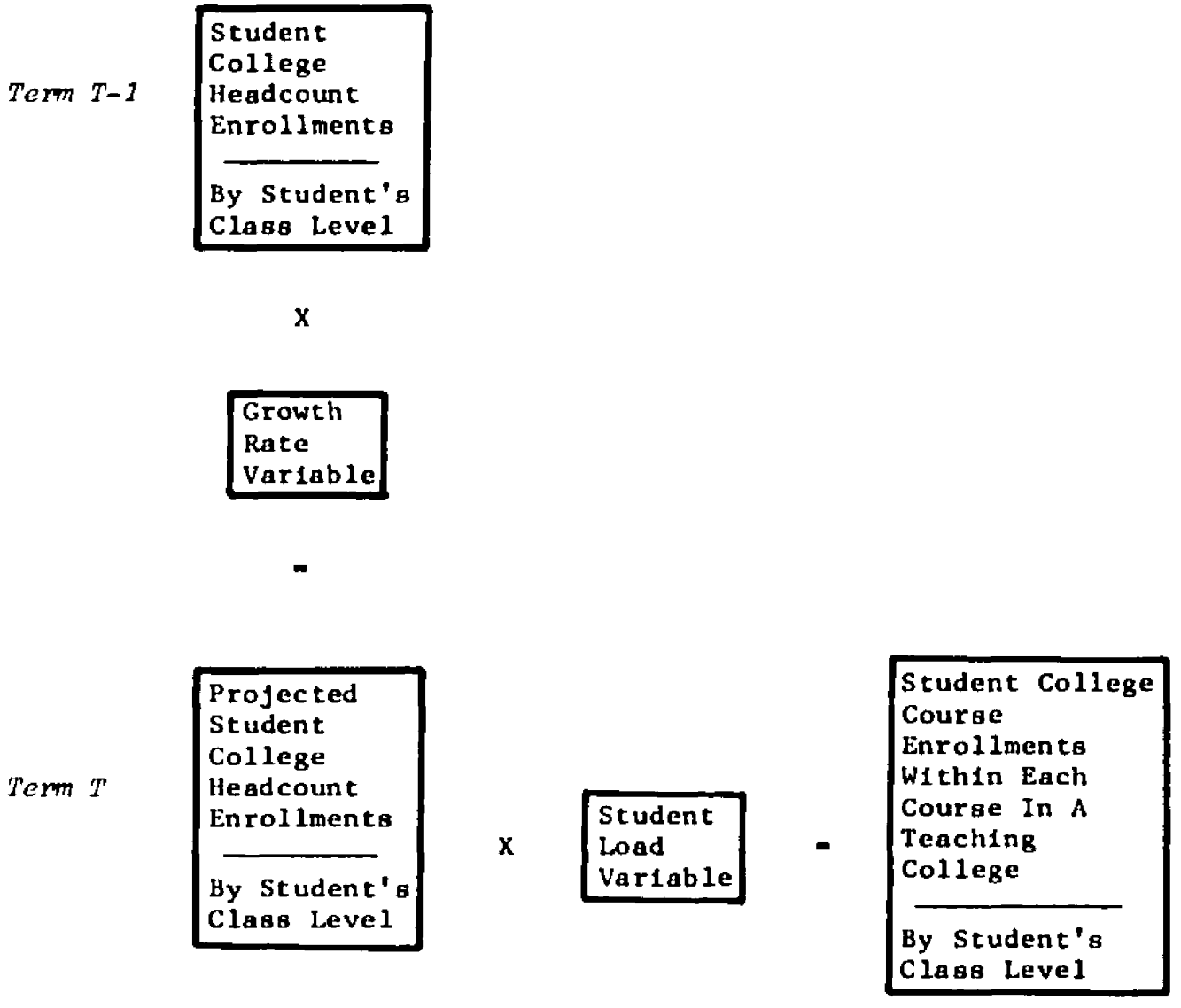
Table 26

	STUDENT CLASS LEVEL				
	Freshman	Sophomore	Junior	Senior	Total
Fall 1968 Actual Enrollments	909	105	112	28	1154
Fall 1969 Actual Enrollments	860	118	102	27	1107
Fall 1969 Projected Enrollments	835	113	100	24	1072
Error-Course Enrollments	*-25*	*-5*	*-2*	*-3*	*-35*
-% of 1969 Actual	*-2.9*	*-4.2*	*-2.0*	*-11.1*	*-3.2*
Fall 1970 Actual Enrollments	716	101	90	32	939
Fall 1970 Projected Enrollments	715	101	90	29	935
Error-Course Enrollments	*-1*			*-3*	*-4*
-% of 1970 Actual	*-.1*			*-9.4*	*-.4*
Fall 1971 Actual Enrollments	1044	137	119	95	1395
Fall 1971 Projected Enrollments	1044	131	114	50	1339
Error-Course Enrollments		*-6*	*-5*	*-45*	*-56*
-% of 1971 Actual		*-2.1*	*-4.2*	*-47.3*	*-40.1*

An inspection of the errors in these tables indicated that all differences occurred where zero course enrollments were involved in the calculations. The single large difference of this type appeared at the freshman level (Table 25) in projections for the College of Human Medicine. In this instance, the School of Medical Technology was transferred to the College of Human Medicine from the College of Veterinary Medicine. The decrease was correctly reflected in undergraduate enrollments for the College of Veterinary Medicine since zero calculations were not involved. However, the transfer represented the first enrollments at the undergraduate level in the College of Human Medicine. Changes in that college did relate course enrollments to a zero condition. Under this method, projections would remain at the zero level.

It was therefore necessary to again revise the projection process to guard against instances where zero course enrollments in the previous year automatically nullified projections for subsequent years. This was accomplished by directly relating course enrollment projections to headcount enrollments. Such an alteration is outlined in the following flow chart (Figure 7).

The revised mechanism began with headcount enrollments for the current term instead of with course enrollments for the previous term. The second independent variable, the number from a student college who enrolled in the selected course, could be intercepted and revised with little difficulty. The data shown in Table 27 indicated that all of the change in course enrollments between two terms had now been accounted for.



FLOW CHART OF THE THIRD METHOD FOR
PROJECTING COURSE ENROLLMENTS
East Lansing Campus

Figure 7

THE THIRD METHOD FOR PROJECTING COURSE ENROLLMENTS
Teaching College: NATURAL SCIENCE
Course: MATHEMATICS 108
East Lansing Campus
Fall Terms

Table 27

	Fall 1968 Head-count of Majors	Head-count Growth Rate	% Enrolled in this Course	Fall 1969 Course Enroll-ments	Fall 1969 Head-count of Majors	Head-count Growth Rate	% Enrolled in this Course	Fall 1970 Course Enroll-ments	Fall 1970 Head-count of Majors	Head-count Growth Rate	% Enrolled in this Course	Fall 1971 Course Enroll-ments
FRESHMEN												
Student College:												
Agr. & Nat. Resources	559	*104.1*	*12.4*	72	582	*90.9*	*11.2*	59	529	*140.6*	*11.7*	87
Arts & Letters	948	*98.8*	*.6*	6	935	*75.0*	*.4*	3	701	*104.4*	*1.4*	10
Lyman Briggs	283	*97.9*	*7.8*	21	277	*76.9*	*4.2*	9	213	*176.1*	*10.1*	38
Business	557	*86.7*	*20.3*	98	483	*86.3*	*16.3*	68	417	*119.9*	*19.3*	96
Communication Arts	320	*110.6*	*1.1*	4	354	*71.5*	*.4*	1	253	*113.8*	*1.7*	5
Education	795	*92.1*	*1.9*	14	732	*71.3*	*1.7*	9	522	*98.4*	*1.8*	9
Engineering	763	*96.9*	*11.2*	83	739	*73.2*	*7.6*	41	541	*94.5*	*9.8*	50
Human Ecology	313	*85.5*	*4.5*	12	269	*76.6*	*6.3*	13	200	*128.2*	*5.8*	15
Human Medicine	66	*86.4*	*40.4*	23	57	*124.6*	*31.1*	15	71	*111.3*	*43.0*	34
James Madison	268	*94.4*	*0*	0	253	*77.1*	*.5*	1	195	*115.4*	*0*	0
Justin Morrill	316	*83.2*	*.8*	2	263	*101.9*	*.7*	2	268	*101.5*	*2.6*	7
Natural Science	1304	*108.1*	*18.0*	253	1409	*85.0*	*18.9*	226	1198	*97.1*	*86.3*	305
Osteopathic Medicine	-			-	-			-	-			-
Social Science	706	*107.1*	*2.4*	18	756	*84.1*	*3.3*	21	636	*133.3*	*3.7*	31
Veterinary Medicine	166	*112.7*	*37.4*	70	187	*97.3*	*31.9*	58	182	*174.3*	*30.0*	95
No Preference	2306	*82.2*	*9.7*	184	1896	*97.3*	*10.3*	190	1845	*111.4*	*13.8*	262
TOTAL	9670	*85.1*	*9.4*	860	9192	*88.6*	*8.8*	716	7777	*115.8*	*11.6*	1044

Timing, Data Base and Implementation

In this section additional consideration is given to the data base and to the time sequence suggested for the projection process. This is followed by a sample implementation of the process for two selected courses.

The implication has persisted over the years that "final" enrollments are not known until grades are assigned. On the East Lansing Campus the number of courses dropped after the second week more than offset the number that are added. As a result, term-end course enrollment totals are traditionally smaller than second-week totals. Each set of estimates should be labelled according to the period within the term that is represented.

It is suggested that the projection process is more than the completion of "a single set of estimates" once a year. It involves a series of revisions and reprojections as additional factors become known. The initial projection for a term would be completed at least a year in advance. The second projection should be available for use in planning the courses to be listed in the time schedule for the term. A final projection would reflect early term enrollment experience. This is approximately five weeks before classes begin. Each of these projections should be progressively more accurate.

A third area for consideration refers to the level of detail required. The course enrollment data suggested in this paper is at the course level. It is submitted that without this detail faculty participation

in the projection process would be seriously limited. A viable working model should encourage this type of participation.

Selecting the Headcount Data Base

Headcount enrollments are available at different levels of detail for use as a basis for projecting course enrollments. The most common levels are

1. first-time headcount enrollments,
2. new student headcount enrollments,
3. headcounts of returning students, and
4. the total headcount at a class level.

In the schedule that follows (Table 28) the freshmen in each of these types are tested as a basis for projecting enrollments in a selected freshman course - Mathematics 108.

The students enrolled in this course who chose Nursing or Pre-Veterinary Medicine as majors were required to complete this course in their freshman year. Students from the Pre-Professional programs in the College of Natural Science must enroll in Introductory Chemistry during their freshman year. Mathematics 108 is a prerequisite for that course. Students who are majoring in Mathematics and Statistics must have completed Mathematics 108 as a prerequisite for the major.

A comparison of the percentage calculations in Table 28 indicates that the relationship which produces the most consistent pattern is the one relating course enrollments to the total freshmen headcount for a student college. This basis is used in the illustrations that follow

HEADCOUNT ENROLLMENTS AS A BASIS FOR PROJECTING COURSE ENROLLMENTS
Teaching College: NATURAL SCIENCE
Course: MATHEMATICS 108
East Lansing Campus
Fall Terms

Table 28

	Headcount Enrollments			% In This Course			Term-End Course Enrollments		
	1969	1970	1971	1969	1970	1971	1969	1970	1971
NURSING[1]									
First-time Freshmen	176	134	236	44.9	63.0	57.2	79	85	135
Total New Freshmen	178	138	246	44.4	61.6	54.9	79	85	135
Returning Freshmen	30	28	38	263.3	303.6	355.3	79	85	135
Total Freshmen	208	166	285	38.0	51.2	47.4	79	85	135
PRE-VETERINARY MEDICINE[1]									
First-time Freshmen	165	161	263	42.4	36.0	36.1	70	58	95
Total New Freshmen	168	165	292	41.7	35.2	32.5	70	58	95
Returning Freshmen	19	16	23	368.4	368.5	413.0	70	58	95
Total Freshmen	187	182	317	37.4	31.9	30.0	70	58	95
PRE-PROFESSIONAL (College of Natural Science)[2]									
First-time Freshmen	198	249	339	39.9	28.1	36.0	79	65	122
Total New Freshmen	253	252	354	31.2	25.8	34.5	79	65	122
Returning Freshmen	78	69	52	101.3	94.2	234.6	79	65	122
Total Freshmen	333	374	412	23.7	20.1	29.6	79	65	122
MATHEMATICS & STATISTICS[3]									
First-time Freshmen	311	239	7	8.7	2.9	-	27	7	-
Total New Freshmen	312	239	149	8.7	2.9	-	27	7	-
Returning Freshmen	39	20	46	69.2	35.0	-	27	7	-
Total Freshmen	253	288	172	7.8	2.4	-	27	7	-
COLLEGE OF NATURAL SCIENCE									
First-time Freshmen	1183	967	934	21.4	23.4	32.7	253	226	305
Total New Freshmen	1192	976	978	21.2	23.2	31.2	253	226	305
Returning Freshmen	209	210	170	121.1	107.6	179.4	253	226	305
Total Freshmen	1409	1198	1212	18.0	18.9	25.2	253	226	305

Note: 1) Mathematics 108 is required in the freshman year.
2) Mathematics 108 is a prerequisite to the required freshmen Chemistry course.
3) Mathematics 108 is a prerequisite to acceptance in the major.

in this chapter. It is difficult to conceive of any single sophisticated mathematical technique that would accurately project this percentage variable with sufficient precision.

Initial Projections

The initial projections were completed by means of the mechanism developed in the previous section. Details of these projections for freshman enrollments in Mathematics 108 and Education 200 were shown in Tables 29 and 30. A summary of the projections for all classes was also included in these schedules.

The course enrollments used as a basis for these projections were obtained from a term-end report. However, experience has shown that the total number enrolled on the second week of the term was traditionally higher than the term-end total. This peak-load period should be recognized in facilities planning and in calculating instructional loads. The next step, therefore, in projecting these enrollments was to convert the term-end projections to the second-week level of activity. The conversion was illustrated in Table 31.

The Second Projections

The primary responsibility for evaluating and revising the initial projections rested with faculty planners. However, because of the close interaction between colleges, members of the Central Staff must coordinate these estimates and interpret their effect on total enrollments for the East Lansing Campus. This required a second set of projections to be completed fifteen weeks before a term began.

INITIAL COURSE ENROLLMENT PROJECTIONS
Teaching College: NATURAL SCIENCE
Course: MATHEMATICS 108
East Lansing Campus
Fall Terms

Table 29

	College Majors					Per Cent Enrolled In This Course					Term-End Course Enrollments				
	1967	1968	1969	1970	1971e	1967	1968	1969	1970	1971e	1967	1968	1969	1970	1971e
FRESHMEN															
Student College:															
Agr. & Nat. Resources	499	559	582	529	612	*12.6*	*11.8*	*12.4*	*11.2*	*11.5*	63	66	72	59	70
Arts & Letters	874	948	935	701	829	*.8*	*.6*	*.6*	*.4*	*.5*	7	6	6	3	4
Lyman Briggs	206	253	277	213	350	*12.6*	*9.9*	*7.6*	*6.2*	*6.2*	26	28	21	9	15
Business	517	557	483	417	503	*18.4*	*21.5*	*20.3*	*16.3*	*17.0*	95	120	98	68	86
Communication Arts	308	320	354	253	279	*.6*	*.6*	*1.1*	*.4*	*.5*	2	2	4	1	1
Education	759	795	732	522	534	*.5*	*2.4*	*1.9*	*1.7*	*1.8*	4	19	14	9	10
Engineering	788	763	739	541	545	*12.9*	*10.9*	*11.2*	*7.6*	*9.0*	102	83	83	41	49
Human Ecology	292	313	269	206	243	*3.1*	*3.5*	*4.5*	*6.3*	*5.0*	9	11	12	13	12
Human Medicine			57	71	70			*40.4*	*31.1*	*22.5*			23	15	16
James Madison	205	268	253	195	229	*.5*			*.5*	*.5*	1			1	1
Justin Morrill	305	316	263	268	281	*1.3*		*.8*	*.7*	*.7*	4		2	2	2
Natural Science	1401	1304	1409	1198	1212	*19.3*	*18.6*	*18.0*	*18.9*	*18.6*	270	243	253	226	225
Osteopathic Medicine	-										-				
Social Science	665	706	756	636	867	*1.5*	*2.1*	*2.4*	*3.3*	*3.0*	10	15	18	21	26
Veterinary Medicine	216	232	187	182	259	*85.4*	*54.2*	*37.4*	*31.9*	*31.0*	145	90	70	58	93
No Preference	2264	2306	1896	1845	2228	*10.5*	*9.8*	*9.7*	*10.3*	*10.0*	237	228	184	190	223
TOTAL	9299	9670	9192	7777	9081	*10.5*	*9.4*	*9.4*	*8.2*	*8.2*	975	909	860	716	833
SUMMARY															
Freshman	9299	9670	9192	7777	9081	*10.5*	*9.4*	*9.4*	*8.2*	*8.2*	975	909	860	716	833
Sophomore	7613	7618	7818	7789	6937	*1.7*	*1.4*	*1.5*	*1.3*	*1.5*	127	105	118	101	105
Junior	7555	7758	8171	8564	9552	*1.2*	*1.4*	*1.2*	*1.1*	*1.2*	89	111	102	90	110
Senior-Special	6621	7235	7621	8046	8797	*.4*	*.4*	*.3*	*.4*	*.4*	26	28	26	32	39
TOTAL	31088	32281	32802	32176	34367	*3.8*	*3.6*	*3.4*	*2.8*	*3.2*	1217	1153	1106	939	1087

e = estimated or projected

INITIAL COURSE ENROLLMENT PROJECTIONS
Teaching College: EDUCATION
Course: EDUCATION 200
East Lansing Campus
Fall Terms

Table 30

	College Majors					Per Cent Enrolled In This Course					Term-End Course Enrollments				
	1967	1968	1969	1970	1971e	1967	1968	1969	1970	1971e	1967	1968	1969	1970	1971e
FRESHMEN															
Student College:															
Agr. & Nat. Resources	499	559	582	529	612		.2					1			
Arts & Letters	874	948	935	701	829	1.4	.4	1.0	.1	1.0	12	4	9	1	8
Lyman Briggs	206	283	277	213	350										
Business	517	557	483	417	503	.4			.2		2			1	
Communication Arts	308	320	354	253	279	.3		1.1			1		4		
Education	759	795	732	522	534	2.1	.8	1.4	3.3	3.3	16	5	10	17	18
Engineering	788	763	739	541	545										
Human Ecology	292	313	269	206	243	1.7	.6	1.1	1.0	1.0	5	2	3	2	2
Human Medicine			57	71	70										
James Madison	205	268	253	195	229			.4					1		
Justin Morrill	305	316	263	268	281		.3	.4	.4	.4		1	1	1	1
Natural Science	1401	1304	1409	1198	1212	.4	.1	.1	.1	.1	6	1	2	1	1
Osteopathic Medicine	-										-				
Social Science	665	706	756	636	867	.5	.1	.5	.3	.3	3	1	4	2	3
Veterinary Medicine	216	232	187	182	299										
No Preference	2264	2306	1896	1845	2228	.5		.4	.1	.1	11	1	7	2	2
TOTAL	9299	9670	9192	7777	9081	.6	.2	.4	.3	.4	56	16	41	27	35
SUMMARY															
Freshmen	9299	9670	9192	7777	9081	.6	.2	.4	.3	.4	56	16	41	27	35
Sophomore	7613	7618	7818	7789	6937	5.1	5.2	5.9	4.6	4.3	461	469	464	351	299
Junior	7555	7758	8171	8564	9552	8.1	7.7	7.1	5.6	4.9	613	596	583	477	469
Senior-Special	6621	7235	7621	8046	8797	1.5	1.9	1.8	.5	.5	97	137	125	44	41
TOTAL	31088	32281	32802	32176	34367	3.9	3.8	3.7	2.8	2.5	1227	1218	1213	899	844

e = estimated or projected

COMPARISON OF TERM-END AND SECOND-WEEK COURSE ENROLLMENTS
FOR SELECTED COURSES
East Lansing Campus
Fall Terms

Table 31

	MATHEMATICS 108					EDUCATION 200				
	Frsh.	Soph.	Jr.	Sr.	Total	Frsh.	Soph.	Jr.	Sr.	Total
COURSE ENROLLMENTS										
Fall 1967										
Term-End	975	127	89	26	1217	56	461	613	97	1227
Second Week	980	127	98	29	1234	57	466	611	98	1232
% 2nd Week to Term-End	*100.5*	*100.0*	*110.1*	*111.5*	*101.4*	*101.8*	*101.1*	*99.7*	*101.0*	*100.4*
Fall 1968										
Term-End	909	105	111	28	1153	16	469	596	137	1218
Second Week	923	105	120	31	1179	14	477	603	138	1232
% 2nd Week to Term-End	*101.5*	*100.0*	*108.1*	*110.7*	*102.3*	*87.5*	*101.7*	*101.2*	*100.7*	*101.1*
Fall 1969										
Term-End	860	118	102	26	1106	41	464	583	125	1213
Second Week	846	138	110	34	1128	40	459	580	111	1190
% 2nd Week to Term-End	*98.4*	*116.9*	*107.8*	*130.8*	*102.0*	*97.6*	*98.9*	*99.5*	*88.8*	*98.1*
Fall 1970										
Term-End	716	101	90	32	939	27	351	477	44	899
Second Week	736	111	113	39	999	27	351	476	47	901
% 2nd Week to Term-End	*102.8*	*109.9*	*125.6*	*121.9*	*106.4*	*100.0*	*100.0*	*99.8*	*106.8*	*100.2*
Fall 1971[e]										
Term-End	833	105	110	39	1087	35	299	469	41	844
Second Week	841	116	127	48	1132	36	299	469	43	847
% 2nd Week to Term-End	*101.0*	*110.0*	*115.0*	*120.0*	*104.1*	*102.0*	*100.0*	*100.0*	*104.0*	*100.4*
Fall 1971[a]										
Term-End	1044	137	119	95	1395	40	282	408	26	756
Second Week	1054	144	134	102	1434	43	281	412	28	764
% 2nd Week to Term-End	*101.1*	*106.1*	*112.6*	*107.4*	*102.8*	*107.5*	*99.6*	*101.0*	*107.7*	*101.1*

e = estimated or projected
a = actual enrollments

The projections established by the faculty for the Fall Term of 1971 for the two courses selected in this study were reproduced in Tables 32 and 33. Each of the sections listed was subsequently assigned separate sequence numbers and was published in the Time Schedule of Courses.

The Third Projections

The third stage of the course enrollment projection process followed the early enrollment period. Early enrollment was essentially a measure of student demand for the courses offered. The measure was limited to the number of courses that had been listed in the Schedule of Courses. During the Winter, Spring and Summer terms eligibility to participate was restricted to students who were currently enrolled. In spite of these limitations, these data were useful in updating term projections.

In Tables 34 and 35 early enrollment activity was summarized and served as a basis for revising the Fall 1971 projections. It is at this stage that decisions regarding the cancellations of small-sized sections can be finalized and advice of cancelled sections can be readily communicated to the students. During the week of early registration students are allowed to enroll in additional courses to complete their schedules.

In this set of projections an adjustment was also made to reflect any reduction in the size of a section due to the existence of an over-capacity condition. Such a condition did occur in sections 6 and 9

FACULTY COURSE ENROLLMENT PROJECTIONS
Teaching College: NATURAL SCIENCE
Course: MATHEMATICS 108
East Lansing Campus
Fall Terms

Table 32

	Faculty Projections				Actual Second-Week Enrollments					% Actual To Faculty Projections				
	1968	1969	1970	1971	1968	1969	1970	1971[e]	1971	1968	1969	1970	1971[e]	1971
Section 1	30	30	30	30	32	29	30	30	31	*106.7*	*58.0*	*100.0*	*100.0*	*103.3*
2	30	30	30	31	30	30	29	31	29	*100.0*	*100.0*	*96.7*	*100.0*	*93.5*
3	30	30	30	30	30	30	29	30	30	*100.0*	*100.0*	*96.7*	*100.0*	*100.0*
4	30	30	30	30	31	31	28	30	32	*103.3*	*103.3*	*93.3*	*100.0*	*106.7*
5	30	31	30	30	30	25	32	21	39	*100.0*	*80.6*	*64.0*	*70.0*	*130.0*
6	30	30	30	31	29	27	21	25	29	*96.7*	*90.0*	*70.0*	*80.0*	*93.5*
7	30	30	30	30	30	29	27	29	31	*100.0*	*96.7*	*90.0*	*95.0*	*103.3*
8	30	30	29	30	32	32	29	30	30	*106.7*	*106.7*	*100.0*	*100.0*	*100.0*
9	30	30	30	30	28	31	27	29	32	*93.3*	*103.3*	*90.0*	*95.0*	*106.7*
10	30	30	30	30	28	18	18	18	17	*93.3*	*60.0*	*60.0*	*60.0*	*56.7*
. . .														
40	35	35	35	35	37	21	19	21	35	*105.7*	*60.0*	*54.3*	*60.0*	*100.0*
41	35	35	35	35	33	34	34	34	35	*94.3*	*97.1*	*97.1*	*97.1*	*100.0*
42	35	35	35	35	37	17	9	16	30	*105.7*	*48.6*	*25.7*	*45.0*	*85.7*
43	30			35	30	26		28	28	*100.0*			*80.0*	*80.0*
44	30			35	30			28	26	*100.0*			*80.0*	*74.3*
45				35	6			28	28				*80.0*	*80.0*
46				35	20			28	32				*80.0*	*91.4*
47				35				28	34				*80.0*	*97.1*
48									30					
49									29					
50									2					
TOTAL	1343	1344	1313	1473	1188	1128	999	1178	1434	*88.5*	*83.9*	*76.1*	*80.0*	*97.4*

e = estimated or projected

FACULTY COURSE ENROLLMENT PROJECTIONS
Teaching College: EDUCATION
Course: EDUCATION 200
East Lansing Campus
Fall Terms

Table 33

	Faculty Projections			Actual Second-Week Enrollments				% Actual To Faculty Projections			
	1969	1970	1971	1969	1970	1971[e]	1971	1969	1970	1971[e]	1971
Lectures											
901	610	465	390								
902	610	465	390								
TOTAL	1220	930	780	1201	908	762	764	98.4	97.6	97.7	97.9
Recitations											
1	35	15	15	34	15	15	16	97.1	100.0	98.0	106.7
2	35	15	15	34	15	15	15	97.1	100.0	98.0	100.0
3	35	15	15	36	15	15	15	102.9	100.0	100.0	100.0
4	35	15	15	34	16	15	13	97.1	106.7	100.0	86.7
5	35	15	15	36	15	15	16	102.9	100.0	100.0	106.7
33	35	15	15	33	15	14	16	94.3	100.0	96.0	106.7
34	35	15	15	34	14	14	15	97.1	93.3	98.0	100.0
35	30	15	15	30	14	14	15	100.0	93.3	96.0	100.0
49		15	15		16	15	14		106.7	100.0	93.3
50		15	15		15	15	10		100.0	100.0	66.7
51		15	30		14	30	30		93.3	100.0	100.0
59		15			13				86.7		
60		15			10				66.7		
61		30			33				110.0		
TOTAL	1220	930	780	1201	908	762	764	98.4	97.6	97.7	97.9

e = estimated or projected

THE THIRD PROJECTION OF COURSE ENROLLMENTS
Teaching College: NATURAL SCIENCE
Course: MATHEMATICS 108
East Lansing Campus
Fall Terms

Table 34

	Early Enrollment Section Reservations Accepted[1]				Actual Second-Week Enrollment					% Actual To Early Enrollments				
	1968	1969	1970	1971	1968	1969	1970	1971e	1971	1968	1969	1970	1971e	1971
Section 1	29	24	27	30	32	29	30	33	31	*110.3*	*120.8*	*111.1*	*110.0*	*103.3*
2	29	20	30	31	30	30	29	31	29	*103.4*	*150.0*	*96.7*	*100.0*	*93.5*
3	28	30	30	30	30	30	29	30	30	*107.1*	*100.0*	*96.7*	*100.0*	*100.0*
4	30	30	20	30	31	31	28	33	32	*103.3*	*103.3*	*140.0*	*110.0*	*106.7*
5	31	31	27	30	30	25	32	30	39	*96.8*	*80.6*	*118.5*	*100.0*	*130.0*
6	30	9	14	31	29	27	21	47	29	*96.7*	*300.0*	*150.0*	*150.0*	*93.5*
7	30	18	30	30	30	29	27	30	31	*100.0*	*161.1*	*90.0*	*100.0*	*103.3*
8	30	30	29	30	32	32	29	31	30	*106.7*	*106.7*	*100.0*	*104.0*	*100.0*
9	29	30	21	25	28	31	27	31	32	*96.6*	*103.3*	*128.6*	*125.0*	*128.0*
10	29	25	17	24	28	18	18	19	17	*96.6*	*72.0*	*105.9*	*80.0*	*58.3*
...														
40	22	10	10	27	37	21	19	30	35	*168.2*	*210.0*	*190.0*	*111.1*	*129.6*
41	30	19	26	26	33	34	34	35	35	*110.0*	*178.9*	*130.8*	*135.0*	*134.6*
42	26	9	7	10	37	17	9	15	30	*142.3*	*188.9*	*128.6*	*150.0*	*300.0*
43	30			0	30	26		24	28	*100.0*			*80.0*	
44	30			0	30			24	26	*100.0*			*80.0*	
45				15	6			12	28				*80.0*	*186.7*
46				0	20			24	32				*80.0*	
47				0				24	34				*80.0*	
48									30					
49									29					
50									2					
TOTAL	1142	950	847	1151	1188	1128	999	1358	1434	*104.0*	*118.7*	*117.9*	*118.0*	*124.6*

Note: 1) Totals after departmental deletions and approvals.

e = estimated or projected

THE THIRD PROJECTION OF COURSE ENROLLMENTS
Teaching College: EDUCATION
Course: EDUCATION 200
East Lansing Campus
Fall Terms

Table 35

	Early Enrollment Section Reservations Accepted[1]			Actual Second-Week Enrollments				% Actual To Early Enrollments			
	1969	1970	1971	1969	1970	1971e	1971	1969	1970	1971e	1971
Lectures											
901	635	377	312								
902	215	275	156								
TOTAL	850	652	468	1201	908	762	764	*141.3*	*139.3*	*162.8*	*163.3*
Recitations											
1	35	14	14	34	15	15	16	*97.1*	*107.1*	*98.0*	*114.3*
2	35	15	19	34	15	15	15	*97.1*	*100.0*	*98.0*	*166.7*
3	35	8	2	36	15	15	15	*102.9*	*187.5*	*150.0*	*750.0*
4	35	0	11	34	16	15	13	*97.1*		*100.0*	*118.2*
5	35	12	15	36	15	15	16	*102.9*	*125.0*	*110.0*	*106.7*
33	4	12	13	33	15	14	16	*825.0*	*125.0*	*107.7*	*123.1*
34	24	15	2	34	14	14	15	*141.7*	*93.3*	*700.0*	*750.0*
35	15	15	15	30	14	14	15	*200.0*	*93.3*	*93.3*	*100.0*
49		9	3		16	15	14		*177.8*	*500.0*	*466.7*
50		11	1		15	15	10		*136.4*		
51		3	16		14	30	30		*466.7*	*187.5*	*187.5*
59		1			13						
60		0			10						
61		16			33				*206.3*		
TOTAL	850	652	468	1201	908	762	764	*141.3*	*139.3*	*162.8*[e]	*163.3*

e = estimated or projected

Note: 1) The decrease in early enrollment reservations was due to a policy change effecting returning students. It was anticipated that students who were new to the Campus would offset this reduction. Projections from the second cycle were therefore retained.

of Mathematics 108 (See Table 36). Caution should be exercised in recording a reduction of this type however, since it is possible that the students involved may have already been requested by their advisors to transfer to another section. Such transfers would not represent a reduction in the total enrolled for a course.

The three sets of projections were summarized in Table 37. For comparative purposes, actual course enrollments for the term were also listed.

REVISION OF COURSE ENROLLMENT PROJECTIONS
East Lansing Campus

Fall 1971

Table 36

	MATHEMATICS 108 Projections				EDUCATION 200 Projections		
	Assigned Room Capacity	Early Enrollment Based	Reduction	Revised Enrollments	Assigned Room Capacity	Early Enrollment Based	Revised Enrollments
Section 1	42	33		33	25	15	15
2	50	31		31	30	15	15
3	42	30		30	30	15	15
4	35	33		33	25	15	15
5	50	30		30	25	15	15
6	35	47	12	35	30	15	15
7	32	30		30	30	15	15
8	60	31		31	25	15	15
9	30	31	1	30	20	15	15
10	50	19		19	30	15	15
TOTAL	-	1358	13	1345	-	762	762

SUMMARY OF COURSE ENROLLMENT PROJECTIONS FOR SELECTED COURSES
East Lansing Campus
Fall 1971

Table 37

	MATHEMATICS 108					EDUCATION 200				
	Frsh.	Soph.	Jr.	Sr.	Total	Frsh.	Soph.	Jr.	Sr.	Total
Initial Projections										
As of Term-End	833	105	120	39	1087	35	299	469	41	844
As of Second Week	841	116	127	48	1132	36	299	469	43	847
Second Projections (As of Second Week)										
Faculty Projection					1473					780
Revised Projection					1178					762
Third Projections										
As of Second Week					1358					762
Revised (over capacity)					1345					762
Actual Enrollments										
As of Term-End	1044	137	119	95	1395	40	282	408	26	756
As of Second Week	1054	144	134	102	1434	43	281	412	28	764

CHAPTER V

TRANSLATING COURSE ENROLLMENTS INTO TEACHING REQUIREMENTS

Projecting Credit Hours

Productivity at a university is cumstomarily measured in terms of credit hours. The annual questionnaire from the Bureau of the Budget for the State of Michigan requires that credit hours should be tabulated by class level. Credit hours are calculated from course enrollments by applying the assigned number of course credits or class credits to the number of students enrolled in the course. This conversion for the two courses used as examples in the previous chapter was illustrated in Table 38.

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East Lansing Campus

CALCULATION OF COURSE CREDIT HOURS FOR SELECTED COURSES
Fall 1971

Table 38

	Frsh.	Soph.	Jr.	Sr.	Total
MATHEMATICS 108					
Course Enrollments	1054	144	134	102	1434
Course Credits	5	5	5	5	5
Course Credit Hours	5270	720	670	510	7170
EDUCATION 200					
Course Enrollments	43	281	412	28	764
Course Credits	5	5	5	5	5
Course Credit Hours	215	1045	2060	140	3820

Credit hours have traditionally been summarized in at least three different ways.

1. Student-oriented summaries,
2. Faculty-oriented summaries, and
3. Administrator-oriented summaries

A variation of the third method was adopted for the 1972-73 budget questionnaire in which credit hours were accumulated by discipline. This resulted in accumulations that crossed existing organizational lines.

Each of these methods measured activity in a distinctively different way. A description and comparison of the distributions produced was described below.

Student-Oriented Summaries

In summaries of this type, credit hours are assigned to the college and department that is responsible for the administration of the student's major program. These summaries are useful for calculating credit-hour loads carried by majors. Student loads are used as prediction variables in the next chapter. The variation in the size of student loads during the Fall of 1971 was illustrated in Table 39. At the undergraduate level these ranged from an average of 7.71 per student to 16.09. At all levels, the averages are less than those prescribed by the Bureau of the Budget of the State of Michigan for calculating full-time equated students.

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STUDENT CREDIT-HOUR LOADS
BY MAJOR FIELDS OF STUDY

Fall 1971

Table 39

	STUDENT CLASS LEVELS										
	UNDERGRADUATE						GRADUATE				
	Freshmen						Grad. Prof.				Total
	First-time	Total	Soph.	Jr.	Sr.	Spec.	Class 8	Class 9	Mas.	Dr.	Students
STUDENT COLLEGES											
Agr. & Nat. Resources	13.78	15.78	14.96	14.77	14.59	12.65			9.36	7.83	13.61
Arts & Letters	14.56	14.45	15.04	14.78	14.26	11.55			8.24	6.75	13.31
Lyman Briggs	15.12	15.06	16.09	15.58	14.59	13.00					15.35
Business	13.63	13.84	15.05	14.87	14.24	11.85			10.88	7.93	13.45
Communication Arts	14.33	14.29	14.83	14.58	14.35	10.68			9.42	7.31	13.71
Education	13.80	13.92	14.88	15.10	13.94	7.71			6.53	7.84	11.40
Engineering	13.82	13.92	15.77	14.83	13.99	10.88			9.34	6.29	13.70
Human Ecology	13.73	13.92	14.44	14.75	14.08	11.06			7.37	6.76	13.48
Human Medicine	15.30	15.11	15.12	14.21	14.26	13.00	16.32	15.83	7.88	11.08	14.52
James Madison	14.63	14.66	15.46	15.30	13.66	13.38					14.89
Justin Morrill	15.41	15.19	15.20	15.26	14.81	12.67					15.15
Natural Science	15.25	15.15	15.44	15.05	14.08	12.26			8.45	6.79	13.39
Osteopathic Medicine							17.00				17.00
Social Science	14.22	14.27	14.92	14.83	14.02	11.94			10.40	7.52	13.77
Veterinary Medicine	15.85	15.90	15.91			16.29	14.14	18.67	7.24	6.55	15.54
No Preference	13.93	13.90	14.85			12.68					14.25
Unclassified						13.92					13.92
TOTAL CAMPUS	14.39	14.51	15.09	14.89	14.14	11.33	15.42	17.41	8.53	7.38	13.42

Faculty-Oriented Summaries

Summaries of this type are traditionally used in cost-benefit studies. Credit hours are assigned to the department holding the faculty appointment. This is the department that normally absorbs the instructional cost.

Allocation problems are encountered for faculty who have joint or multiple appointments. In these instances credit hours are assigned on the basis of the share of the total salary paid from the general fund account of a department. The allocation problem is further complicated by appointments to joint or multiple departments such as those found in the medicine colleges. These distributions are based on information found in the letter of appointment.

Credit hours accumulated on this basis are published in the Teaching Load and Time Distribution report prepared by the Office of Institutional Research. College summaries for the years 1970 and 1971 for the Bureau of the Budget were also accumulated by this method.

Administrator-Oriented Summaries

Credit hours accumulated in this manner reflect the activity required by a department to organize and administer a course. This is the department that recognized the need for the course, developed its content, petitioned for the various approvals through the established university channels, arranged for announcements in the catalog and time schedules, negotiated classroom space requirements, and assigned the instructor. Allocations of hours earned in inter-department and inter-disciplinary courses require special attention.

Credit hours published in regular term reports by the Office of the Registrar are distributed on this basis. State of Michigan Budget summaries prior to 1969 were also accumulated on this basis.

Summary

A comparison of the results obtained from the use of the three basic methods of allocating credit hours is shown in Table 40. Note especially the large variance for University College. This is the result of the dual enrollment arrangement at this University. In student-oriented summaries, credit hours are shown in the college of the student's major even though the student is also enrolled during his first two years in University College.

Discipline-Oriented Summaries

In the 1972-73 State Budget Request the existing organizational structure at this University was disregarded by the Budget Bureau of the State of Michigan. In that request, credit hours were accumulated by discipline i.e. they were administrator-oriented summaries. The disciplines, in turn, were assigned to subcategories that differed with the University college structure. As a result, credit hours for the Anatomy Department, for example, were accumulated across college lines and were shown as a single discipline in the Health Science subcategory. In this University, Anatomy is administered separately by each of the three medicine colleges. Other examples of crossing college organizational lines include the grouping of

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East Lansing Campus

COMPARISON OF CREDIT-HOUR DISTRIBUTIONS
Fall 1971

Table 40

COLLEGE	CREDIT HOURS			PERCENTAGE DISTRIBUTION		
	Course Oriented	Faculty Oriented	Student Oriented	Course Oriented	Faculty Oriented	Student Oriented
Agr. & Nat. Resources	22887	24540	40293	4.1	4.4	7.2
Arts & Letters	77534	79757	55986	13.9	14.3	10.0
Lyman Briggs	5453	5577	12543	1.0	1.0	2.2
Business	48442	47965	49090	8.7	8.6	8.8
Communication Arts	16896	16732	25034	3.0	3.0	4.5
Education	56364	56332	69544	10.1	10.1	12.5
Engineering	16719	16732	30021	3.0	3.0	5.4
Human Ecology	13583	13943	23264	2.4	2.5	4.2
Human Medicine	1713	8924	8232	.3	1.6	1.5
James Madison	3687	3346	8291	.7	.6	1.5
Justin Morrill	7925	7808	12149	1.4	1.4	2.2
Natural Science	91878	93142	65553	16.5	16.7	11.8
Osteopathic Medicine	1343	558	1797	.2	.1	.3
Social Science	87441	87007	92793	15.7	15.6	16.6
Veterinary Medicine	17551	11156	13085	3.1	2.0	2.3
University College	84842	84219	-	15.3	15.1	-
No Preference	-	-	48552	-	-	8.7
All Univ. Courses	3480	-	-	.6	-	-
English Lang. Center	-	-	1511	-	-	.3
EAST LANSING CAMPUS	557738	557738	557738	100.0	100.0	100.0

Labor and Industrial Relations in the Business subcategory instead of as a Social Science; Economics, Park and Recreational Resources and History in the Social Science subcategory instead of with the Colleges of Business, Agriculture and Arts and Letters. Credit hours distributed in this manner were illustrated in Table 41.

Projecting Teaching Requirements

The next concern in this chapter is with the selection of the most suitable method for counting faculty. The methods most commonly used at this University for these counts are

1. Headcount of total faculty,
2. Headcount of teaching faculty,
3. Full-time equated faculty, and
4. Equivalent numbers of teaching faculty.

Each of these methods are described below.

Headcount of Total Faculty

This is a headcount of all faculty members who have appointments, plus others who do not have formal appointments, but who are engaged in typical activities.

A total headcount is useful for planning faculty recruitment and for establishing the number of different appointments necessary to satisfy faculty commitments. This number may be misleading, however, if used to relate faculty to students or to teaching loads since faculty duties also include various non-teaching activities. In addition, headcounts are unsuitable for apportioning instructors between departments.

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STUDENT CREDIT HOURS
DISTRIBUTED BY STATE OF MICHIGAN PROGRAM SUBCATEGORIES[1]
Fall 1971

Table 41

Subcategories	Credit Hours	% of Total
Agriculture and Natural Resources	20079	3.6
Arts, Humanities and Letters	59678	10.7
Biological Science	31791	5.7
Business, Management and Commerce	32907	5.9
Computer and Information Sciences	5020	.9
Education	57447	10.3
Engineering, Architecture and Related Technical Fields	17290	3.1
Health Science Professions	7808	1.4
Law	-	-
Physical Sciences and Mathematics	71390	12.8
Social Sciences, Area Studies, Human Services and Public Affairs	117125	21.0
Other Disciplines	137203	24.6
East Lansing Campus	557738	100.0

Note: 1) These subcategories were itemized in the instructions for the Program Budget Evaluation System for Higher Education (PBES) of the State of Michigan: February, 1972, Appendix A.

Headcount of Teaching Faculty

These headcounts are restricted to faculty members who are engaged in the teaching activity.

This method may be more appropriate for relating faculty to students or for calculating teaching loads. However, it fails to recognize the amount of time spent by the teaching faculty in non-teaching activities. It is also subject to difficulties of apportioning headcounts between departments.

Total Full-Time Equated Faculty (FTEF)

This term refers to an equivalent number. For each individual appointed to a department, a calculation is made of the percentage of his total salary that is paid from the General Fund or instructional budget of that department. Total full-time equivalent counts are sums of these percentages.

This method is often used in cost-benefit studies since the numbers are increments of fund-related calculations. Allocations between departments are based on the percentage of the member's salary that is absorbed by a department. FTEF counts are reported in State Budget Requests as the basis for measuring productivity.

Equivalent numbers are often regarded as undesirable for internal planning purposes since they do not represent actual persons. In addition, in studies that relate faculty to students and credit hours, it may be more appropriate to restrict faculty counts to the equivalent number engaged in the teaching activity.

Teaching Activity of Full-Time Equated Faculty

To calculate the number of faculty under this method, the activities of the total FTEF are apportioned between teaching, research, public service, and administrative duties. The equivalent number of faculty is the sum of the calculations allocated to the teaching activity. These counts are restricted to credit hours produced and to course enrollments and are refinements of the fund-related total FTEF counts.

The Method and Base Selected

The State Budget Request is always prepared with cost-benefit overtones. The type of summary that is most acceptable for relating instructional costs to credit hours produced is the faculty-oriented base. One of the more appropriate methods for relating faculty numbers to credit hours is by means of an equivalent number that represents the time spent by the full-time equated faculty in the teaching activity.

Faculty Involvement

A basic premise emphasized throughout this thesis is the need for faculty involvement in the projection process. The role of the Central Staff focuses on designing the system, producing initial projections, and supplying support data for use in evaluating and revising plans. Members of the Central Staff are responsible for coordinating, summarizing, and assisting in completing institutional presentations. The targets are recommended in the departments. In the final analysies these become the measure of stewardship and accountability.

Projecting Faculty Requirements

Initial faculty projections are prepared by members of the Central Staff. These tentative projections are forwarded to the colleges along with estimates of student headcounts and course enrollments. The projections are evaluated by faculty planners, customized to fit local plans and returned by the college to the Central Staff to be summarized and coordinated into a second set of projections. These estimates are tempered by the supply and demand in the market and the availability of resources and are available to support the course projections published in the Schedule of Courses for the term.

A third set of projections would be completed at the close of the early enrollment period. These estimates reflect the decisions on course sizes using the guidelines published by the Office of the Provost.

The faculty-oriented credit-hour distribution which was summarized in Table 40 and the corresponding course credits such as those illustrated in Table 38 were used as the basis for calculating faculty requirements.

A summary of these data and the associated variables was shown in Table 42. The historical data in this table is regularly reported each term by the Office of Institutional Research. The credit hour and course enrollment base is calculated from data published by the Office of the Registrar. These data are directly related to individual courses through the type of schedule illustrated in Tables 43 and 44.

Initial projections of the variables, shown in Table 42, may be calculated by means of one of the following techniques: least squares, mean over N years, or by repeating last year's ratio. Subsequent projections, however, would reflect the changes resulting from interaction between college and Central Staff planners. Illustrative projections of the variables for the Fall term of 1971 were shown in Table 45.

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TABULATION OF CREDIT HOURS AND FACULTY REQUIREMENTS

Fall 1971

Table 42

	COURSE DATA			FACULTY				VARIABLES			
					Full-time Equivalent			Course Teaching			
	Total Credit Hours	Course Enroll'ts	Average Course Credits	Total Course Credits	Faculty Teaching	Faculty Total	Faculty Headcount	Weighted Average Class Size	Credits Per Teaching FTEF	FTEF Per Total FTEF	Total FTEF Per Headcount
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
TEACHING COLLEGE											
Agr. & Nat. Resources	24540	7273	3.37	1602.72	77.29	112.93	632	15.31	20.74	68.4	17.9
Arts & Letters	79757	24562	3.25	3820.05	319.51	400.55	583	20.88	12.30	77.5	68.7
Lyman Briggs	5577	1464	3.81	306.54	19.08	21.88	25	27.00	10.82	87.2	87.5
Business	47965	11890	4.03	1349.07	124.25	161.22	253	35.55	10.86	77.1	63.7
Communication Arts	16732	4936	3.39	773.38	48.11	68.63	121	21.63	16.08	70.1	56.7
Education	56332	15940	3.53	3378.82	179.86	237.78	425	16.67	18.79	75.6	55.9
Engineering	16732	5329	3.14	888.64	86.24	125.50	194	18.83	10.30	68.7	64.7
Human Ecology	13943	4462	3.13	604.20	50.05	64.65	148	23.08	12.07	77.4	43.7
Human Medicine	8924	3025	2.95	337.80	36.12	85.99	186	26.42	8.86	44.3	46.2
James Madison	3346	856	3.91	203.50	16.70	20.67	22	16.44	12.19	80.8	94.0
Justin Morrill	7808	1972	3.96	549.47	29.27	39.07	39	14.21	18.77	74.9	100.2
Natural Science	93142	24385	3.82	3617.76	352.86	473.70	1046	25.75	10.25	74.5	45.3
Osteopathic Medicine	558	164	3.40	30.22	18.99	40.15	82	18.46	1.59	47.3	49.0
Social Science	87007	23327	3.73	2854.14	213.69	305.70	557	30.48	13.36	69.9	54.9
Veterinary Medicine	11156	2631	4.25	401.31	51.14	83.68	142	27.80	7.85	61.1	31.7
University College	84219	22732	3.70	2118.10	206.26	250.81	264	39.76	10.27	82.2	176.6
TOTAL	557738	154948	3.60	22735.72	1822.42	2492.91	4719	24.53	12.48	73.1	52.8
Comparative Data											
Fall 1969	554864	156282	3.55	20969.79	1842.44	2506.82	4773	26.46	11.38	73.5	52.5
Fall 1970	546200	154696	3.53	22226.90	1865.10	2560.78	4814	24.57	11.92	72.8	53.2
Fall 1971	557738	154948	3.60	22735.72	1822.42	2492.91	4719	24.53	12.48	73.1	52.8

Note: Calculations: Column 3 = (1)/(2)
8 = (1)/(4)
9 = (4)/(5)
10 = (5)/(6)
11 = (6)/(7)

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TABULATION OF COURSE DATA
Teaching College: NATURAL SCIENCE
Course: MATHEMATICS 108

Fall 1971

Table 43

Section Number	Assigned Room Capacity	Course Enrollments Projected	Course Enrollments Actual	Course Credits Projected	Course Credits Actual	Course Credit Hours Projected	Course Credit Hours Actual
RECITATIONS							
1	42	33	31	5	5	165	155
2	50	31	29	5	5	155	145
3	42	30	30	5	5	150	150
4	35	33	32	5	5	165	160
5	50	30	29	5	5	150	195
6	35	35	29	5	5	175	145
7	32	30	31	5	5	150	155
8	60	31	30	5	5	155	150
9	30	30	32	5	5	150	160
10	50	19	17	5	5	95	85
...	...	...	...	...	...	...	...
40	42	30	35	5	5	150	175
41	42	35	35	5	5	175	175
42	42	15	30	5	5	75	150
43	42	24	28	5	5	120	140
44	42	24	26	5	5	120	130
45	42	12	28	5	5	60	140
46	42	24	32	5	5	120	160
47	35	24	34	5	5	120	170
48		-	30	-	5	-	150
49		-	29	-	5	-	145
50		-	2	-	5	-	10
Course Total		1345	1434	235	250	6725	7170

Weighted Average Class Size:
Projected 6725/235 = 28.62
Actual 7170/250 = 28.68

MICHIGAN STATE UNIVERSITY
East Lansing Campus

TABULATION OF COURSE DATA
Teaching College: EDUCATION
Course: EDUCATION 200

Fall 1971

Table 44

Section Number	Assigned Room Capacity	Course Enrollments Projected	Course Enrollments Actual	Course Credits Projected	Course Credits Actual	Course Credit Hours Projected	Course Credit Hours Actual
LECTURES							
901	420			3	3		
902	420			3	3		
Total		655	764	6	6	1965	2292
RECITATIONS							
1	25	15	16	2	2	30	32
2	30	15	15	2	2	30	30
3	30	15	15	2	2	30	30
4	25	15	13	2	2	30	26
5	25	15	16	2	2	30	32
...	...	...	...	...	...	...	...
33	30	15	16	2	2	30	32
34	24	15	15	2	2	30	30
35	25	15	15	2	2	30	30
...	...	...	...	...	...	...	...
49	24	15	14	2	2	30	28
50	24	15	10	2	2	30	20
E51	75	30	30	2	2	60	60
Total		655	764	102	102	1310	1528
Course Total		655	764	108	108	3275	3820

Weighted Average Class Size:

Projected:	Lectures	1965/6	= 327.50
	Recitations	1310/102	= 12.84
	Total	3275/108	= 30.32
Actual:	Lectures	2292/6	= 382.00
	Recitations	1528/102	= 14.98
	Total	3820/108	= 35.37

MICHIGAN STATE UNIVERSITY
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COMPARATIVE TRENDS FOR SELECTED VARIABLES

Fall Terms

Table 45

	Weighted Average Class Size				Course Credits Per Teaching FTEF				Teaching FTEF Per Total FTEF				Total FTEF Per Faculty Headcount			
	1969	1970	1971[e]	1971	1969	1970	1971[e]	1971	1969	1970	1971[e]	1971	1969	1970	1971[e]	1971
TEACHING COLLEGE																
Agr. & Nat. Resources	14.28	14.70	14.49	15.31	17.10	18.30	17.75	20.74	67.3	68.8	68.1	68.4	20.0	19.7	18.5	17.9
Arts & Letters	22.59	20.71	21.65	20.58	11.55	11.43	11.49	12.30	82.1	82.6	82.3	77.5	67.3	69.0	68.0	68.7
Lyman Briggs	26.32	24.09	25.21	27.00	6.58	8.51	9.00	10.82	92.2	90.8	91.5	87.2	76.0	70.9	72.0	87.5
Business	35.20	35.40	35.34	35.55	10.80	10.39	10.60	10.86	74.8	76.9	75.9	77.1	55.6	61.4	60.0	63.7
Communication Arts	22.02	22.01	22.01	21.63	15.94	13.77	14.86	16.07	54.9	59.8	57.4	70.1	56.3	60.3	58.0	56.7
Education	21.09	18.17	19.63	16.67	17.10	18.90	18.00	18.79	73.3	74.2	73.8	75.6	51.5	52.8	53.0	55.9
Engineering	18.41	18.02	18.22	18.83	9.67	10.65	10.16	10.30	63.2	64.3	63.8	68.7	69.3	64.2	64.0	64.7
Human Ecology	26.38	24.99	25.69	23.08	8.68	9.01	8.85	12.07	78.9	75.3	77.1	77.4	43.3	46.6	44.0	43.7
Human Medicine	13.72	23.51	25.00	26.42	8.03	7.99	8.01	8.86	42.3	39.4	40.4	44.3	39.1	26.9	34.2	46.2
James Madison	21.55	16.09	18.82	16.44	6.12	10.53	11.00	12.19	73.9	78.5	76.2	80.8	85.4	85.0	85.0	94.0
Justin Morrill	14.74	12.49	13.62	14.21	12.37	13.43	14.00	18.77	87.3	80.1	83.7	74.9	106.1	96.8	98.0	100.2
Natural Science	28.09	25.26	26.00	25.75	9.32	9.68	9.50	10.25	74.0	75.5	75.0	74.5	45.3	44.7	45.0	45.3
Osteopathic Medicine	-	-	18.61	18.46	-	-	1.00	1.59	-	-	40.4	47.3	-	59.8	55.0	49.0
Social Science	29.51	29.86	29.69	30.48	11.90	13.21	12.56	13.36	69.4	65.6	67.5	69.9	57.3	55.9	55.0	54.9
Veterinary Medicine	27.87	28.16	28.02	27.90	7.95	13.09	10.52	7.85	59.8	54.9	57.4	61.1	53.3	53.6	53.4	31.7
University College	46.63	40.29	43.46	39.76	9.46	10.62	10.04	10.27	84.0	80.9	82.5	82.2	85.5	88.7	89.0	176.7
TOTAL	26.46	24.57	25.28	24.53	11.38	11.92	11.65	12.48	73.5	72.8	72.7	73.1	52.5	53.2	53.0	52.8
Mathematics Department:	30.76	28.22	29.50	29.43	11.31	10.94	11.13	10.73	79.9	80.9	82.0	84.2	60.5	61.2	64.0	61.8

e = estimated

CHAPTER VI

TRANSLATING TEACHING REQUIREMENTS INTO INSTRUCTIONAL EXPENDITURES

The main thrust in this chapter is the selection of variables that are relevant and their arrangement in such a way that will guard against their mathematical imbalance. It is suggested that this can be accomplished through a series of ratios placed as factors in equations wherein the variables represent quantifications of what are essentially political questions. An equation is a convenient form for visualizing the effect of decisions and for highlighting the extent and type of counterbalancing required. Final projections were summarized in condensed pro forma statements of revenues and expenditures. Subsequent comparisons with actual experience were completed through an analysis of the constitutent variables.

These equations can be solved by any desk calculator. More formal programs utilizing the information stored in student data banks can also be designed for the system 360 equipment in the Central Data Processing Department.

Budget variables are selected so as to provide those who will be analyzing the data with the measurements they believe will be relevant. The first group of analysts consists of the trustees, committeemen of the state government and other members of the Legislature, and representatives of the Governor's Office who implement the Program Budget Evaluation System (PBES). This group has shown concern for the following ratios:

1. the student-faculty ratio,
2. the average teaching load of the faculty, and
3. the average class size.

The second group consists of the faculty. They tend to focus on methods of enhancing the learning environment. Consequently, attention in this group centers on the content of the course, on the course requirements for a major, the selection of suitable classroom facilities, and the choice of the most appropriate instructional method for the discipline and the instructor.

A third group consists of institutional administrators who have the task of assuring the various university publics that benefits derived from programs are reasonably commensurate with amounts spent. Many academic benefits cannot be quantitatively measured. Consequently, justifications are continually represented by a blend or mingling of subjective opinions and objectively derived relationships. When one reinforces the other, the probability of acceptance by the publics is increased.

An assumption made in the projection of instructional expenditures is that these costs will fluctuate, within limits, with the volume of teaching activity. Secondly, the most commonly recognized media for measuring this activity is the number of credit hours produced. The variability of cost with volume was tested in the schedule that follows. In Part A of Table 46 the dollar cost of the instructional activity was shown as a percentage of credit hours taught. Expenditures per hour have increased from $19.95 in the year 1967-68 to $24.35 in 1971-72.

True variable expense rates should remain fairly constant within a reasonable range of activity. To eliminate the effect of extraneous factors, a second rate was calculated in Part B. This rate compared the number of full-time equated faculty with credit hours of activity. The rate in Part B was fairly constant thereby confirming the basic premise of variability. The abnormally high rate in the year 1970-71 was the result of an unexpected decrease in freshmen enrollments after instructional committments were completed. In this study, the budgets for teaching departments were classified as flexible budgets. All other General Fund expenditures were grouped together and were shown as supporting costs and were related by percentages to instructional expenditures.

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East Lansing Campus

COMPARISON OF INSTRUCTIONAL EXPENDITURES WITH CREDIT HOURS PRODUCED
Fiscal Years 1967-68 through 1971-72

Table 46

	1967-68	1968-69	1969-70	1970-71	1971-72
Total Credit Hours	1649808	1723824	1749494	1732082	1732758
PART A					
Instructional Expenditures (in thousands)	$32913	35659	38304	42249	42913
Expenditure Per Hour					
Rate	$19.95	20.69	21.89	24.39	24.35
Index	100.0%	103.7	109.7	122.3	122.1
PART B					
Teaching FTEF	1700.53	1800.59	1842.44	1865.10	1822.42
FTEF Per Hour					
Rate	.103%	.104	.105	.107	.105
Index	100.0%	101.0	101.9	103.9	101.9

Flexible Budget Procedures

The following steps summarize the procedures suggested for using these variables in preparing flexible type budgets.

I. The base or independent variable used for estimating these budgets is student headcounts. The process for projecting headcount enrollments was described in Chapter III.

II. The second step in the process is the projection of course enrollments and related course credits (see Chapter IV) and credit hours (see Chapter V).

III. The third stage is the development of teaching requirements. These are expressed in terms of equivalent numbers of full-time faculty who are actively engaged in the teaching of courses (see Chapter V).

IV. The fourth stage is covered in this chapter. The variables are selected and set up in equations. A mechanism is organized so that the results of alternate policy decisions can be simulated and their economic consequence summarized in terms of general fund revenues and expenditures.

V. In the final stage, a method of analyzing variances from planned objectives is described.

Organizing the Variables

The variables recognized in this thesis may be classified into two groups. The independent variable is represented by student headcounts. These were projected by means of a self-contained model illustrated

in Chapter III. The remainder of the performance measurements are dependent variables. These variables were shown in Table 47 as items 1-5. For comparative purposes actual relationships for a five-year period at this University were listed. The end-product of items 1-12 was arranged in the form of a condensed statement of revenues and expenditures. The general logic used in their development is described in this chapter.

The first set of equations is restricted to performance measurements. The basic premise is that

Total Credit Hours Earned by Students

= Total Credit Hours Taught by the Faculty

This permise is expanded to

Total Credit Hours Earned by Students

= (Student Headcount Enrollments) (Average Student Credit-Hour Load)

and to

Total Credit Hours Earned

= (Course Enrollments) (Average Course Credits)

where

Total Course Enrollments

= (Headcount Enrollment) (Average Student Course Load)

The instructor side of the equation can be algebraically described as follows:

Total Credit Hours Taught by the Faculty

= (Teaching FTEF) (FTEF Teaching Load) (Weighted Average Class Size)

and as

Total Credit Hours Taught

= (Weighted Average Class Size) (Total Course Credits)

and also as

Total Credit Hours Taught

$$= \frac{\text{(Headcount Enrollment)}}{\text{(Student-Faculty Ratio)}} \text{ (FTEF Teaching Load) (Weighted Average Class Size)}$$

Instructional activities are carried on by a number of assistants who may not be formally classified as members of the faculty. For this reason the term instructor is shown in the equations that follow. The single exception is found in the use of the term full-time equivalent faculty (FTEF). This term is retained because of its common usage, even though the number included such categories as graduate assistants, assistant instructors, lecturers, etc.

Additional variables relating to the number of full-time equivalent faculty were developed in the following equations.

Teaching FTEF

= (Instructor Headcount) (% Total FTEF Per Headcount) (% of FTEF Time Spent in Teaching)

and

Teaching FTEF

= (Instructor Headcount) (% Teaching FTEF to Faculty Headcount)

and as

Teaching FTEF

$$= \frac{\text{Headcount Enrollments}}{\text{Student-Instructor Ratio}}$$

Other instructor variables found to be useful were

Tenured Faculty

= (Instructor Headcount) (% with Tenure)

and

Graduate Assistants

= (Instructor Headcount) (% Graduate Assistants)

Relationships between students and instructors were clarified in the following student-instructor ratios:

The Student-Instructor Ratio

$$= \frac{\text{Headcount Enrollments}}{\text{Teaching FTEF}}$$

This ratio is also expressed as

The Student-Instructor Ratio

$$= \frac{\text{(FTEF Teaching Load) (W'td Average Class Size)}}{\text{(Teaching FTEF) (FTEF Teaching Load)}}$$

where

The Weighted Average Class Size

$$= \frac{\text{(Headcount Enrollments) (Average Student Load)}}{\text{(Teaching FTEF) (FTEF Teaching Load)}}$$

or

The Weighted Average Class Size

$$= \frac{\text{Student Credit Hours}}{\text{Total Course Credits}}$$

The second set of equations were concerned with the merging of performance measurements with revenues and expenditures. The basic equality may be stated as

Total General Fund Revenues

= Total General Fund Expenditures

Revenues were restated as

Total Revenues

= (Fee Revenue) + (State Appropriations) + (Other Revenues)

and as

Total Revenues

= (Fee Revenue) (1 + State Appropriation %)
(1 + Other Revenue %)

where

Fee Revenue

= (Headcount Enrollment) (Fees Per Student)

or

Fee Revenue

= (Total Credit Hours) (Fees Per Hour)

and

State Appropriations

= (Fee Revenue) (State Appropriation %)

and as

Other Revenue

= (Fee Revenue) (Other Revenue %)

The expenditure side of this equation was expressed as

Total General Fund Expenditures

= (Instructional Expenditures) + (Other Expenditures)

or as

Total Expenditures

= (Instructional Expenditures) (1 + Other Overhead %)

where

Instructional Expenditures

= (Teaching FTEF) (Instructional Expenditures Per Teaching FTEF)

and

Instructional Expenditures

= (Total Credit Hours) (Instructional Expenditures Per Hour)

For convenience in projecting the data, selected equations were combined below.

Total Credit Hours:

(Headcount Enrollments) (Average Student Course Load) (Average Course Credit)

= (Instructor Headcount) (% Teaching FTEF) (FTEF Teaching Load) (W'td Average Class Size)

Total General Fund Revenues and/or Expenditures:

(Total Credit Hours) (Fees Per Hour) (1 + State Appropriation %) (1 + Other Revenue %)

= (Total Credit Hours) (Instructional Expenditures Per Hour) (1 + Overhead %)

and as

(Headcount Enrollments) (Fees Per Student) (1 + State Appropriation %) (1 + Other Revenue %)

= (Teaching FTEF) (Instructional Expenditures Per Teaching FTEF) (1 + Overhead %)

Calculation of the Variables

The following data were taken from the records of this University and were used to illustrate the process of summarization, simulation and evaluation. The data were developed separately for the entire East Lansing Campus, the College of Natural Science and the Department of Mathematics within that college. The procedures followed in this development were outlined previously in this chapter under the caption "Flexible Budget Procedures".

A list of selected variables was shown in Table 47. These were assembled into the equations shown in Appendix A. Selected summary equations were reproduced in this chapter (Table 48) to illustrate the simulation process and a comparative summary of the performance measurements was shown in Table 49.

Note that not all equations can be applied at the college or department level. For example, in Table 48, headcounts of majors may be useful at the total campus level of detail (Equation 25) but are misleading at the college and department level (see Equation 25^a). Mathematics majors do not represent the proper basis for calculating course enrollments and credit hours taught in that department. The cross-over by majors to teaching departments was illustrated in Chapter IV on course enrollments.

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THE SELECTED VARIABLES
Fiscal Years 1967-68 through 1971-72

Table 47

	Fiscal Years						Equation Reference [1]
	1967-68	1968-69	1969-70	1970-71	1971-72*	1971-72	
EAST LANSING CAMPUS							
1. Average Student Course Load	12.0	12.0	12.0	12.0	11.6	11.6	2
2. % Teaching FTEF to Instr. Headcount	35.9	36.8	38.6	38.7	38.5	38.6	7
3. Average Course Credits	3.6	3.6	3.6	3.6	3.6	3.6	3
4. Teaching FTEF Credit-Hour Load	34.9	34.9	35.9	37.8	36.9	38.8	13
5. Weighted Average Class Size	27.8	27.4	26.5	24.6	25.3	24.5	12
6. Student Fees Per Credit Hour	13.1	13.7	15.9	16.8	17.6	17.9	17
7. Student Fees Per Student	557.8	592.3	680.2	717.6	728.9	744.7	16
8. % State Approp. to Student Fees	208.6	207.2	195.9	204.1	203.0	200.0	18
9. % Other Revenue to Fees & State Approp.	2.9	5.3	5.7	6.1	6.0	6.3	21
10. Instr. Expend. Per Tchg. FTEF	19354.4	19803.9	20789.8	22652.6	22772.1	23152.0	22
11. Instr. Expend. Per Credit Hour	19.9	20.7	21.9	24.4	24.4	24.4	23
12. % Overhead to Instructional Expend.	108.6	114.7	126.6	122.1	132.0	134.2	24
COLLEGE OF NATURAL SCIENCE							
1. Average Student Course Load			Does Not Apply				2
2. % Teaching FTEF to Instr. Headcount	30.1	32.6	33.6	33.7	33.8	33.7	7
3. Average Course Credits	3.7	3.7	3.7	3.7	3.7	3.7	3
4. Teaching FTEF Credit-Hour Load	27.3	27.4	26.8	28.0	28.0	29.0	13
5. Weighted Average Class Size	28.5	27.7	28.1	25.3	26.0	25.7	12
6. Student Fees Per Credit Hour	10.6	11.0	12.7	13.3	13.6	13.9	17
7. Student Fees Per Student	557.8	592.3	680.2	717.6	728.9	744.7	16
8. % State Approp. to Student Fees	123.3	127.5	113.1	126.1	116.4	112.2	18
9. % Other Revenue to Fees & State Approp.	2.1	2.1	-.1	-.7	-1.0	-1.0	21
10. Instr. Expend. Per Tchg. FTEF	18426.4	19069.8	20140.6	20922.5	20954.5	21405.5	22
11. Instr. Expend. Per Credit Hour	23.7	25.2	26.8	29.6	28.8	28.7	23
12. % Overhead to Instructional Expend.	1.5	1.5	1.0	1.1	1.0	1.6	24

Note: 1) See detailed equations in Appendix A.

MICHIGAN STATE UNIVERSITY

THE SELECTED VARIABLES
Fiscal Years 1967-68 through 1971-72

Table 47 (Continued)

	Fiscal Years						Equation Reference[1]
	1967-68	1968-69	1969-70	1970-71	1971-72*	1971-72	
DEPARTMENT OF MATHEMATICS							
1. Average Student Course Load			Does Not Apply				2
2. % Teaching FTEF to Instr. Headcount	52.3	50.9	47.9	49.5	50.0	52.0	7
3. Average Course Credits	4.5	4.5	4.5	4.5	4.5	4.5	3
4. Teaching FTEF Credit-Hour Load	28.8	30.8	30.0	28.8	28.4	27.6	13
5. Weighted Average Class Size	32.7	31.1	30.8	28.2	29.5	29.4	12
6. Student Fees Per Credit Hour	7.5	7.3	8.8	9.4	8.9	8.4	17
7. Student Fees Per Student	557.8	592.3	680.2	717.6	728.9	744.7	16
8. % State Approp. to Student Fees	68.7	83.7	74.4	95.2	100.2	113.0	18
9. % Other Revenue to Fees & State Approp.	2.1	2.1	-.1	-.7	-1.5	-2.0	21
10. Instr. Expend. Per Tchg. FTEF	12164.4	12987.2	13960.8	14586.3	14698.0	14246.0	22
11. Instr. Expend. Per Credit Hour	12.9	13.6	15.1	18.0	17.6	17.6	23
12. % Overhead to Instructional Expend.	-	-	-	-	-	-	24

Note: 1) See detailed equations in Appendix A.

MICHIGAN STATE UNIVERSITY

COMPOSITE EQUATION OF PERFORMANCE MEASUREMENTS
Fiscal Years 1967-68 through 1971-72

Table 48

EQUATION #25 (See Appendix A)
(Headcount Enrollments) (Average Student Course Load) (Average Course Credit)
= (Instructor Headcount)(% Teaching FTEF)(FTEF Credit-Hour Load)(Wt'd Average Class)

DATA
EAST LANSING CAMPUS

1967-1968	(38758)	(11.9555447)	(3.5604319)	=1649808=	(4731)	(35.9444092%)	(34.9378547)	(27.7685289)
1968-1969	(39949)	(12.0468597)	(3.5818975)	=1723824=	(4888)	(36.8369476)	(34.9115400)	(27.4226286)
1969-1970	(40820)	(11.9798138)	(3.5775803)	=1749494=	(4773)	(38.6012990)	(35.8861292)	(26.4601613)
1970-1971	(40511)	(11.9732418)	(3.5709497)	=1732082=	(4814)	(38.7432489)	(37.7914429)	(24.5738302)
1971-1972[e]	(41912)	(11.6004963)	(3.5684903)	=1735000=	(4822)	(38.5203235)	(36.9492202)	(25.2800000)
1971-1972	(41649)	(11.5895220)	(3.5897798)	=1732758=	(4719)	(38.6187752)	(38.7585902)	(24.5313511)

COLLEGE OF NATURAL SCIENCE (Does Not Apply)

DEPARTMENT OF MATHEMATICS (Does Not Apply)

MICHIGAN STATE UNIVERSITY
COMPOSITE EQUATION OF PERFORMANCE MEASUREMENTS
Fiscal Years 1967-68 through 1971-72

Table 48 (Continued)

EQUATION #25[a] (See Appendix A)
(Course Enrollments) (Average Course Credits)
= (Instructor Headcount)(% Teaching FTEF)(FTEF Credit-Hour Load)(W'td Avg. Class Size)

DATA
EAST LANSING CAMPUS
1967-1968 (463373)(3.5604319) = 1649808 = (4731)(35.9444092%)(34.9378547)(27.7685289)
1968-1969 (481260)(3.5818975) = 1723824 = (4888)(36.8369476)(34.9115400)(27.4226286)
1969-1970 (489016)(3.5775803) = 1749494 = (4773)(38.6042990)(35.8861292)(26.4601613)
1970-1971 (485048)(3.5709497) = 1732082 = (4814)(38.7432489)(37.7914429)(24.5738302)
1971-1972[e](486200)(3.5684903) = 1735000 = (4822)(38.5203235)(36.9492202)(25.2800000)
1971-1972 (482692)(3.5897798) = 1732758 = (4719)(38.6187752)(38.7585902)(24.5313511)

COLLEGE OF NATURAL SCIENCE
1967-1968 (69571)(3.6874272) = 256538 = (1004)(30.1525114%)(27.2959448)(28.4653130)
1968-1969 (69982)(3.7130262) = 259845 = (1051)(32.6146527)(27.3950168)(27.6711570)
1969-1970 (71496)(3.7003888) = 264563 = (1048)(33.5591603)(26.7789537)(28.0907370)
1970-1971 (70055)(3.7003212) = 259226 = (1086)(33.7200737)(28.0228461)(25.2608510)
1971-1972[e](70700)(3.7057992) = 262000 = (1065)(33.7652582)(28.0225892)(26.0000000)
1971-1972 (71305)(3.6918589) = 263248 = (1046)(33.7342256)(28.9772288)(25.7457650)

DEPARTMENT OF MATHEMATICS
1967-1968 (21548)(4.4945239) = 96848 = (197)(52.2994924%)(28.7635969)(32.6801291)
1968-1969 (21552)(4.5028768) = 97046 = (199)(50.8844221)(30.8293543)(31.0867476)
1969-1970 (21512)(4.5070193) = 96955 = (219)(47.9178082)(30.0376423)(30.7584719)
1970-1971 (20268)(4.4590981) = 90377 = (225)(29.5022222)(28.7523348)(28.2213374)
1971-1972[e](20500)(4.4878049) = 92000 = (220)(50.0000000)(28.3522342)(29.5000000)
1971-1972 (20239)(4.5260141) = 91602 = (217)(52.0460829)(27.5548479)(29.4346689)

MICHIGAN STATE UNIVERSITY
COMPARATIVE SUMMARY OF PERFORMANCE MEASUREMENTS
Fiscal Years 1967-68 through 1971-72

Table 49

	Fiscal Years					
	1967-68	1968-69	1969-70	1970-71	1971-72[e]	1971-72
EAST LANSING CAMPUS						
1. Student Headcount	38758	39949	40820	40511	41912	41649
2. Course Enrollments	463373	481260	489016	485048	486200	482692
3. Course Credits	59412.87	62861.37	66118.04	70484.82	68631.33	70634.43
4. Credit Hours	1649808	1723824	1749494	1732082	1735000	1732758
5. Instructor Headcount	4731	4888	4773	4814	4822	4719
6. Teaching FTEF	1700.53	1800.59	1842.44	1865.10	1857.45	1822.42
COLLEGE OF NATURAL SCIENCE						
1. Student Headcount	4954	4822	4941	4805	4875	4904
2. Course Enrollments	69571	69982	71496	70055	70700	71305
3. Course Credits	9012.30	9390.46	9418.16	10261.97	10076.92	10224.90
4. Credit Hours	256538	259845	264563	259226	262000	263248
5. Instructor Headcount	1095	1051	1048	1086	1065	1046
6. Teaching FTEF	330.17	342.78	351.70	366.20	359.60	352.86
DEPARTMENT OF MATHEMATICS						
1. Student Headcount	1308	1203	1248	1184	1125	1035
2. Course Enrollments	21548	21552	21512	20268	20500	20239
3. Course Credits	2963.51	3121.78	3152.14	3202.44	3118.64	3112.04
4. Credit Hours	96848	97046	96955	90377	92000	91602
5. Instructor Headcount	197	199	217	225	220	217
6. Teaching FTEF	103.03	101.26	104.94	111.38	110.00	112.94

The conversion of performance measurements into general fund revenues and expenditures was shown in Tables 50 and 51. This information, in turn, was summarized in condensed pro forma statements of general fund revenues and expenditures (Table 52).

Simulations

The equations shown in Appendix A of this paper can be used in a variety of ways to simulate the effect of planned changes in the selected variables. The few examples that follow were used to illustrate the type of alternatives that could be simulated.

Problem #1

How many students could have been accommodated during the fiscal year 1971-1972 if

(a) the number of teaching FTEF were to be increased from 1822.42 to 1830.00, and

(b) the teaching load was reduced from the present level of 38.75859 to 38.0 credit hours per teaching FTEF?

Solution:

This problem can be conveniently solved by merging equations #1 and #13 and solving for headcount enrollments.

(Headcount Enrollments) (Average Student Credit-Hour Load)

= (Teaching FTEF)(FTEF Credit-Hour Load)(Wt'd Average Class Size)

$$\frac{(1822.42 + 7.58)\ (38.75859 - .75859)\ (24.5135)}{(41.60383)} = 41{,}004 \text{ Students}$$

MICHIGAN STATE UNIVERSITY
COMPOSITE EQUATION OF GENERAL FUND REVENUES AND EXPENDITURES
Fiscal Years 1967-68 through 1971-72

Table 50

EQUATION #26 (See Appendix A)
(Total Credit Hours)(Fees Per Hour)(1 + State Appropriation %)(1 + Other Revenue %)
= (Total Credit Hours)(Instructional Expenditures Per Hour)(1 + Overhead %)

DATA
EAST LANSING CAMPUS

1967-1968 (1649808) (13.1029853) (1 + 2.0860314) (1 + .0290550)
= 68,650,324 = (1649808) (19.949414) (1 + 1.0858306)

1968-1969 (1723824) (13.7272894) (1 + 2.0717291) (1 + .0533742)
= 76,567,298 = (1723824) (20.685794) (1 + 1.1472282)

1969-1970 (1749494) (15.8705208) (1 + 1.9585371) (1 + .0566837)
= 86,801,189 = (1749494) (21.894290) (1 + 1.2661171)

1970-1971 (1732082) (16.7847082) (1 + 2.0412541) (1 + .0614897)
= 93,853,560 = (1732082) (24.392236) (1 + 1.2214201)

1971-1972[e] (1735000) (17.6069164) (1 + 2.0299856) (1 + .0600043)
= 98,114,000 = (1735000) (24.379256) (1 + 1.3195890)

1971-1972 (1732758) (17.8997875) (1 + 2.0000000) (1 + .0625591)
= 98,869,000 = (1732758) (24.350000) (1 + 1.3432750)

MICHIGAN STATE UNIVERSITY
COMPOSITE EQUATION OF GENERAL FUND REVENUES AND EXPENDITURES
Fiscal Years 1967-68 through 1971-72

Table 50 (Continued)

COLLEGE OF NATURAL SCIENCE

1967-1968 (256538) (10.5533488) (1 + 1.2329143) (1 + .0212145)
= 6,173,494 = (256538) (23.7152001) (1 + .0147347)

1968-1969 (259845) (10.9921992) (1 + 1.2753376) (1 + .0210650)
= 6,635,875 = (259845) (25.1563317) (1 + .0151647)

1969-1970 (264563) (12.7032956) (1 + 1.1310260) (1 + .9992809)
= 7,156,849 = (264563) (26.7740954) (1 + .0103642)

1970-1971 (256226) (13.3022189) (1 + 1.2608358) (1 + .9933752)
= 7,744,350 = (259226) (29.5561594) (1 + .0107841)

1971-1972[e] (262000) (13.5618053) (1 + 1.1635335) (1 + .9899999)
= 7,610,577 = (262000) (28.7604008) (1 + .0100000)

1971-1972 (263248) (13.8728803) (1 + 1.1221202) (1 + .9900000)
= 7,672,500 = (263248) (28.6921838) (1 + .0158000)

DEPARTMENT OF MATHEMATICS

1967-1968 (96848) (7.5328556) (1 + .6872339) (1 + .0212145)
= 1,253,295 = (96848) (12.9408454) (-)

1968-1969 (97046) (7.3427653) (1 + .3427653) (1 + .0210650)
= 1,315,081 = (97046) (13.5511098) (-)

1969-1970 (96955) (8.7553814) (1 + .7439832) (.9992809)
= 1,465,051 = (96955) (15.1106286) (-)

1970-1971 (90377) (9.4016287) (1 + .9515542) (.9933752)
= 1,624,616 = (90377) (17.9759895) (-)

1971-1972[e] (92000) (8.9126957) (1 + 1.0022476)(.9858402)
= 1,616,778 = (92000) (17.5736739) (-)

1971-1972 (91602) (8.4142813) (1 + 1.1300630)(.9799997)
= 1,608,942 = (91602) (17.5644855) (-)

MICHIGAN STATE UNIVERSITY
COMPOSITE EQUATION OF GENERAL FUND REVENUE AND EXPENDITURES
Fiscal Years 1967-68 through 1971-72

Table 51

EQUATION #27 (See Appendix A)
(Headcount Enrollments)(Fees Per Student)(1 + State Appropriation %)(1 + Other Revenue %)
= (Teaching FTEF)(Instructional Expenditures Per Teaching FTEF)(1 + Overhead %)

DATA
EAST LANSING CAMPUS

1967-1968 (38758)(557.7534961)(1 + 2.08603144%)(1 + .02905499)
= 68,650,324 = (1700.53)(19354.3795170)(1 + 1.0858306)

1968-1969 (39949)(592.3410098)(1 + 2.07172911)(1 + .05337423)
= 76,567,298 = (1800.59)(19803.8798394)(1 + 1.1472282)

1969-1970 (40820)(680.1906173)(1 + 1.95853721)(1 + .05668368)
= 86,801,189 = (1842.44)(20789.7836565)(1 + 1.2661171)

1970-1971 (40511)(717.6443682)(1 + 2.04125408)(1 + .06148973)
= 93,853,560 = (1865.10)(22652.5939628)(1 + 1.2214201)

1971-1972[e] (41912)(728.8604696)(1 + 2.02998559)(1 + .06000434)
= 98,114,000 = (1857.45)(22772.0853859)(1 + 1.3195890)

1971-1972 (41649)(744.6997527)(1 + 2.00000000)(1 + .06255910)
= 98,869,000 = (1822.42)(23151.9940591)(1 + 1.3432750)

MICHIGAN STATE UNIVERSITY
COMPOSITE EQUATION OF GENERAL FUND REVENUE AND EXPENDITURES
Fiscal Years 1967-68 through 1971-72

Table 51 (Continued)

COLLEGE OF NATURAL SCIENCE

1967-1968 (4954)(557.7534961)(1 + 1.23291428%)(1 + .0212145)
= 6,173,494 = (330.17)(18426.4166944)(1 + .0147347)

1968-1969 (4822)(592.3410098)(1 + 1.27533760)(1 + .0210650)
= 6,635,875 = (342.78)(19069.8027890)(1 + .0151647)

1969-1970 (4941)(680.1906173)(1 + 1.13102598)(.9992809)
= 7,156,849 = (351.70)(20140.5601365)(1 + .0103642)

1970-1971 (4805)(717.6443682)(1 + 1.26083576)(.9933752)
= 7,744,350 = (366.20)(20922.2419443)(1 + .0107841)

1971-1972[e] (4875)(728.8601026)(1 + 1.16353347)(.9899999)
= 7,610,577 = (359.60)(20954.4632925)(1 + .0100000)

1971-1972 (4904)(744.6998369)(1 + 1.12212021)(.9900000)
= 7,672,500 = (352.86)(21405.5432750)(1 + .0158000)

DEPARTMENT OF MATHEMATICS

1967-1968 (1308)(557.7534961)(1 + .68723390)(1 + .0212145)
= 1,253,295 = (103.03)(12164.3696011)(-)

1968-1969 (1203)(592.3410098)(1 + .83658533)(1 + .0210650)
= 1,315,081 = (101.26)(12987.1716374)(-)

1969-1970 (1248)(680.1906173)(1 + .74398323)(.9992809)
= 1,465,051 = (104.94)(13960.8442920)(-)

1970-1971 (1184)(717.6443682)(1 + .95155415)(.9933752)
= 1,624,616 = (111.38)(14586.2452864)(-)

1971-1972[e] (1125)(728.8604444)(1 + 1.00224764)(.9858402)
= 1,616,778 = (110.00)(14697.9818182)(-)

1971-1972 (1035)(744.7004831)(1 + 1.13006298)(.9799997)
= 1,608,942 = (112.94)(14245.9890207)(-)

MICHIGAN STATE UNIVERSITY
CONDENSED STATEMENT OF GENERAL FUND REVENUES AND EXPENDITURES
(in Thousands of Dollars)

Fiscal Years 1967-68 through 1971-72

Table 52

	Fiscal Years					
	1967-68	1968-69	1969-70	1970-71	1971-72[e]	1971-72
EAST LANSING CAMPUS						
REVENUES						
Student Fees	$21617	23663	27765	29072	30548	31016
State Appropriations	49095	49025	54380	59345	62012	62032
Total	66712	72688	82145	88417	92560	93048
Other Revenues	1938	3879	4656	5437	5554	5821
Total	68650	76567	86801	93854	98114	98869
EXPENDITURES						
Instructional	32913	35659	38304	42249	42298	42193
Other Expenditures	35737	40908	48497	51605	55816	56676
Total	68650	76567	86801	93854	98114	98869

MICHIGAN STATE UNIVERSITY
CONDENSED STATEMENT OF GENERAL FUND REVENUES AND EXPENDITURES
(in Thousands of Dollars)

Fiscal Years 1967-68 through 1971-72

Table 52 (Continued)

	Fiscal Years					
	1967-68	1968-69	1969-70	1970-71	1971-72[e]	1971-72
COLLEGE OF NATURAL SCIENCE						
REVENUES						
Student Fees	$2707	2856	3361	3448	3553	3652
State Appropriation	3338	3643	3801	4348	4134	4098
Total	6045	6499	7162	7796	7687	7750
Other Revenues	128	137	-5	-52	-76	-77
Total	6173	6636	7157	7744	7611	7673
EXPENDITURES						
Instructional	6084	6537	7083	7662	7535	7554
Other Expenditures	89	99	74	82	76	119
Total	6173	6636	7157	7744	7611	7673
DEPARTMENT OF MATHEMATICS						
REVENUES						
Student Fees	$730	713	849	850	820	771
State Appropriations	501	596	631	808	822	871
Total	1231	1309	1480	1658	1642	1642
Other Revenues	22	6	-15	-33	-25	-33
Total	1253	1315	1465	1625	1617	1609
EXPENDITURES						
Instructional	1253	1315	1465	1625	1617	1609
Other Expenditures	-	-	-	-	-	-
Total	1253	1315	1465	1625	1617	1609

Problem #2

Assume that the decreasing trend in the average class size should be encouraged and was projected in the 1971-72 budget as 24.2 students instead of the 25.28 already included in the estimates. How many teaching FTEF would be required if, in addition, student headcounts were increased to say 41,700?

Solution:

$$\frac{(41,700)\ (41.60383)}{(38.7589)\ (24.2)} = 1849.63 \text{ Teaching FTEF}$$

Problem #3

Assume that student enrollments had been 43,149 during the Fall term of 1971 instead of 41,649. What increase in the average class size would have resulted if all other variables remained fixed?

Solution:

$$\frac{(43,149)\ (41.60383)}{(1822.42)(38.75859)} = 25.4 \text{ Students Per Class}$$

This is an average increase of less than one student per class.

Problem #4

What decrease in the total number of students would be required to offset an increase in student loads to an average of 45.0 hours per student per year? Assume that all other factors remained constant.

Solution:

$$(41,649) - \frac{(1,732,758)}{45.0} = 3,143 \text{ Student Decrease}$$

Problem #5

What increase in the number of students would be required to offset a cost-of-living increase of 4% (4% of 1970 payroll of $100,969,235) amounting to approximately $4,100,000 to all members of the University? Assume that the entire increase is to be absorbed by student fees and without state assistance.

Solution:

Data for the fiscal year 1971-72 were as follows:

Average Instructional Cost Per FTEF (Item 10, Table 47)		$23152
Average Fees Per Student (Item 7, Table 47)	$744.70	
Required Break-Even Student-Instructor Ratio (Equation #8)	31.1	$23152
Actual 1971-72 Student-Instructor Ratio	22.9	

Therefore, present ratios would have to be substantially altered before the cost-of-living increase could be financed through student fees. An examination of Equation #27 (Appendix A33) would show the basic variables involved.

General Fund Variance Analyses

A detailed explanation of the differences between planned and actual amounts can be obtained from an examination of the selected variables listed in Tables 47 and 48. A more systematic method of analyzing the variances is shown in the latter part of this chapter. The general logic was first outlined in flow charts. These were followed by

calculations for the fiscal year 1971-1972.

The level of detail in these analyses depends to some extent on the organizational level involved. For example, student data may be examined separately at the class level (freshmen, sophomores, etc.) or by separating the activities of resident and non-resident enrollments. Faculty data may be analyzed by classification (professors, associate professors, etc.) or by such groups as tenured and non-tenured personnel.

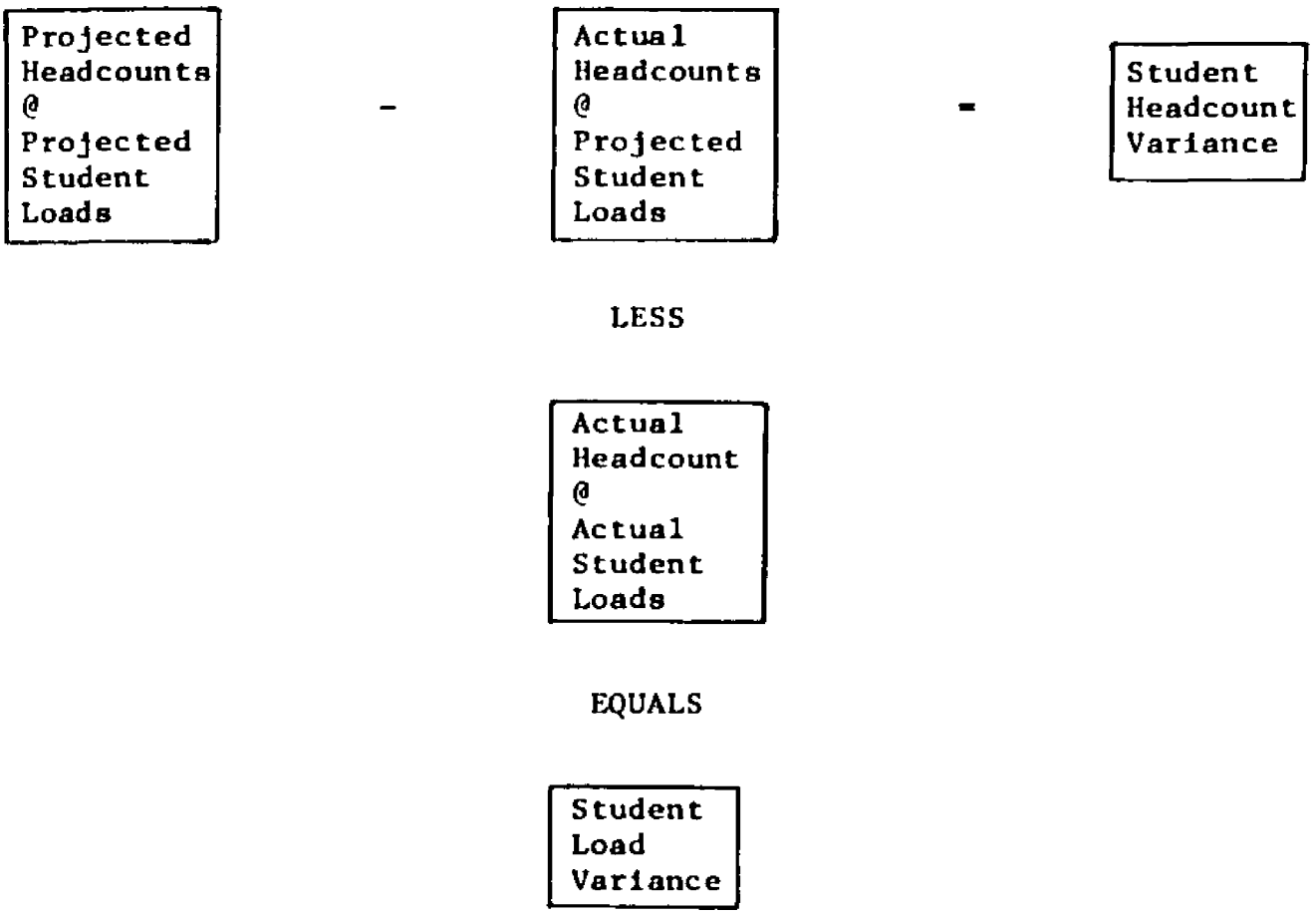
The variables used in the tables and figures illustrated in this chapter were taken from the equations shown in detail in Appendix A.

Student Fee Variances

Variations in student fees begin with an analysis of student credit hours as outlined in the flow chart in Figure 8 and the analyses in Figures 9 and 10. This was followed by an expanded version of student fees variances in Table 53.

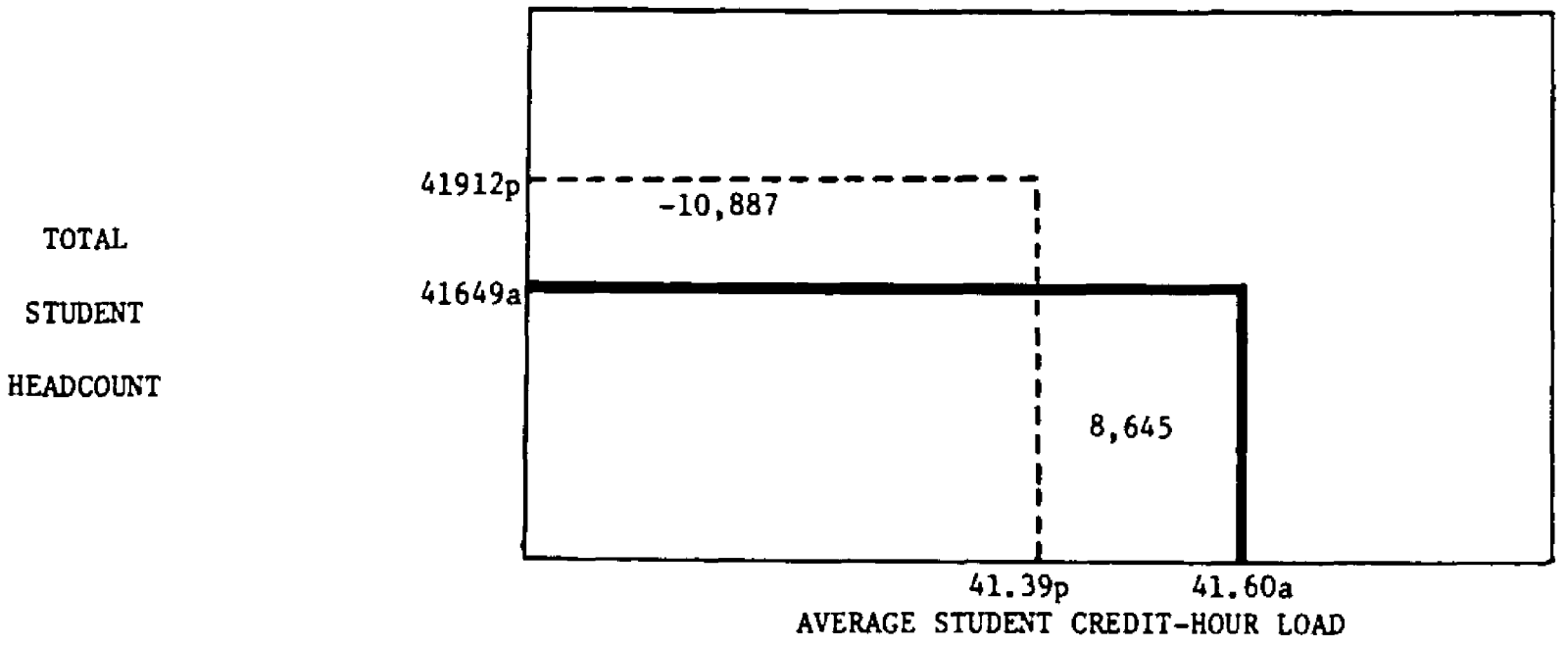
Instructional Expenditure Variances

These variations also begin with an analysis of credit hours taught. The general logic was outlined in the flow chart in Figure 11 and the analysis in Figure 12. Instructional expenditures were described in three parts. The first was a two-way analysis (Figure 13). The second, a three-way analysis, was outlined in Figure 14 and illustrated in Table 54. The third method described variations in four parts (see Figure 15 and Table 55).



MICHIGAN STATE UNIVERSITY
FLOW CHART OF GENERAL FUND STUDENT FEE REVENUE VARIANCES
Variance in Student Credit Hours Earned

Figure 8



FORMULAE

(Projected Headcounts)(Projected Loads)-(Actual Headcounts)(Projected Loads)=Headcount Variance
(Actual Headcounts)(Projected Loads)-(Actual Headcounts)(Actual Loads)=Load Variance

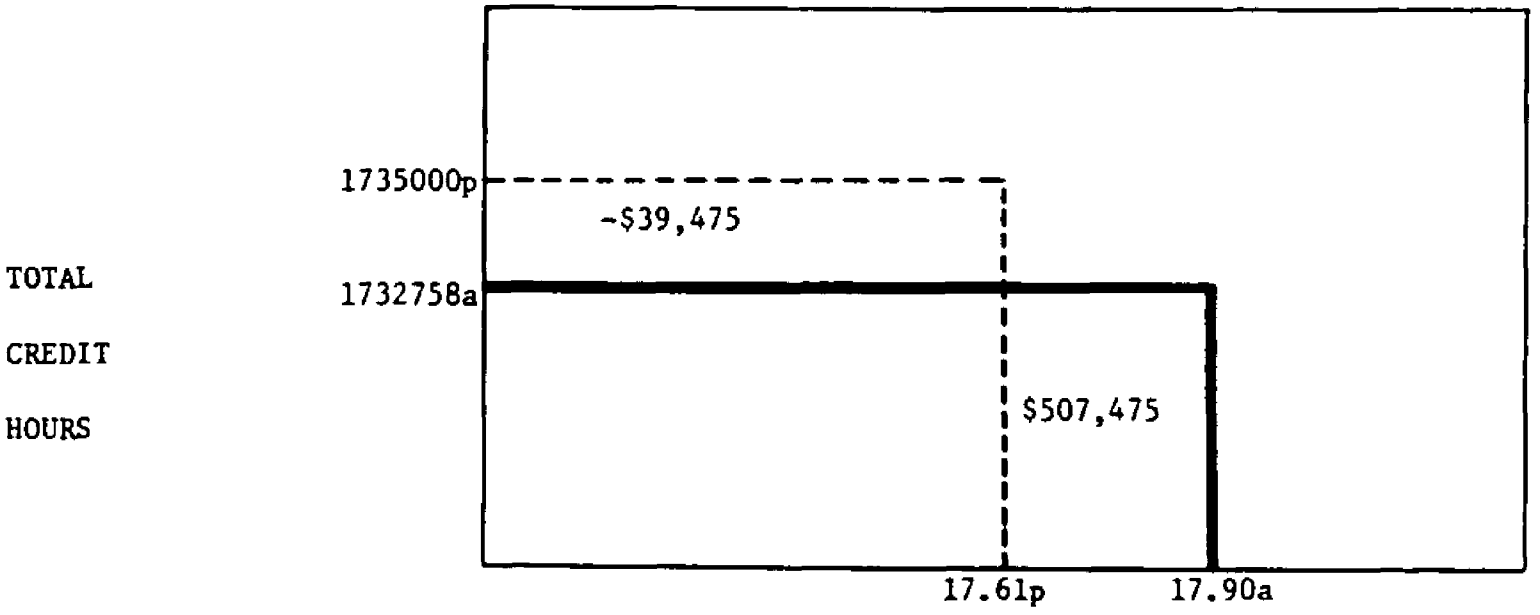
CALCULATION

(41912)(41.3962588) - (41649)(41.3962588)	=	-10,887
(41649)(41.3962588) - (41649)(41.6038320)		8,645
		2,242

Note: p = projected
a = actual

MICHIGAN STATE UNIVERSITY
GENERAL FUND STUDENT FEE REVENUE VARIANCES
Variance in Student Credit Hours Earned
Fiscal Year 1971-1972

Figure 9



FORMULAE

(Projected Credit Hours @ Projected Fee Rate) - (Actual Credit Hours @ Projected Fee Rate)
= Credit-Hour Variance

(Actual Credit Hours @ Projected Fee Rate) - (Actual Credit Hours @ Actual Fee Rate)
= Fee Rate Variance

CALCULATION

(1735000 @ $17.6069164) - (1732758 @ $17.6069164) =	$ -39,475
(1732758 @ 17.6069164) - (1732758 @ 17.8997875) =	507,475
Total Student Fee Revenue Variance	$ 468,000

MICHIGAN STATE UNIVERSITY
GENERAL FUND STUDENT FEE REVENUE VARIANCES
Variances in Student Fees
Fiscal Year 1971-1972

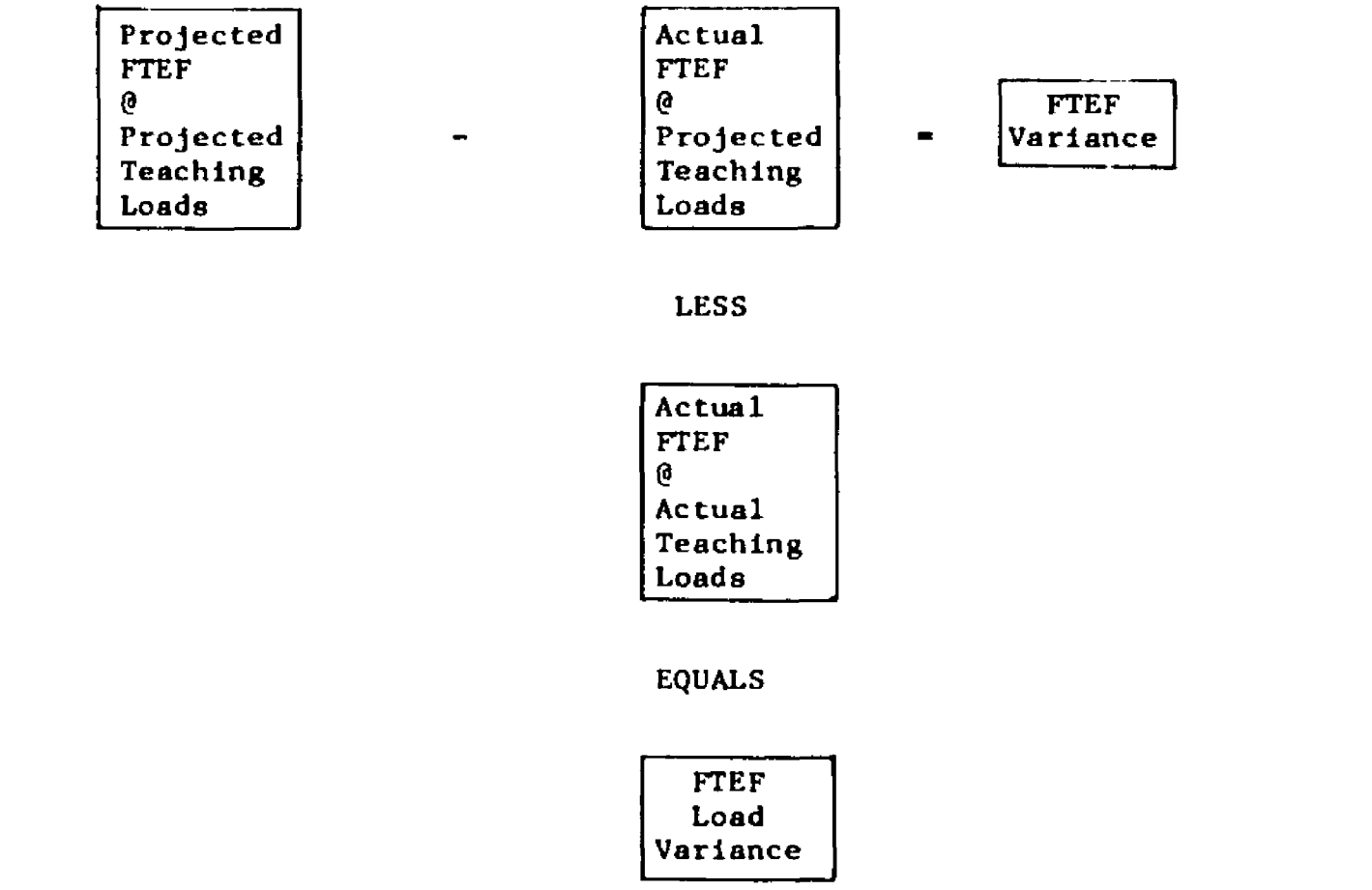
Figure 10

MICHIGAN STATE UNIVERSITY
GENERAL FUND STUDENT FEE REVENUE VARIANCES
Expanded Variance in Student Fees
Fiscal Year 1971-1972

Table 53

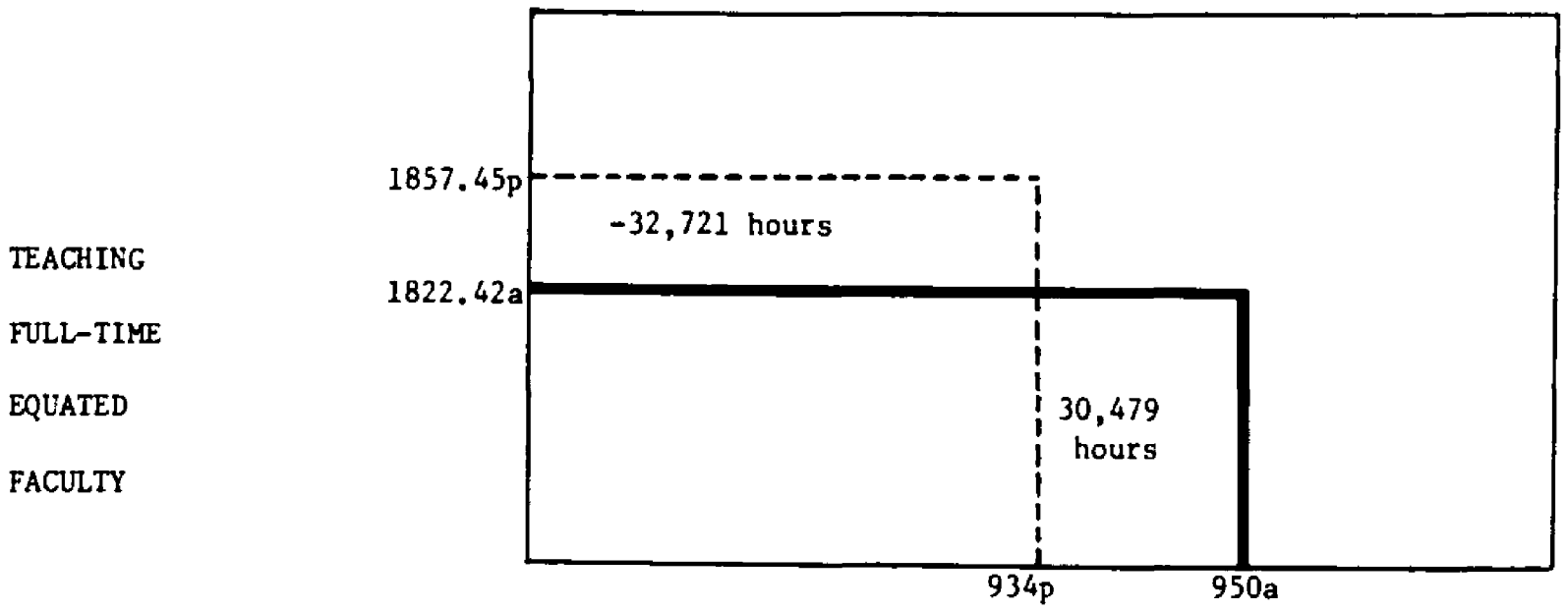
Item	Headcount Enrollments	Student Load	Student Fees Per Hour	Student Fee Revenue
FORMULAE				
1	Projected	Projected	Projected	Total Projected
2	Actual-Projected	Projected	Projected	Headcount Variance
3	Actual	Actual-Projected	Projected	Load Variance
4	Actual	Actual	Actual-Projected	Fee Rate Variance
5	Actual	Actual	Actual	Total Actual
CALCULATIONS				
1	41912	41.3962588	$17.6069164	$30,548,000
2	-263	41.3962588	17.6069164	-191,690
3	41649	.2075732	17.6069164	152,215
4	41649	41.6038320	.2928711	507,475
5	41649	41.6038320	17.8997875	31,016,000

SUMMARY		
2	Student Headcount Variance	$-191,690
3	Student Load Variance	152,215
4	Student Fee Rate Variance	507,475
1-5	Total Student Fee Revenue Variance	$ 468,000



MICHIGAN STATE UNIVERSITY
FLOWCHART OF GENERAL FUND INSTRUCTIONAL EXPENDITURES VARIANCES
Variances in Credit Hours Taught

Figure 11



FORMULAE

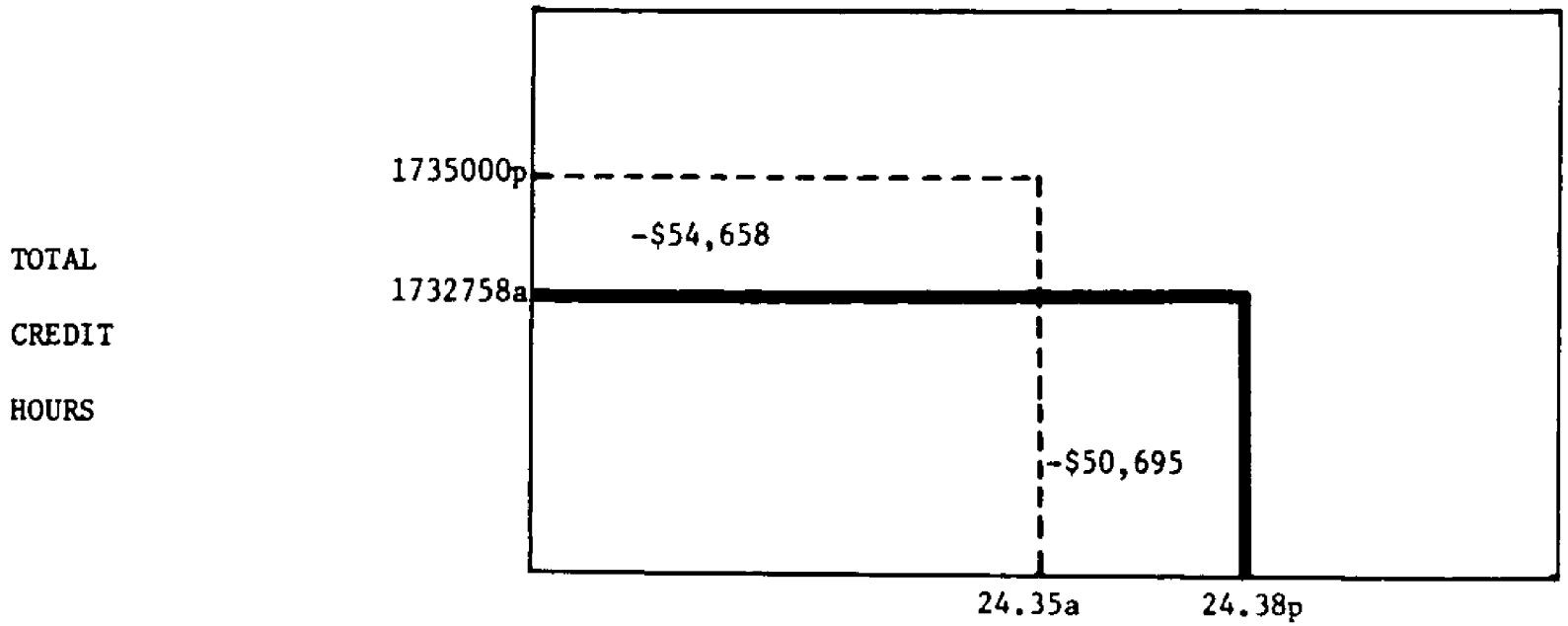
(Projected FTEF @ Projected Load)-(Actual FTEF @ Projected Loads) = FTEF Variance
(Actual FTEF @ Projected Load)-(Actual FTEF @ Actual Load) = Load Variance

CALCULATION

(1857.45)[(36.9492202)(25.2800000)]	-	(1822.42)[(36.9492202)(25.2800000)]		
(1857.45) (934)	-	(1822.42) (934)		-32,721
(1822.42)[(36.9492202)(25.2800000)]	-	(1822.42)[(38.7585902)(24.5313511)]		
(1822.42) (934)	-	(1822.42) (934)	=	30,479
Total Credit-Hour Variance				-2,242

MICHIGAN STATE UNIVERSITY
GENERAL FUND INSTRUCTIONAL EXPENDITURES VARIANCES
Variance in Credit Hours Taught
Fiscal Year 1971-1972

Figure 12



FORMULAE

(Projected Credit Hours @ Projected Rate)-(Actual Credit Hours @ Projected Rate)
= Credit Hour Variance

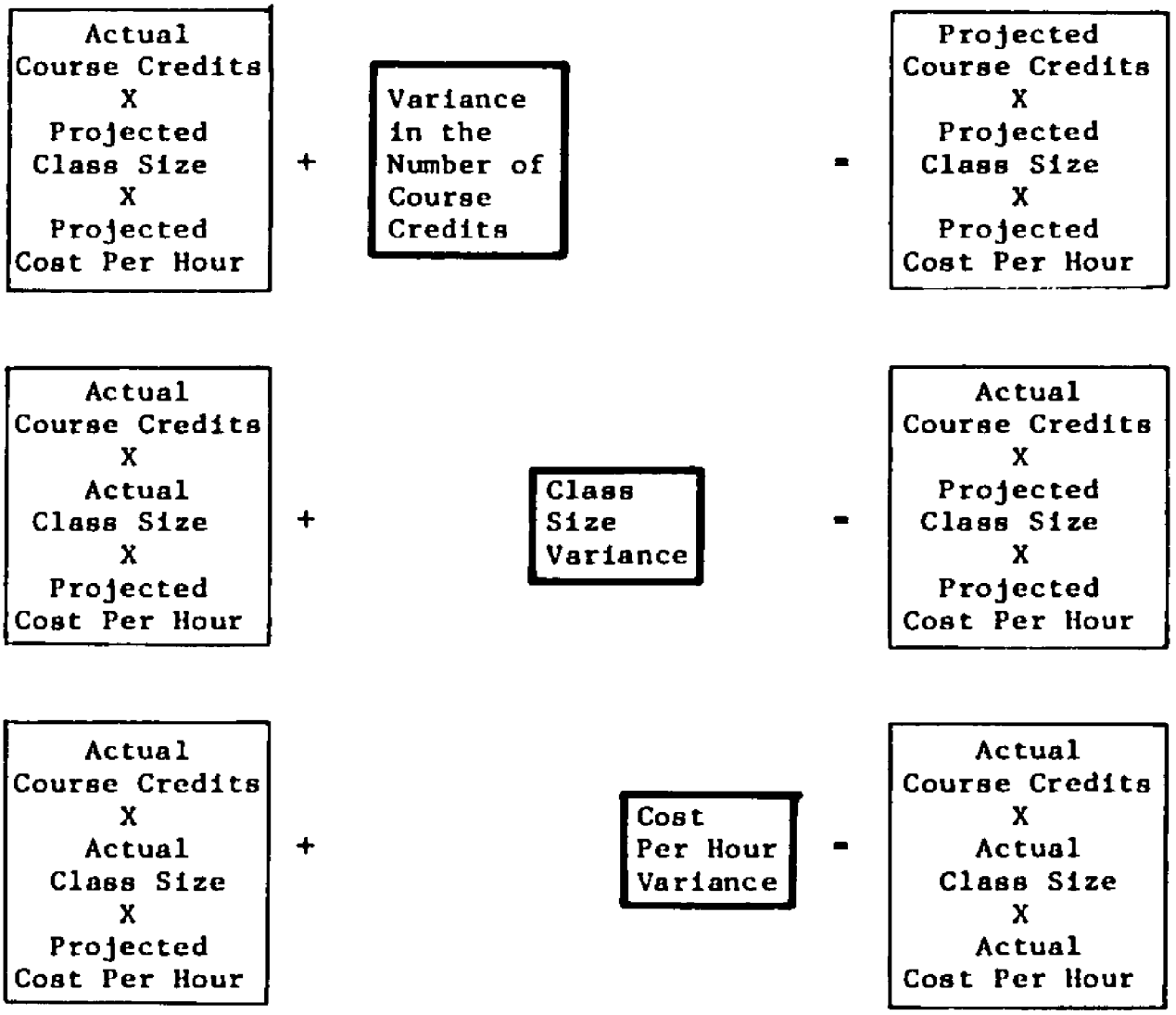
(Actual Credit Hours @ Projected Rate)-(Actual Credit Hours @ Actual Rate)
= Expenditure Rate Variance

CALCULATION

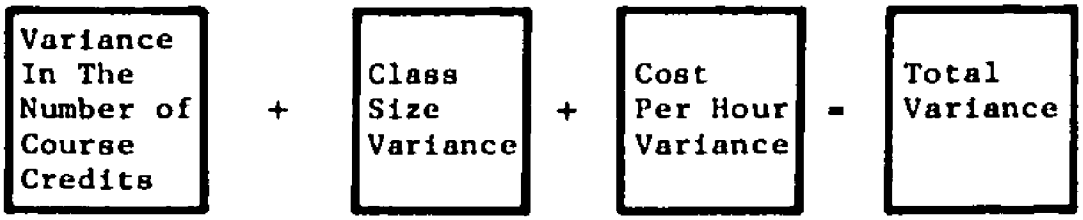
(1735,000 @ $24.3792565) = (1732758 @ $24.3792565) = $-54,658
(1732,758 @ 24.3792565) = (1732758 @ 24,3500000) = -50,695
Total Instructional Expenditure Variance -105,353

MICHIGAN STATE UNIVERSITY
GENERAL FUND INSTRUCTIONAL EXPENDITURES VARIANCES
Variance in Instructional Expenditures
Fiscal Year 1971-1972

Figure 13



SUMMARY



MICHIGAN STATE UNIVERSITY
FLOW CHART OF GENERAL FUND INSTRUCTIONAL EXPENDITURES VARIANCES
Expanded Variances in Instructional Expenditures

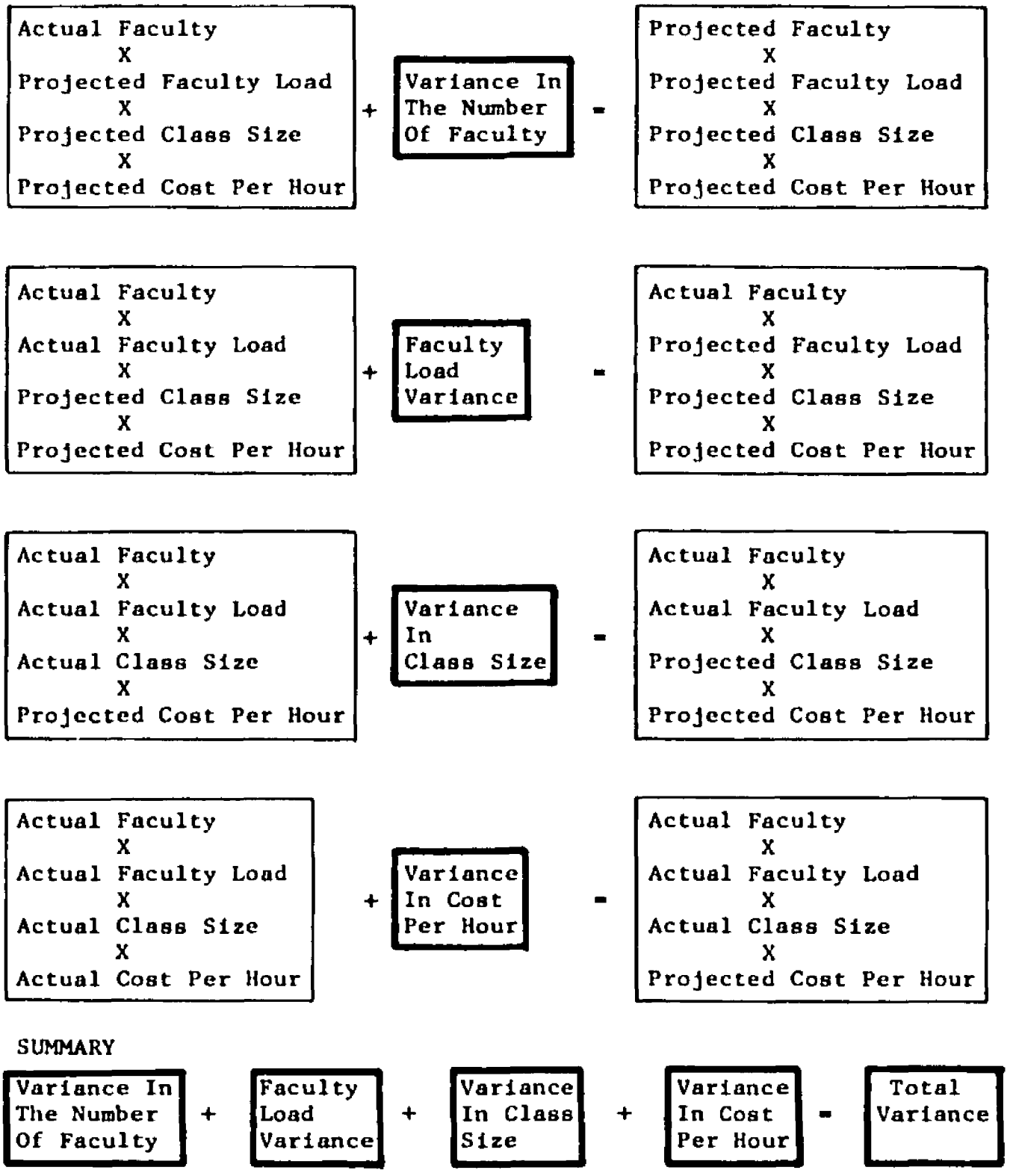
Figure 14

MICHIGAN STATE UNIVERSITY
GENERAL FUND INSTRUCTIONAL EXPENDITURE VARIANCES
Expanded Variance in Instructional Expenditures
Fiscal Year 1971-1972

Table 54

Item	Total Course Credits	Average Class Size	Cost Per Hour	Total Instructional Expenditures
FORMULAE				
1	Projected	Projected	Projected	Total Projected
2	Actual-Projected	Projected	Projected	Course Credit Variance
3	Actual	Actual-Projected	Projected	Class Size Variance
4	Actual	Actual	Actual-Projected	Cost Rate Variance
5	Actual	Actual	Actual	Total Actual
CALCULATIONS				
1	68631.3291139	25.2800000	$24.3792565	$42,298,010
2	2003.1008014	25.2800000	24.3792565	1,234,526
3	70634.4299153	-.7486489	24.3792565	-1,289,184
4	70634.4299153	24.5313511	-.0292565	-50,694
5	70634.4299153	24.5313511	24.3500000	42,192,657

SUMMARY		
2	Variance in Total Number of Course Credits	$ 1,234,526
3	Class Size Variance	-1,289,184
4	Cost Rate Variance	-50,695
1-5	Total Instructional Expenditure Variance	$ -105.353



MICHIGAN STATE UNIVERSITY
FLOW CHART OF CENTRAL FUND INSTRUCTIONAL EXPENDITURE VARIANCES
Further Expanded Variance in Instructional Expenditures

Figure 15

MICHIGAN STATE UNIVERSITY
GENERAL FUND INSTRUCTIONAL EXPENDITURE VARIANCES
Further Expanded Variance in Instructional Expenditures
Fiscal Year 1971-1972

Table 55

Item	Teaching FTEF	FTEF Teaching Load	Average Class Size	Cost Per Hour	Instructional Expenditures
FORMULAE					
1	Projected	Projected	Projected	Projected	Total Projected
2	Actual-Projected	Projected	Projected	Projected	FTEF Variance
3	Actual	Actual-Projected	Projected	Projected	Load Variance
4	Actual	Actual	Actual-Projected	Projected	Class Size Variance
5	Actual	Actual	Actual	Actual-Projected	Cost Rate Variance
6	Actual	Actual	Actual	Actual	Total Actual
CALCULATIONS					
1	1857.45	36.9492202	25.2800000	$24.3792565	$42,298,010
2	-35.03	36.9492202	25.2800000	24.3792565	-797,706
3	1822.42	1.8093700	25.2800000	24.3792565	2,032,232
4	1822.42	38.7585902	-.7486489	24.3792565	-1,289,185
5	1822.42	38.7585902	24.5313511	-.0292565	-50,694
6	1822.42	38.7585902	24.5313511	24.3500000	42,192,657

SUMMARY		
2	Teaching FTEF Variance	$ -797,706
3	Teaching Load Variance	2,032,232
4	Class Size Variance	-1,289,184
5	Cost Rate Variance	-50,695
1-6	Total Instructional Expenditure Variance	$ -105,353

CHAPTER VII

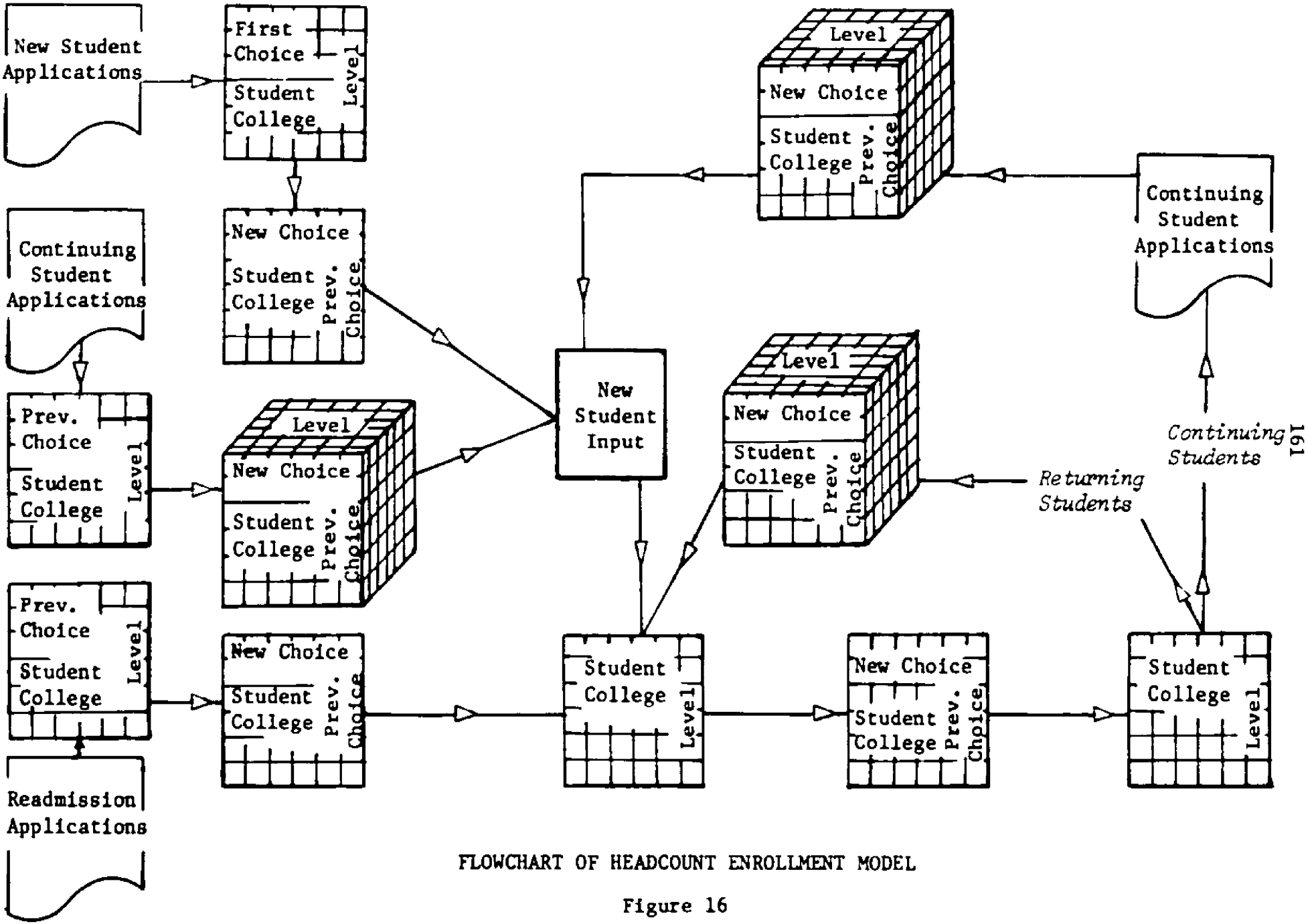
SUMMARY AND RECOMMENDATIONS

In this study an attempt was made to recognize the essential elements required to project and summarize information that should be useful in managing university resources. The constituent parts of the system were described as subsets of a continuous data flow that related student headcount enrollments to financial accountability.

The data flow began with the conceptualization of a model for projecting student headcount enrollments. Headcounts for each college were divided into three categories selected according to source: new (first-time and transfer), readmitted and returning.

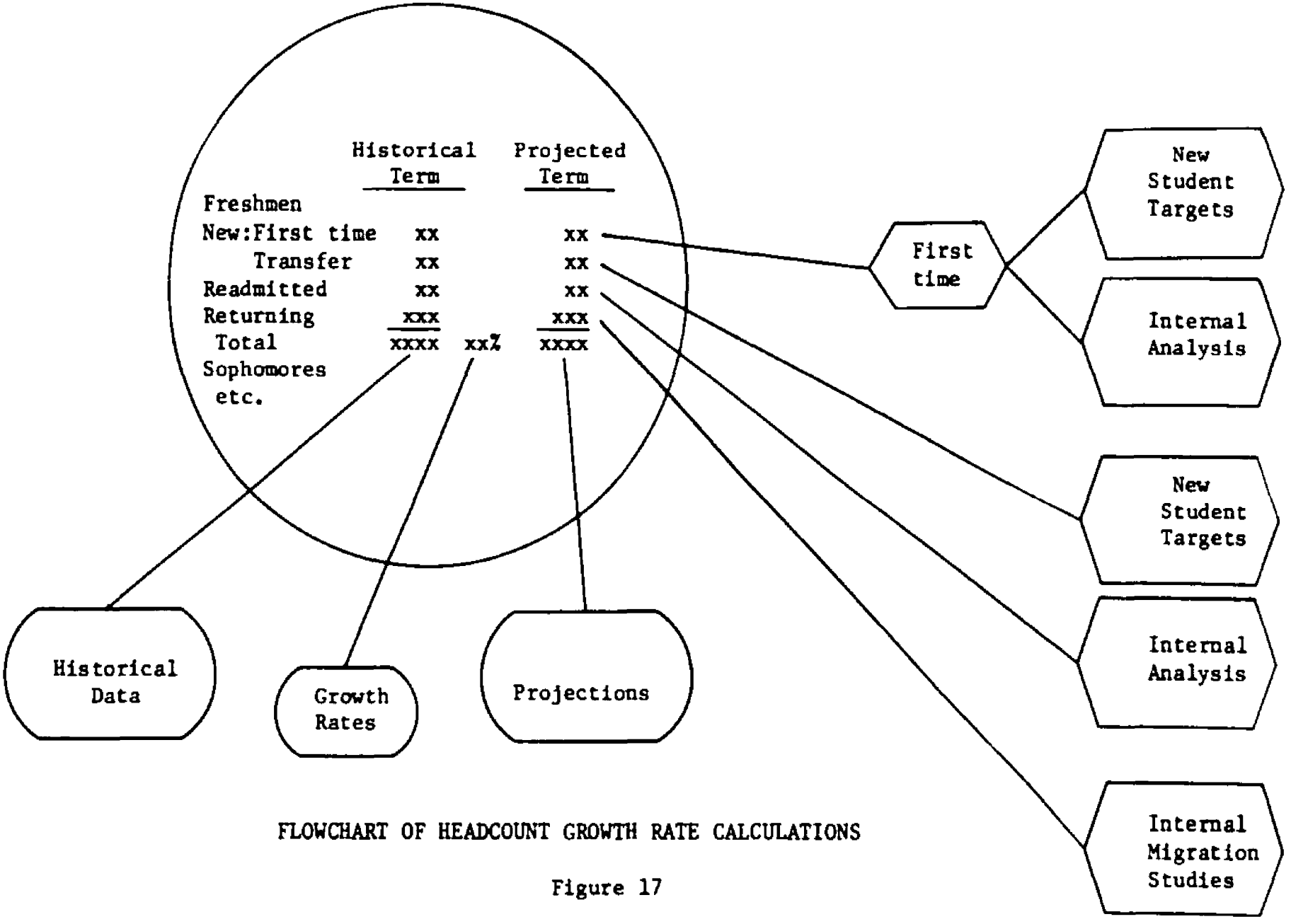
The new student element was related to the number of applications received and to targets set for the Admissions Department. Readmitted students were based on historical trends and the number of applications received by the Registrar. Returning student enrollments were projected on the basis of intra-campus migration studies. These three elements were assembled by class level within each college and used as a basis for calculating headcount growth rates. The general logic of the data flow in the model was outlined in the flow chart shown in Figures 16 and 17.

In a second model, headcount growth rates were merged with a second variable that recognized the size of the course loads carried by the different majors and the shift in course requirements that was anticipated in each college that operated as a service agent for majors from other colleges. Credit hours were calculated by assigning the course credit



FLOWCHART OF HEADCOUNT ENROLLMENT MODEL

Figure 16



FLOWCHART OF HEADCOUNT GROWTH RATE CALCULATIONS

Figure 17

value to the number enrolled in the course.

Course requirements reflecting these student demands were then redefined into teaching assignments and used as a basis for projecting the number of full-time equated instructors. The minimum number of variables recognized for calculating faculty requirements was: the number of teaching assignments, the proportion of teaching time to the total load carried by the faculty, the average teaching load and the average-sized section. The data flow for this model was illustrated in Figure 18.

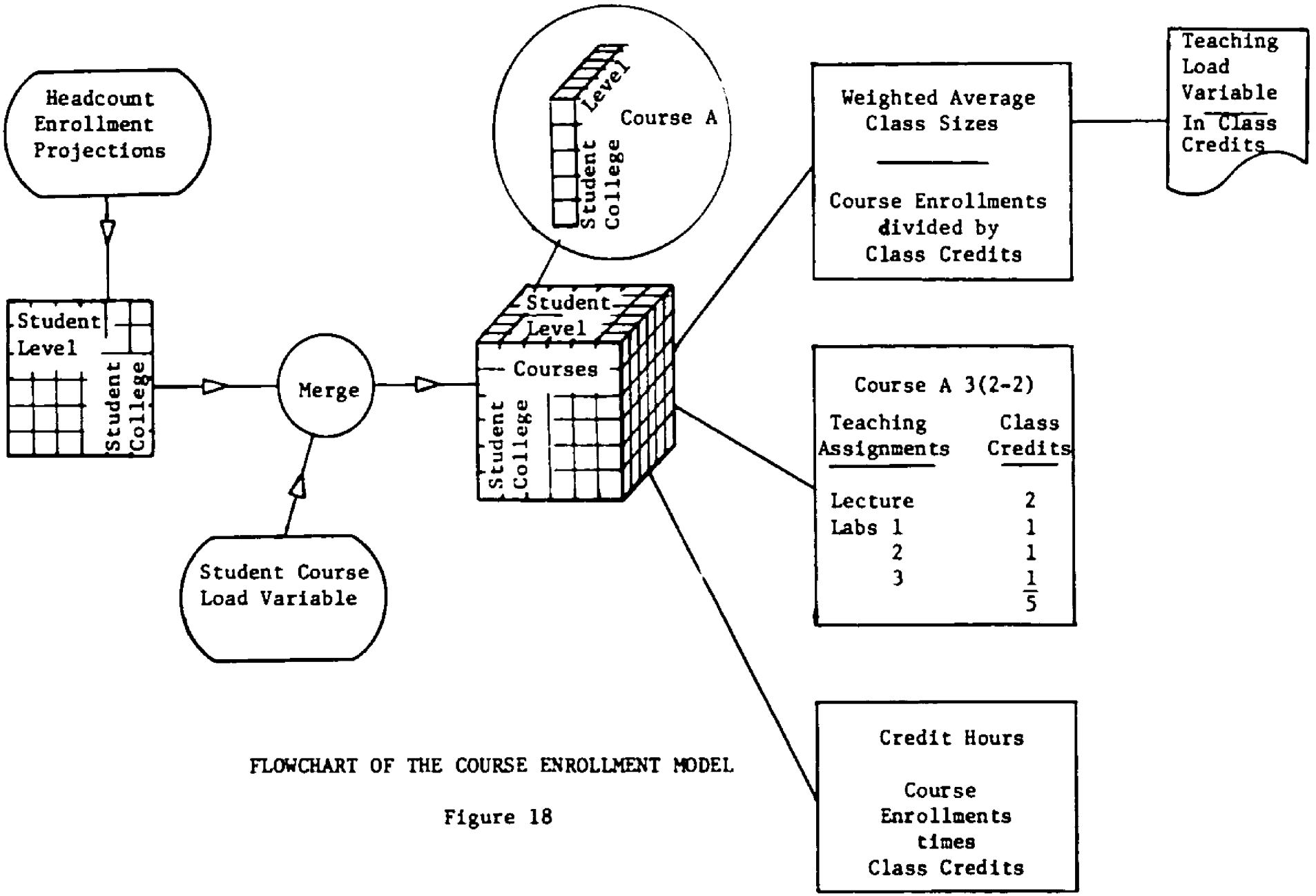
The performance measurements were assembled into the following equation:

> The number of credit hours earned by students was equal to the number of credit hours taught by instructors. Credit hours earned were represented by the product of headcount enrollments times average student course loads times the average course credit value. Credit hours taught were equal to the number of instructors times the average percentage of time spent in teaching times the average credit-hour load carried by a faculty member times the average size of each class.

In the next phase, performance measurements were related to general fund instructional costs and student fees. Other groups of general fund accounts were added and the elements were assembled into equations. The following logic was used as the basis.

> General fund revenues were equal to general fund expenditures. Therefore,
> credit hours earned by students multiplied by the average tuition per hour times 1 plus State appropriation per cent times 1 plus other revenue per cent was equal to the product of credit hours taught times instructional expenditures per hour times 1 plus an overhead per cent.

These equations were then expressed in over thirty variations. The purpose of these expansions was to provide quantitative controls for further use in seeking optimum allocations of university resources.



FLOWCHART OF THE COURSE ENROLLMENT MODEL

Figure 18

The end product was the creation of a structured institutional information flow comprised of a coordinated series of fragmented systems maintained in separate operating departments. It was a flow through which budget differences between organizational units could be compared and appraised; a system that can become operational through a team effort at the present time at this University.

The data flow that was described should contribute to the efforts of those at this University who have shown a concern

1. for insuring the use of coordinated data at all organizational levels,
2. for recognizing college and departmental autonomy and accountability,
3. for stimulating continuous involvement from the early planning stages at the departmental level,
4. for summarizing quantitative appraisal techniques that can be used, understood and applied at all levels, and
5. for encouraging mutual efforts toward a solution of the problems of meeting increasing demands with limited resources.

Recommendations

The definitions, data sources and equations set forth in this paper are meaningful to the planning and management process at Michigan State University and should be utilized for these purposes.

It is strongly recommended that to achieve a workable institutional system, this University should provide for a coordinated data flow among the various operational units. This type of action is primarily directed toward an elimination of the type of limitations that are placed on an institutional data flow by fragmented subsystems.

During the process of departmentalization, a section of an institution becomes somewhat "walled off". It becomes primarily responsible to the level of management that is immediately above it, and to other departments of equal rank. When a department has difficulty with its own records it solves the problem in the way that is most satisfactory to its own operations. When this restrictive view prevails, the best that can be accomplished by systems personnel is a local revision to an existing method.

At Michigan State University technological refinements in data banks have been mainly associated with a sponsoring operational unit. Little progress has been achieved toward an institutional horizontal integration of all operational units. For example, a data element may be independently generated as a result of a transaction such as the assessment of fees and tuition, the registering of a student, the payment of a billing, the appointment of a staff member, etc. The result of the transaction is recorded by the operational unit concerned, and stored in machine retrievable form by a central data processing department. In many instances, little attention is given to the need for establishing common linkages between the operational banks of different organizational units. It is suggested that attention should be given toward the improvement of cross-references between the vertically-oriented files of departments or operational units.

If an institution is to maximize its performance it must continually analyze its entire system. Unrelated solutions resulting in adjustments to isolated units may be helpful, but a radical reappraisal of the

entire system may be required. It is recommended that only one system should prevail in this University. All of the operational units are subsystems working within the single institutional system.

At the present time, in this University, each office or department that creates a file becomes responsible for the maintenance of its own data. Under this type of arrangement requests for information on student registrations, for example, are directed to the Registrar. Requests for data on student financial assistance are directed to the Office of Financial Aids. Data banks of University finances are maintained by the University Business Office. Information on the faculty is the property of the Office of the Provost. The data used to fill institutional requests are, consequently, taken from the files that are designed primarily, if not wholly, for meeting the demands of day-to-day operations.

With increased frequency, requests for institutional data are cutting across organizational lines. This results in problems of accessibility, scope, and arrangement of the data, and in the hazards of interpretation that results from the merging of unlike data. Moreover, centralizing the data storage area for the university has not broadened this provincial approach. In an effort to improve its service to operational units, the Administrative Data Processing Department has assigned its staff on the basis of their expertise of the operations of an organizational unit. This resulting specialization within the ranks of data storage and retrieval personnel increases the operational duality that is already in existence.

The fundamental purpose of an institutional information system is to aid in the decision-making throughout the University. All of those who are in positions of authority should be involved in its creation. The plan must be deliberated and must be strongly supported from the top down.

Secondly, collection of the data should take place at a point close to its origin. This eliminates the need for duplication of effort and should result in increased accuracy and earlier availability.

A third criterion concerns the efficient processing, storage, and retrieval of the data. A centralized system requires that a datum be maintained once only. The ability to cross reference and to interrelate all of the data in the system is, therefore, essential.

A number of situations are encountered when it is desirable for two or more executives to exercise some direction over the activities of a single employee. For example, in industry, a plant manager should have sufficient authority to enable him to fulfill his responsibility as manager and consequently should direct all of those who affect the results of plant activities. However, the chief accountant at the central office has the responsiblity for maintaining the accounting records for the entire company. He, too, should have sufficient authority to fulfill his function. He cannot be held responsible for the adequacy and accuracy of plant records if he has no authority over those records.

The functional authority (the chief accountant) would prescribe policies and methods and would also determine the timing and performance of the

accounting and reporting activities under his jurisdiction. He should issue the necessary orders relating to his function to the line executive who, in turn, would be responsible for their performance.

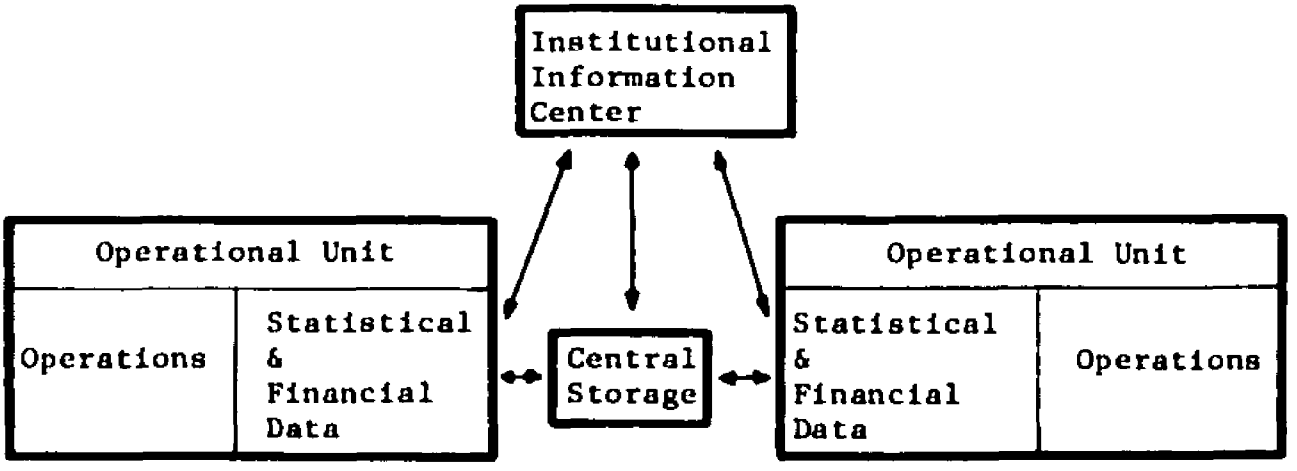
This is the type of coordinated organizational structure that is proposed in this study for the Institutional Information System. Departments would have direct authority over their own operations. However, functional authority over the collection, evaluation, storage, and dissemination of Institutional data would be vested in a central authority who is responsible for the entire data system.

Optimal institutional performance is more probable under this type of organization (1) when functional control is confined to a minor aspect of total departmental activities; (2) when the operational executive does not possess the necessary technical skill in the required function; and (3) when a consistency in terms, definitions, and trend continuity is important.

A basic concern of this recommendation is to foster the view that a system is comprised of a number of user depositories, each under the direct control of a department, and all are under the jurisdiction of the Institutional Information System.

Each department is responsible for its own operations. However, each is also responsible for gathering and maintaining data for use by the entire institution. These data would be stored by the departments in a central institutional storage unit and would be supplemented by reports held in decentralized user depositories.

The organizational structure of the Institutional Information System would appear as a cluster of operational departments grouped around a central storage and retrieval department. Each department is directly responsible for the performance of its own function. Operational departments, however, will also be responsible to the Institutional Information Center for data they have gathered. This dual relationship is indicated in the diagram (Figure 19) that follows:



MICHIGAN STATE UNIVERSITY
CHART OF PROPOSED DATA FLOW

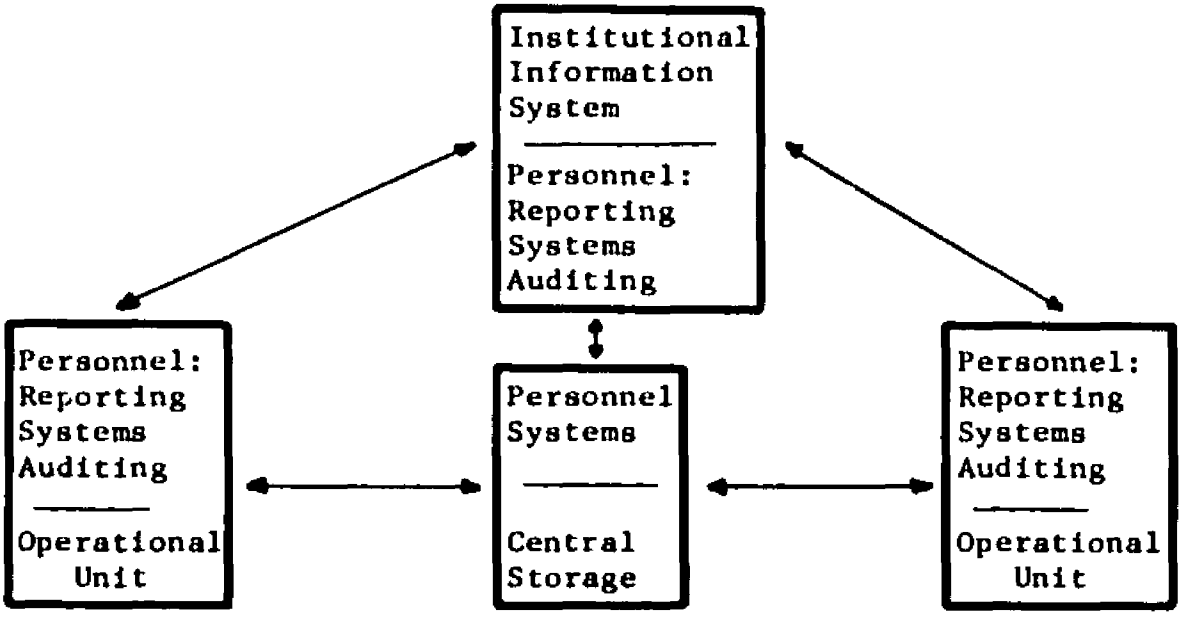
Figure 19

Personnel Organization

Systems experts and auditors should be in a position to recommend sweeping changes where necessary. Their views should not be confined to a single trouble area within a subsystem. They must also be sufficiently specialized to solve the problems that are peculiar to a function. In short, some systems analysts should be attached to an operational

department and be trained in depth to solve unique and specialized problems. Their greater efforts, however, should be to rebuild the entire system, fusing overlapping departments, eliminating inter-departmental duplications of effort and creating new departments in the interest of increasing efficiency. Their objectives should include a responsibility to integrate the parts into one harmonious whole.

Consistent with this concept of a single system that is strengthened by functional authority, department systems personnel were located in operational units (Figure 20), but under the functional control of the Institution's central systems staff. This arrangement would result in an increased depth of experience in a specialized function (e.g. student financial aids) in addition to the skills related to institutional data reporting and the presentation of financial reviews for deans, trustees, and legislators.



MICHIGAN STATE UNIVERSITY
FLOW CHART OF PROPOSED PERSONNEL ORGANIZATION

Figure 20

The Admissions and Registration subgroup of the Committee on Institutional Cooperation[56] reported the following in a Conference on Computers held in Chicago on October 2, 1967: "The problem of determining whether systems personnel should be located in the university organization central processing area or dispersed throughout the user areas seemed to be a key problem. Effective development of data processing systems will be best obtained within an environment providing co-development between the user and the technical data processing staff, within a framework of an overall management information system, and with policy guidelines established by top management. This arrangement will allow the user to specify his needs (problem definition) and data processing to contribute technical knowledge for the solution of the problem."

It is submitted that the "key problem" regarding the allocation of systems personnel would be better solved by the development of an information system such as that recommended in this chapter. It is also submitted that a co-development between user departments and technical data processing staffs would be a movement in the direction of inconsistent institutional reporting. Such an organization would increase communication hazards and be exposed to the type of inefficient use of resources that is associated with a swelling group of decentralized autonomous units located on a single campus. Co-development would lead to a sitution where it would be increasingly difficult to work within an

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[56] King, Horace C. and Martin, Frank B. Attaining Management Goals Through Co-Development, 13th Annual College and University Machine Records Conference, April, 1968, p. 4.

institutional framework. Robert M. Hutchin's quotation regarding a large university could be appropriately applied to a group of co-developed information systems: "There is nothing to hold it together, and something that is not held together is likely to fall apart".[57] Co-development at best could result in co-existence. This is not the coordinated intra-campus unity that is essential to institutional planning.

Properly employed, it could represent a means for a continuous appraisal of both the data and the procedures used for its accumulation. A systematic review of progress toward planned objectives could relate decisions and efforts with the central philosophy of the institution. The elimination of duplicated effort, and the reduction of the necessity for hasty and expensive "crash" programs based on potentially unreliable data, would represent further economies. But this type of university information system would be most economical not because of reduced costs, but because it would aid in solving problems and making decisions; because it would provide a record of past, present and projected performance; and because it would do all of these things with more accuracy and when they are most needed.

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[57] Hutchins, Robert M. The Next Fifty Years, American Planner's Institute, October, 1967, p. 12.

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APPENDIX A

MICHIGAN STATE UNIVERSITY
SIMULATION EQUATIONS

Fiscal Years 1967-68 through 1971-72

EQUATION #1
(Headcount Enrollments) (Average Student Credit-Hour Load) = Total Credit Hours

EAST LANSING CAMPUS

1967-1968	(38758)	(42.5669023)	= 1,649,808
1968-1969	(39949)	(43.1506170)	= 1,723,824
1969-1970	(40820)	(42.8587457)	= 1,749,494
1970-1971	(40511)	(42.7558441)	= 1,732,082
1971-1972[e]	(41912)	(41.3962588)	= 1,735,000
1971-1972	(41649)	(41.6038320)	= 1,732,758

COLLEGE OF NATURAL SCIENCE (Does Not Apply)

DEPARTMENT OF MATHEMATICS (Does Not Apply)

EQUATION #2
(Headcount Enrollments) (Average Student Course Load) = Course Enrollments

EAST LANSING CAMPUS

1967-1968	(38758)	(11.9555447)	= 463,373
1968-1969	(39949)	(12.0468597)	= 481,260
1969-1970	(40820)	(11.9798138)	= 489,016
1970-1971$_e$	(40511)	(11.9732418)	= 485,048
1971-1972^e	(41912)	(11.6004963)	= 486,200
1971-1972	(41649)	(11.5895220)	= 482,692

COLLEGE OF NATURAL SCIENCE (Does Not Apply)

DEPARTMENT OF MATHEMATICS (Does Not Apply)

EQUATION #3
(Course Enrollments) (Average Course Credits) = Total Credit Hours

EAST LANSING CAMPUS

1967-1968	(463373)	(3.5604319)	= 1,649,808
1968-1969	(481260)	(3.5818975)	= 1,723,824
1969-1970	(489016)	(3.5775803)	= 1,749,494
1970-1971	(485048)	(3.5709497)	= 1,732,082
1971-1972[e]	(486200)	(3.5694903)	= 1,735,000
1971-1972	(482692)	(3.5897798)	= 1,732,758

COLLEGE OF NATURAL SCIENCE

1967-1968	(69571)	(3.6874272)	= 256,538
1968-1969	(69982)	(3.7130262)	= 259,845
1969-1970	(71496)	(3.7003888)	= 264,563
1970-1971	(70055)	(3.7003212)	= 259,226
1971-1972[e]	(70700)	(3.7057992)	= 262,000
1971-1972	(71305)	(3.6918589)	= 263,248

DEPARTMENT OF MATHEMATICS

1967-1968	(21548)	(4.4945239)	= 96,848
1968-1969	(21552)	(4.5028768)	= 97,046
1969-1970	(21512)	(4.5070193)	= 96,955
1970-1971	(20268)	(4.4590981)	= 90,377
1971-1972[e]	(20500)	(4.4878049)	= 92,000
1971-1972	(20239)	(4.5260141)	= 91,602

EQUATION #4
(Instructor Headcount) (% with Tenure) = Tenured Faculty

EAST LANSING CAMPUS

1967-1968	(4731)	(23.7793278)	= 1,125
1968-1969	(4888)	(24.5908347)	= 1,202
1969-1970	(4773)	(26.4613451)	= 1,263
1970-1971	(4814)	(27.6485251)	= 1,331
1971-1972[e]	(4822)	(28.6188300)	= 1,380
1971-1972	(4719)	(29.5401568)	= 1,394

COLLEGE OF NATURAL SCIENCE

1967-1968	(1004)	(26.7928287)	= 269
1968-1969	(1051)	(27.9733587)	= 294
1969-1970	(1048)	(28.0534351)	= 294
1970-1971	(1086)	(28.2688766)	= 307
1971-1972[e]	(1065)	(30.0469480)	= 320
1971-1972	(1046)	(29.8279159)	= 312

DEPARTMENT OF MATHEMATICS (Data Not Available)

EQUATION #5
(Instructor Headcount) (% Graduate Assistants) = Graduate Assistants

EAST LANSING CAMPUS

1967-1968	(4731)	(42.7816529)	= 2,024
1968-1969	(4888)	(43.6988543)	= 2,136
1969-1970	(4773)	(45.9668971)	= 2,194
1970-1971	(4814)	(47.7980889)	= 2,301
1971-1972[e]	(4822)	(46.2256325)	= 2,229
1971-1972	(4719)	(45.9419369)	= 2,168

COLLEGE OF NATURAL SCIENCE

1967-1968	(1004)	(59.9601594)	= 602
1968-1969	(1051)	(54.7098002)	= 575
1969-1970	(1048)	(57.0610687)	= 598
1970-1971	(1086)	(56.3535912)	= 612
1971-1972[e]	(1065)	(56.5258216)	= 602
1971-1972	(1046)	(56.6921606)	= 593

DEPARTMENT OF MATHEMATICS (Data Not Available)

EQUATION #6

(Instructor Headcount) (% Total FTEF to Headcount) (% Teaching FTEF to Total FTEF) = Teaching FTEF

EAST LANSING CAMPUS

1967-1968	(4731)	(49.5842317)	= 2345.83	(72.4916128)	= 1700.53
1968-1969	(4888)	(50.3510638)	= 2461.16	(73.1602171)	= 1800.59
1969-1970	(4773)	(52.5208464)	= 2506.82	(73.4970999)	= 1842.44
1970-1971	(4814)	(53.1944329)	= 2560.78	(72.8332774)	= 1865.10
1971-1972[e]	(4822)	(53.0039403)	= 2555.85	(72.6744527)	= 1857.45
1971-1972	(4719)	(52.8270820)	= 2494.91	(73.1041233)	= 1822.42

COLLEGE OF NATURAL SCIENCE

1967-1968	(1095)	(40.2337900)	= 440.56	(74.9432540)	= 330.17
1968-1969	(1051)	(44.2654615)	= 465.23	(73.6796853)	= 342.78
1969-1970	(1048)	(45.3463740)	= 475.23	(74.0062706)	= 351.70
1970-1971	(1086)	(44.6574586)	= 484.98	(75.5082684)	= 366.20
1971-1972[e]	(1065)	(45.0206573)	= 479.47	(74.9994786)	= 359.60
1971-1972	(1046)	(45.2868069)	= 473.70	(74.4901837)	= 352.86

DEPARTMENT OF MATHEMATICS

1967-1968	(197)	(63.3248731)	= 124.75	(82.5891784)	= 103.03
1968-1969	(199)	(63.3216080)	= 126.01	(80.3587017)	= 101.26
1969-1970	(217)	(60.5253456)	= 131.34	(79.8994975)	= 104.94
1970-1971	(225)	(61.2133333)	= 137.73	(80.8683656)	= 111.38
1971-1972[e]	(220)	(60.9772727)	= 134.15	(81.9977637)	= 110.00
1971-1972	(217)	(61.8387097)	= 134.19	(84.1642447)	= 112.94

EQUATION #7
(Instructor Headcount) (% Teaching FTEF to Headcount) = Teaching FTEF

EAST LANSING CAMPUS
1967-1968 (4731) (35.9444092) = 1700.53
1968-1969 (4888) (36.8369476) = 1800.59
1969-1970 (4773) (38.6012990) = 1842.44
1970-1971 (4814) (38.7432489) = 1865.10
1971-1972[e] (4822) (38.5203235) = 1857.45
1971-1972 (4719) (38.6187752) = 1822.42

COLLEGE OF NATURAL SCIENCE
1967-1968 (1095) (30.1525114) = 330.17
1968-1969 (1051) (32.6146527) = 342.78
1969-1970 (1048) (33.5591603) = 351.70
1970-1971 (1086) (33.7200737) = 366.20
1971-1972[e] (1065) (33.7652582) = 359.60
1971-1972 (1046) (33.7342256) = 352.86

DEPARTMENT OF MATHEMATICS
1967-1968 (197) (52.2994924) = 103.03
1968-1969 (199) (50.8844221) = 101.26
1969-1970 (219) (47.9178082) = 104.94
1970-1971 (225) (49.5022222) = 111.38
1971-1972[e] (220) (50.0000000) = 110.00
1971-1972 (217) (52.0460829) = 112.94

EQUATION #8

$$\frac{\text{Headcount Enrollments}}{\text{Teaching FTEF}} = \text{Student-Instructor Ratio}$$

EAST LANSING CAMPUS

1967-1968	(38758)	/	(1700.53)	=	22.7917179
1968-1969	(39949)	/	(1800.59)	=	22.1866166
1969-1970	(40820)	/	(1842.44)	=	22.1554026
1970-1971	(40511)	/	(1865.10)	=	21.7205512
1971-1972[e]	(41912)	/	(1857.45)	=	22.5642682
1971-1972	(41649)	/	(1822.42)	=	22.8536781

COLLEGE OF NATURAL SCIENCE (Does Not Apply)

DEPARTMENT OF MATHEMATICS (Does Not Apply)

EQUATION #8[a]

$$\frac{\text{Course Enrollments}}{\text{Teaching FTEF}} = \text{Course Enrollment-Instructor Ratio}$$

EAST LANSING CAMPUS

1967-1968	(463373)	/	(1700.53)	=	272.4874000
1968-1969	(481260)	/	(1800.59)	=	267.2790585
1969-1970	(489016)	/	(1842.44)	=	265.4175984
1970-1971	(485048)	/	(1865.10)	=	260.0654120
1971-1972[e]	(486200)	/	(1857.45)	=	261.7567095
1971-1972	(482692)	/	(1822.42)	=	264.8632039

COLLEGE OF NATURAL SCIENCE

1967-1968	(69571)	/	(330.17)	=	210.7126632
1968-1969	(69982)	/	(342.78)	=	204.1601027
1969-1970	(71496)	/	(351.70)	=	203.2868922
1970-1971	(70055)	/	(366.20)	=	191.3025669
1971-1972[e]	(70700)	/	(359.60)	=	196.6073415
1971-1972	(71305)	/	(352.86)	=	202.0773111

DEPARTMENT OF MATHEMATICS

1967-1968	(21548)	/	(103.03)	=	209.1429681
1968-1969	(21552)	/	(101.26)	=	212.8382382
1969-1970	(21512)	/	(104.94)	=	204.9933295
1970-1971	(20268)	/	(111.38)	=	181.9716287
1971-1972[e]	(20500)	/	(110.00)	=	186.3636364
1971-1972	(20239)	/	(112.94)	=	179.2013458

EQUATION #9

$$\frac{\text{(FTEF Credit-Hour Load) (W'td Average Class Size)}}{\text{(Average Student Credit-Hour Load)}} = \text{Student-Instructor Ratio}$$

EAST LANSING CAMPUS

1967-1968	(34.9378547)	(27.7685289)	/	(42.5669023)	=	22.7917179
1968-1969	(34.9115400)	(27.4226286)	/	(43.1506170)	=	22.1866166
1969-1970	(35.8861292)	(26.4601613)	/	(42.8587457)	=	22.1554026
1970-1971	(37.7914429)	(24.5738302)	/	(42.7558441)	=	21.7205512
1971-1972[e]	(36.9492202)	(25.2800000)	/	(41.3962588)	=	22.5642582
1971-1972	(38.7585902)	(24.5313511)	/	(41.6038320)	=	22.8536781

COLLEGE OF NATURAL SCIENCE (Does Not Apply)

DEPARTMENT OF MATHEMATICS (Does Not Apply)

EQUATION #9[a]

$$\frac{\text{FTEF Credit-Hour Load) (W'td Average Class Size)}}{\text{(Average Course Credits)}} = \text{Course Enrollment-Instructor Ratio}$$

EAST LANSING CAMPUS						
1967-1968	(34.9378547)	(27.7685289)	/	(3.5604319)	=	272.4874000
1968-1969	(34.9115400)	(27.4226286)	/	(3.5818975)	=	267.2790585
1969-1970	(35.8861292)	(26.4601613)	/	(3.5775803)	=	265.4175984
1970-1971	(37.7914429)	(24.5738302)	/	(3.5709497)	=	260.0654120
1971-1972[e]	(36.9492202)	(25.2800000)	/	(3.5684903)	=	261.7567095
1971-1972	(38.7585902)	(24.5313511)	/	(3.5897798)	=	264.8632039
COLLEGE OF NATURAL SCIENCE						
1967-1968	(27.2959448)	(28.4653130)	/	(3.6874272)	=	210.7126632
1968-1969	(27.3950168)	(27.6711570)	/	(3.7130262)	=	204.1601027
1969-1970	(26.7789537)	(28.0907370)	/	(3.7003888)	=	203.2868922
1970-1971	(28.0228461)	(25.2608510)	/	(3.7003212)	=	191.3025669
1971-1972[e]	(28.0225892)	(26.0000000)	/	(3.7057992)	=	196.6073415
1971-1972	(28.9772288)	(25.7457650)	/	(3.6918589)	=	202.0773111
DEPARTMENT OF MATHEMATICS						
1967-1968	(28.7635969)	(32.6801291)	/	(4.4945239)	=	209.1429681
1968-1969	(30.8293543)	(31.0867476)	/	(4.5028768)	=	212.8382382
1969-1970	(30.0386423)	(30.7584719)	/	(4.5070193)	=	204.9933295
1970-1971	(28.7523348)	(28.2213374)	/	(4.4590981)	=	181.9715287
1971-1972[e]	(28.3513097)	(29.5000000)	/	(4.4878049)	=	186.3636364
1971-1972	(27.5548479)	(29.4346689)	/	(4.5260141)	=	179.2013458

EQUATION #10

$$\frac{\text{Headcount Enrollments}}{\text{Student-Instructor Ratio}} = \text{Teaching FTEF}$$

EAST LANSING CAMPUS

1967-1968	(38758)	/	(22.7917179)	=	1700.53
1968-1969	(39949)	/	(22.1866166)	=	1800.59
1969-1970	(40820)	/	(22.1554026)	=	1842.44
1970-1971	(40511)	/	(21.7205512)	=	1865.10
1971-1972[e]	(41912)	/	(22.5642682)	=	1857.45
1971-1972	(41649)	/	(22.8536781)	=	1822.42

COLLEGE OF NATURAL SCIENCE (Does Not Apply)

DEPARTMENT OF MATHEMATICS (Does Not Apply)

EQUATION #10[a]

$$\frac{\text{Course Enrollments}}{\text{Course Enrollment-Instruction Ratio}} = \text{Teaching FTEF}$$

EAST LANSING CAMPUS

1967-1968	(463373)	/	(272.4874010)	=	1700.53
1968-1969	(481260)	/	(267.2790595)	=	1800.59
1969-1970	(489016)	/	(265.4175984)	=	1842.44
1970-1971	(485048)	/	(260.0654120)	=	1865.10
1971-1972[e]	(486200)	/	(261.7567095)	=	1857.45
1971-1972	(482692)	/	(264.8632039)	=	1822.42

COLLEGE OF NATURAL SCIENCE

1967-1968	(69571)	/	(210.7126632)	=	330.17
1968-1969	(69982)	/	(204.1601027)	=	342.78
1969-1970	(71496)	/	(203.2868922)	=	351.70
1970-1971	(70055)	/	(191.3025669)	=	366.20
1971-1972[e]	(70700)	/	(196.6073415)	=	359.60
1971-1972	(71305)	/	(202.0773111)	=	352.86

DEPARTMENT OF MATHEMATICS

1967-1968	(21548)	/	(209.1429681)	=	103.03
1968-1969	(21552)	/	(212.8382382)	=	101.26
1969-1970	(21512)	/	(204.9933295)	=	104.94
1970-1971	(20268)	/	(181.9716287)	=	111.38
1971-1972[e]	(20500)	/	(186.3636364)	=	110.00
1971-1972	(20239)	/	(179.2013458)	=	112.94

EQUATION #11

$$\frac{\text{(Headcount Enrollments) (Average Student Credit-Hour Load)}}{\text{(Teaching FTEF) (FTEF Credit-Hour Load)}} = \text{Weighted Average Class Size}$$

EAST LANSING CAMPUS

1967-1968	(38758)	(42.5669023)	/	(1700.53)	(34.9378547)	=	27.7685289
1968-1969	(39949)	(43.1506170)	/	(1800.59)	(34.9115400)	=	27.4226286
1969-1970	(40820)	(42.8587457)	/	(1842.44)	(35.8861292)	=	26.4601613
1970-1971	(40511)	(42.7558441)	/	(1865.10)	(37.7914429)	=	24.5738302
1971-1972[e]	(41912)	(41.3962588)	/	(1857.45)	(36.9492202)	=	25.2800000
1971-1972	(41649)	(41.6038320)	/	(1822.42)	(38.7585902)	=	24.5313511

COLLEGE OF NATURAL SCIENCE (Does Not Apply)

DEPARTMENT OF MATHEMATICS (Does Not Apply)

EQUATION #11[a]

$$\frac{\text{(Course Enrollments) (Average Course Credits)}}{\text{(Teaching FTEF) (FTEF Credit-Hour Load)}} = \text{Weighted Average Class Size}$$

EAST LANSING CAMPUS

1967-1968	(463373)	(3.5604319)	/	(1700.53)	(34.9378547)	=	27.7685289
1968-1969	(481260)	(3.5818975)	/	(1800.59)	(34.9115400)	=	27.4226286
1969-1970	(489016)	(3.5775803)	/	(1842.44)	(35.8861292)	=	26.4601613
1970-1971	(485048)	(3.5709497)	/	(1865.10)	(37.7914429)	=	24.5738302
1971-1972[e]	(486200)	(3.5684903)	/	(1857.45)	(36.9492202)	=	25.2800000
1971-1972	(482692)	(3.5897798)	/	(1822.42)	(38.7585902)	=	24.5313511

COLLEGE OF NATURAL SCIENCE

1967-1968	(69571)	(3.6874272)	/	(330.17)	(27.2959448)	=	28.4653130
1968-1969	(69982)	(3.7130262)	/	(342.78)	(27.3950168)	=	27.6711570
1969-1970	(71496)	(3.7003888)	/	(351.70)	(26.7789537)	=	28.0907370
1970-1971	(70055)	(3.7003212)	/	(366.20)	(28.0228461)	=	25.2608510
1971-1972[e]	(70700)	(3.7057992)	/	(359.60)	(28.0225892)	=	26.0000000
1971-1972	(71305)	(3.6918589)	/	(352.86)	(28.9772288)	=	25.7457650

DEPARTMENT OF MATHEMATICS

1967-1968	(21548)	(4.4945239)	/	(103.03)	(28.7633969)	=	32.6801291
1968-1969	(21552)	(4.5028768)	/	(101.26)	(30.8293543)	=	31.0867476
1969-1970	(21512)	(4.5070193)	/	(104.94)	(30.0376423)	=	30.7584719
1970-1971	(20268)	(4.4590981)	/	(111.38)	(28.7523348)	=	28.2213374
1971-1972[e]	(20500)	(4.4878049)	/	(110.00)	(28.3513097)	=	29.5000000
1971-1972	(20239)	(4.5260141)	/	(112.94)	(27.5548479)	=	29.4346689

EQUATION #12

$$\frac{\text{Total Credit Hours}}{\text{Total Course Credits}} = \text{Weighted Average Class Size}$$

EAST LANSING CAMPUS

1967-1968	(1649808)	/	(59412.8700855)	=	27.7685289
1968-1969	(1723824)	/	(62861.3698980)	=	27.4226286
1969-1970	(1749494)	/	(66118.0398776)	=	26.4601613
1970-1971	(1732082)	/	(70484.8200668)	=	24.5738302
1971-1972[e]	(1735000)	/	(68631.3291139)	=	25.2800000
1971-1972	(1732758)	/	(70634.4299153)	=	24.5313511

COLLEGE OF NATURAL SCIENCE

1967-1968	(256538)	/	(9012.3020955)	=	28.4653130
1968-1969	(259845)	/	(9390.4638682)	=	27.6711570
1969-1970	(264563)	/	(9418.1580213)	=	28.0907370
1970-1971	(259226)	/	(10261.9662338)	=	25.2608510
1971-1972[e]	(262000)	/	(10076.9230769)	=	26.0000000
1971-1972	(263248)	/	(10224.9049504)	=	25.7457650

DEPARTMENT OF MATHEMATICS

1967-1968	(96848)	/	(2963.5133834)	=	32.6801291
1968-1969	(97046)	/	(3121.7804207)	=	31.0867476
1969-1970	(96955)	/	(3152.1396874)	=	30.7584719
1970-1971	(90377)	/	(3202.4350483)	=	28.2213374
1971-1972[e]	(92000)	/	(3118.6440678)	=	29.5000000
1971-1972	(91602)	/	(3112.0445184)	=	29.4346689

EQUATION #13
(Teaching FTEF)(FTEF Credit-Hour Load)(Weighted Average Class Size)=Total Credit Hours

EAST LANSING CAMPUS

1967-1968	(1700.53)	(34.9378547)	(27.7685289)	=	1,649,808
1968-1969	(1800.59)	(34.9115400)	(27.4226286)	=	1,723,824
1969-1970	(1842.44)	(35.8861292)	(26.4601613)	=	1,749,494
1970-1971	(1865.10)	(37.7914429)	(24.5738302)	=	1,732,082
1971-1972[e]	(1857.45)	(36.9492202)	(25.2800000)	=	1,735,000
1971-1972	(1822.42)	(38.7585902)	(24.5313511)	=	1,732,758

COLLEGE OF NATURAL SCIENCE

1967-1968	(330.17)	(27.2959448)	(28.4653130)	=	256,538
1968-1969	(342.78)	(27.3950168)	(27.6711570)	=	259,845
1969-1970	(351.70)	(26.7789537)	(28.0907370)	=	264,563
1970-1971	(366.20)	(28.0228461)	(25.2608510)	=	259,226
1971-1972[e]	(359.60)	(28.0225892)	(26.0000000)	=	262,000
1971-1972	(352.86)	(28.9772288)	(25.7457650)	=	263,248

DEPARTMENT OF MATHEMATICS

1967-1968	(103.03)	(28.7635969)	(32.6801291)	=	96,848
1968-1969	(101.26)	(30.8293543)	(31.0867476)	=	97,046
1969-1970	(104.94)	(31.0376423)	(30.7584719)	=	96,955
1970-1971	(111.38)	(28.7523348)	(28.2213374)	=	30,377
1971-1972[e]	(110.00)	(28.3513097)	(29.5000000)	=	92,000
1971-1972	(112.94)	(27.5548479)	(29.4346689)	=	91,602

EQUATION #14
(Weighted Average Class Size)(Total Course Credits) = Total Credit Hours

EAST LANSING CAMPUS

1967-1968	(27.7685289)	(59412.8700855)	=	1,649,808
1968-1969	(27.4226286)	(62861.3698980)	=	1,723,824
1969-1970	(26.4601613)	(66118.0398776)	=	1,749,494
1970-1971	(24.5738302)	(70484.8200668)	=	1,732,082
1971-1972[e]	(25.2800000)	(68631.3291139)	=	1,735,000
1971-1972	(24.5313511)	(70634.4299153)	=	1,732,758

COLLEGE OF NATURAL SCIENCE

1967-1968	(28.4653130)	(9012.3020955)	=	256,538
1968-1969	(27.6711570)	(9390.4638682)	=	259,845
1969-1970	(28.0907370)	(9418.1580213)	=	264,563
1970-1971	(25.2608510)	(10261.9662338)	=	259,226
1971-1972[e]	(26.0000000)	(10076.9230769)	=	262,000
1971-1972	(25.7457650)	(10228.7890843)	=	263,348

DEPARTMENT OF MATHEMATICS

1967-1968	(32.6801291)	(2963.5138834)	=	96,848
1968-1969	(31.0867476)	(3121.7804207)	=	97,046
1969-1970	(30.7584719)	(3152.1396874)	=	96,955
1970-1971	(28.2213374)	(3202.4350483)	=	90,377
1971-1972[e]	(29.5000000)	(3118.6440678)	=	92,000
1971-1972	(29.4346689)	(3112.0445184)	=	91,602

EQUATION #15

$$\frac{\text{Headcount Enrollments}}{\text{Student-Instructor Ratio}} \quad \text{(FTEF Credit-Hour Load)(Weighted Average Class Size)} = \text{Total Credit Hours}$$

EAST LANSING CAMPUS

1967-1968	(38758)	/	(22.7917179) = 1700.53	(34.9378547)(27.7685289)	= 1,649,808
1968-1969	(39949)	/	(22.1866166) = 1800.59	(34.9115400)(27.4226286)	= 1,723,824
1969-1970	(40820)	/	(22.1554026) = 1842.44	(35.8861292)(26.4601613)	= 1,749,494
1970-1971	(40511)	/	(21.7205512) = 1865.10	(37.7914429)(24.5738302)	= 1,732,082
1971-1972[e]	(41912)	/	(22.5642682) = 1857.45	(36.9492202)(25.8000000)	= 1,735,000
1971-1972	(41649)	/	(22.8536781) = 1822.42	(38.7585902)(24.5313511)	= 1,732,758

COLLEGE OF NATURAL SCIENCE (Does Not Apply)

DEPARTMENT OF MATHEMATICS (Does Not Apply)

EQUATION #15[a]

$$\frac{\text{Course Enrollments}}{\text{Course Enrollment-Instructor Ratio}} \text{ (FTEF Credit-Hour Load) (W'td Average Class Size) = Total Credit Hours}$$

EAST LANSING CAMPUS

1967-1968	(463373)	/	(272.4874010)	= 1700.53	(34.9378547) (27.7685289)	= 1,649,808
1968-1969	(481260)	/	(267.2790585)	= 1800.59	(34.9115400) (27.4226286)	= 1,723,824
1969-1970	(489016)	/	(265.4175984)	= 1842.44	(35.8861292) (26.4601613)	= 1,749,494
1970-1971	(485048)	/	(260.0654120)	= 1865.10	(37.7914429) (24.5738302)	= 1,732,082
1971-1972[e]	(486200)	/	(261.7567095)	= 1857.45	(36.9492202) (25.2800000)	= 1,735,000
1971-1972	(482692)	/	(264.8632039)	= 1822.42	(38.7585902) (24.5313511)	= 1,732,758

COLLEGE OF NATURAL SCIENCE

1967-1968	(69571)	/	(210.7126632)	= 330.17	(27.2959448) (28.4653130)	= 256,538
1968-1969	(69982)	/	(204.1601027)	= 342.78	(27.3950168) (27.6711570)	= 259,845
1969-1970	(71496)	/	(203.2868922)	= 351.70	(26.7789537) (28.0907370)	= 264,563
1970-1971	(70055)	/	(191.3025669)	= 366.20	(28.0228461) (25.2608510)	= 259,226
1971-1972[e]	(70700)	/	(196.6073415)	= 359.60	(28.0225892) (26.0000000)	= 262,000
1971-1972	(71305)	/	(202.0773111)	= 352.86	(28.9772288) (25.7457650)	= 263,248

DEPARTMENT OF MATHEMATICS

1967-1968	(21548)	/	(209.1429681)	= 103.03	(28.7635969) (32.6801291)	= 96,848
1968-1969	(21552)	/	(212.8382382)	= 101.26	(30.8293543) (31.0867476)	= 97,046
1969-1970	(21512)	/	(204.9933295)	= 104.94	(30.0376423) (30.7584719)	= 96,955
1970-1971	(20268)	/	(181.9716287)	= 111.38	(28.7523348) (28. ∠13374)	= 96,377
1971-1972[e]	(20500)	/	(186.3636364)	= 111.00	(28.3513097) (29.5000000)	= 92,000
1971-1972	(20239)	/	(179.2013458)	= 112.94	(27.5548479) (29.4346689)	= 91,602

EQUATION #16
(Headcount Enrollments) (Fees Per Student) = Fee Revenue

EAST LANSING CAMPUS

1967-1968	(38758)	(557.7534961)	= 21,617,410
1968-1969	(39949)	(592.3410098)	= 23,663,431
1969-1970	(40820)	(680.1906173)	= 27,765,381
1970-1971	(40511)	(717.6443682)	= 29,072,491
1971-1972[e]	(41912)	(728.8604696)	= 30,548,000
1971-1972	(41649)	(744.6997527)	= 31,016,000

COLLEGE OF NATURAL SCIENCE

1967-1968	(4954)	(557.7534961)	= 2,707,335
1968-1969	(4822)	(592.3410098)	= 2,856,268
1969-1970	(4941)	(680.1906173)	= 3,360,822
1970-1971	(4805)	(717.6443682)	= 3,448,281
1971-1972[e]	(4875)	(728.8601026)	= 3,553,193
1971-1972	(4904)	(744.6998369)	= 3,652,008

DEPARTMENT OF MATHEMATICS

1967-1968	(1308)	(557.7534961)	= 729,542
1968-1969	(1203)	(592.3410098)	= 712,586
1969-1970	(1248)	(680.1906173)	= 848,878
1970-1971	(1184)	(717.6443682)	= 849,691
1971-1972[e]	(1125)	(728.8604444)	= 819,968
1971-1972	(1035)	(744.7004831)	= 770,765

EQUATION #17
(Total Credit Hours) (Fees Per Hour) = Fee Revenue

EAST LANSING CAMPUS

1967-1968	(1649808)	(13.1029853)	=	21,617,410
1968-1969	(1723824)	(13.7272894)	=	23,663,431
1969-1970	(1749494)	(15.8705208)	=	27,765,381
1970-1971	(1732082)	(16.7847082)	=	29,072,491
1971-1972[e]	(1735000)	(17.6069164)	=	30,548,000
1971-1972	(1732758)	(17.8997875)	=	31,016,000

COLLEGE OF NATURAL SCIENCE

1967-1968	(256538)	(10.5533488)	=	2,707,335
1968-1969	(259845)	(10.9921992)	=	2,856,268
1969-1970	(264563)	(12.7032956)	=	3,360,822
1970-1971	(259226)	(13.3022189)	=	3,448,281
1971-1972[e]	(262000)	(13.5618053)	=	3,553,193
1971-1972	(263248)	(13.8728803)	=	3.652,008

DEPARTMENT OF MATHEMATICS

1967-1968	(96848)	(7.5328556)	=	729,542
1968-1969	(97046)	(7.3427653)	=	712,856
1969-1970	(96955)	(8.7553814)	=	848,878
1970-1971	(90377)	(9.4016287)	=	849,691
1971-1972[e]	(92000)	(8.9126957)	=	819,968
1971-1972	(91602)	(8.4142813)	=	770,765

EQUATION #18
(Fee Revenue) (State Appropriation %) = State Appropriation

EAST LANSING CAMPUS

1967-1968	(21617410)	(208.603144%)	= 45,094,597
1968-1969	(23663431)	(207.172911)	= 49,024,219
1969-1970	(27765381)	(195.853721)	= 54,379,532
1970-1971	(29072491)	(204.125408)	= 59,344,341
1971-1972[e]	(30548000)	(202.998559)	= 62,012,000
1971-1972	(31016000)	(200.000000)	= 62,032,000

COLLEGE OF NATURAL SCIENCE

1967-1968	(2707335)	(123.291428%)	= 6045247 - 2707335 = 3,337,912
1968-1969	(2856268)	(127.533760)	= 6498974 - 2856268 = 3,642,706
1969-1970	(3360822)	(113.102598)	= 7161999 - 3360822 = 3,801,177
1970-1971	(3448281)	(126.083576)	= 7795997 - 3448281 = 4,347,716
1971-1972[e]	(3553193)	(116.353347)	= 7687452 - 3553193 = 4,134,259
1971-1972	(3652008)	(112.212021)	= 7750000 - 3652008 = 4,097,992

DEPARTMENT OF MATHEMATICS

1967-1968	(729542)	(68.723390%)	= 1230908 - 729542 = 501,366
1968-1969	(712586)	(83.658533)	= 1308725 - 712586 = 596,139
1969-1970	(848878)	(74.398323)	= 1480429 - 848878 = 631,551
1970-1971	(849691)	(95.155415)	= 1658218 - 849691 = 808,527
1971-1972[e]	(819968)	(100.224764)	= 1641778 - 770765 = 821,811
1971-1972	(770765)	(113.006298)	= 1641778 - 819968 = 871,013

EQUATION #19
(Fee Revenue) (Other Revenue %) = Other Revenue

EAST LANSING CAMPUS

1967-1968	(21,617,410)	(8.966462%)	= 1,938,317
1968-1969	(23,663,431)	(16.395120)	= 3,879,648
1969-1970	(27,765,381)	(16.770077)	= 4,656,276
1970-1971	(29,072,491)	(18.700592)	= 5,436,728
1971-1972[e]	(30,548,000)	(18.181222)	= 5,554,000
1971-1972	(31,016,000)	(18.767732)	= 5,821,000

COLLEGE OF NATURAL SCIENCE

1967-1968	(2,707,335)	(4.737019%)	= 128,247
1968-1969	(2,856,268)	(4.793002)	= 136,901
1969-1970	(3,360,822)	(-.153236)	= (5,150)
1970-1971	(3,448,281)	(-1.497760)	= (51,647)
1971-1972[e]	(3,553,193)	(-2.163546)	= (76,875)
1971-1972	(3,652,008)	(-2.122120)	= (77,500)

DEPARTMENT OF MATHEMATICS

1967-1968	(729,542)	(3.068637%)	= 22,387
1968-1969	(712,586)	(.891962)	= 6,356
1969-1970	(848,878)	(1.811567)	= (15,378)
1970-1971	(849,691)	(3.954614)	= (33,602)
1971-1972[e]	(819,968)	(3.048899)	= (25,000)
1971-1972	(770,765)	(4.260183)	= (32,836)

EQUATION #20

(Fee Revenue) + [(Fee Revenue)(State Appropriation %)]
+ [(Fee Revenue)(Other Revenue %)] = Total Revenue

EAST LANSING CAMPUS

1967-1968 (21617410) + [(2161741)(2.0860314)] + [(21617410)(.0896646)] = 68,650,324
1968-1969 (23663431) + [(2366343)(2.0717291)] + [(23663431)(.1639512)] = 76,567,298
1969-1970 (27765381) + [(2776538)(1.9585372)] + [(27765381)(.1677008)] = 86,801,189
1970-1971 (29072491) + [(2907249)(2.0412541)] + [(29072491)(.1870059)] = 93,853,560
1971-1972[e](30548000) + [(3054800)(2.2099856)] + [(30548000)(.1818122)] = 98,114,000
1971-1972 (31016000) + [(3101600)(2.0000000)] + [(31016000)(.1876773)] = 98,869,000

COLLEGE OF NATURAL SCIENCE

1967-1968 (2707335) + [(2707335)(1.2329143)] + [(2707335)(.0473702)] = 6,173,494
1968-1969 (2856268) + [(2856268)(1.2753376)] + [(2856268)(.0479300)] = 6,635,875
1969-1970 (3360822) + [(3360822)(1.1310260)] + [(3360822)(-.0015324)] = 7,156,849
1970-1971 (3448281) + [(3448281)(1.2608358)] + [(3448281)(-.0149776)] = 7,744,350
1971-1972[e](3553193) + [(3553193)(1.1635335)] + [(3553193)(-.0216355)] = 7,610,577
1971-1972 (3652008) + [(3652008)(1.1221202)] + [(3652008)(-.0212212)] = 7,672,500

DEPARTMENT OF MATHEMATICS

1967-1968 (729542) + [(729542)(.6872339)] + [(729542)(.0306864)] = 1,253,295
1968-1969 (712586) + [(712586)(.8365853)] + [(712586)(.0089196)] = 1,315,081
1969-1970 (848878) + [(848878)(.7439832)] + [(848878)(.0181157)] = 1,465,051
1970-1971 (849691) + [(849691)(.9515542)] + [(849691)(.0395461)] = 1,624,616
1971-1972[e](819968) + [(819968)(1.0022476)] + [(819968)(.0304890)] = 1,616,778
1971-1972 (770765) + [(770765)(1.1300630)] + [(770765)(.0426018)] = 1,608,942

EQUATION #21

(Fee Revenue)(1 + State Appropriation %) (1 + Other Revenue %) = Total Revenue

EAST LANSING CAMPUS

1967-1968	(21617410)	(1 + 2.0860314)	= 66,712,007	(1 + .02905499)	= 68,650,324
1968-1969	(23663431)	(1 + 2.0717291)	= 72,687,650	(1 + .05337423)	= 76,567,298
1969-1970	(27765381)	(1 + 1.9585372)	= 82,144,913	(1 + .05668368)	= 86,801,189
1970-1971	(29072491)	(1 + 2.0412541)	= 88,416,832	(1 + .06148973)	= 93,853,560
1971-1972[e]	(30548000)	(1 + 2.0299856)	= 92,560,000	(1 + .06000432)	= 98,114,000
1971-1972	(31016000)	(1 + 2.0000000)	= 93,048,000	(1 + .06255910)	= 98,869,000

COLLEGE OF NATURAL SCIENCE

1967-1968	(2707335)	(1 + 1.2329143)	= 6,045,247	(1 + .0212145)	= 6,173,494
1968-1969	(2856268)	(1 + 1.2753376)	= 6,498,974	(1 + .0210650)	= 6,635,875
1969-1970	(3360822)	(1 + 1.1310260)	= 7,161,999	(.9992809)	= 7,156,849
1970-1971	(3448281)	(1 + 1.2608358)	= 7,795,997	(.9933752)	= 7,744,350
1971-1972[e]	(3553193)	(1 + 1.1635335)	= 7,687,452	(.9899999)	= 7,610,577
1971-1972	(3652008)	(1 + 1.1221202)	= 7,750,000	(.9900000)	= 7,672,500

DEPARTMENT OF MATHEMATICS

1967-1968	(729542)	(1 + .6872339)	= 1,230,908	(1 + .0212145)	= 1,253,295
1968-1969	(712586)	(1 + .8365853)	= 1,308,725	(1 + .0210650)	= 1,315,081
1969-1970	(848878)	(1 + .7439832)	= 1,480,429	(.9992809)	= 1,465,051
1970-1971	(849691)	(1 + .9515542)	= 1,658,218	(.9933752)	= 1,624,616
1971-1972[e]	(819968)	(1 + 1.0022476)	= 1,640,000	(.9858402)	= 1,616,778
1971-1972	(770765)	(1 + 1.1300630)	= 1,641,778	(.9799997)	= 1,608,942

EQUATION #22
(Teaching FTEF) (Instructional Expend. Per Teaching FTEF) = Instructional Expenditures

EAST LANSING CAMPUS

1967-1968	(1700.53)	(19354.3795170)	=	32,912,703
1968-1969	(1800.59)	(19803.8798394)	=	35,658,668
1969-1970	(1842.44)	(20789.7836565)	=	38,303,929
1970-1971	(1865.10)	(22652.5939628)	=	42,249,353
1971-1972[e]	(1857.45)	(22772.0853859)	=	42,192,657

COLLEGE OF NATURAL SCIENCE

1967-1968	(330.17)	(18426.4166944)	=	6,083,850
1968-1969	(342.78)	(19069.8027890)	=	6,536,747
1969-1970	(351.70)	(20140.5601365)	=	7,083,435
1970-1971	(366.20)	(20922.2419443)	=	7,661,725
1971-1972[e]	(359.60)	(20954.4632925)	=	7,535,225
1971-1972	(352.86)	(21405.5432750)	=	7,553,160

DEPARTMENT OF MATHEMATICS

1967-1968	(103.03)	(12164.3696011)	=	1,253,295
1968-1969	(101.26)	(12987.1716374)	=	1,315,081
1969-1970	(104.94)	(13960.8442920)	=	1,465,051
1970-1971	(111.38)	(14586.2452864)	=	1,624,616
1971-1972[e]	(110.00)	(14697.9818182)	=	1,616,778
1971-1972	(112.94)	(14245.9890207)	=	1,608,942

EQUATION #23
(Total Credit Hours) (Instructional Expend. Per Hour) = Instructional Expenditures

EAST LANSING CAMPUS

1967-1968	(1649808)	($19.9494141)	=	$32,912,703
1968-1969	(1723824)	(20.6857939	=	35,658,668
1969-1970	(1749494)	(21.8942900)	=	38,303,929
1970-1971	(1732082)	(24.3922360)	=	42,249,353
1971-1972[e]	(1735000)	(24.3792565)	=	42,298,101
1971-1972	(1732758)	(24.3499998)	=	42,192,657

COLLEGE OF NATURAL SCIENCE

1967-1968	(256538)	(23.7152001)	=	6,083,850
1968-1969	(259845)	(25.1563317)	=	6,536,747
1969-1970	(264563)	(26.7740954)	=	7,083,435
1970-1971	(259226)	(29.5561594)	=	7,661,725
1971-1972[e]	(262000)	(28.7604008)	=	7,535,225
1971-1972	(263248)	(28.6921838)	=	7,553,160

DEPARTMENT OF MATHEMATICS

1967-1968	(96848)	(12.9408454)	=	1,253,295
1968-1969	(97046)	(13.5511098)	=	1,315,081
1969-1970	(96955)	(15.1106286)	=	1,465,051
1970-1971	(90377)	(17.9759895)	=	1,624,616
1971-1972[e]	(92000)	(17.5736739)	=	1,616,778
1971-1972	(91602)	(17.5644855)	=	1,608,942

EQUATION #24
(Instructional Expenditures) (1 + Overhead %) = Total Expenditures

EAST LANSING CAMPUS

1967-1968	(32912703)	(1 + 1.0858306)	=	68,650,324
1968-1969	(35658668)	(1 + 1.1472282)	=	76,567,298
1969-1970	(38303929)	(1 + 1.2661171)	=	86,801,189
1970-1971	(42249353)	(1 + 1.2214201)	=	93,853,560
1971-1972[e]	(42298010)	(1 + 1.3195890)	=	98,114,000
1971-1972	(42192657)	(1 + 1.3432750)	=	98,869,000

COLLEGE OF NATURAL SCIENCE

1967-1968	(6083850)	(1 + .0147347)	=	6,173,494
1968-1969	(6536747)	(1 + .0151647)	=	6,635,875
1969-1970	(7083435)	(1 + .1013642)	=	7,156,849
1970-1971	(7661725)	(1 + .0107841)	=	7,744,350
1971-1972[e]	(7535225)	(1 + .0100000)	=	7,610,557
1971-1972	(7553160)	(1 + .0158000)	=	7,672,500

DEPARTMENT OF MATHEMATICS

1967-1968	(1253295)	(-)	=	1,253,295
1968-1969	(1315081)	(-)	=	1,315,081
1969-1970	(1465051)	(-)	=	1,465,051
1970-1971	(1624616)	(-)	=	1,624,616
1971-1972[e]	(1616778)	(-)	=	1,616,778
1971-1972	(1608942)	(-)	=	1,608,942

EQUATION #25

(Headcount Enrollments) (Average Student Course Load) (Average Course Credit)
= (Instructor Headcount)(% Teaching FTEF)(FTEF Credit-Hour Load)(Wt'd Average Class)

EAST LANSING CAMPUS

1967-1968 (38758)(11.9555447)(3.5604319)=1649808=(4731)(35.9444092%)(34.9378547)(27.7685289)
1968-1969 (39949)(12.0468597)(3.5818975)=1723824=(4888)(36.8369476)(34.9115400)(27.4226286)
1969-1970 (40820)(11.9798138)(3.5775803)=1749494=(4773)(38.6012990)(35.8861292)(26.4601613)
1970-1971 (40511)(11.9732418)(3.5709497)=1732082=(4814)(38.7432489)(37.7914429)(24.5738302)
1971-1972[e] (41912)(11.6004963)(3.5684903)=1735000=(4822)(38.5203235)(36.9492202)(25.2800000)
1971-1972 (41649)(11.5895220)(3.5897798)=1732758=(4719)(38.6187752)(38.7585902)(24.5313511)

COLLEGE OF NATURAL SCIENCE (Does Not Apply)

DEPARTMENT OF MATHEMATICS (Does Not Apply)

EQUATION #25[a]
(Course Enrollments) (Average Course Credits)
= (Instructor Headcount)(% Teaching FTEF)(FTEF Credit-Hour Load)(W'td Avg. Class Size)

EAST LANSING CAMPUS
1967-1968 (463373)(3.5604319) = 1649808 = (4731)(35.9444092%)(34.9378547)(27.7685289)
1968-1969 (481260)(3.5818975) = 1723824 = (4888)(36.8369476)(34.9115400)(27.4226286)
1969-1970 (489016)(3.5775803) = 1749494 = (4773)(38.6042990)(35.8861292)(26.4601613)
1970-1971 (485048)(3.5709497) = 1732082 = (4814)(38.7432489)(37.7914429)(24.5738302)
1971-1972[e](486200)(3.5684903) = 1735000 = (4822)(38.5203235)(36.9492202)(25.2800000)
1971-1972 (482692)(3.5897798) = 1732758 = (4719)(38.6187752)(38.7585902)(24.5313511)

COLLEGE OF NATURAL SCIENCE
1967-1968 (69571)(3.6874272) = 256538 = (1004)(30.1525114%)(27.2959448)(28.4653130)
1968-1969 (69982)(3.7130262) = 259845 = (1051)(32.6146527)(27.3950168)(27.6711570)
1969-1970 (71496)(3.7003888) = 264563 = (1048)(33.5591603)(26.7789537)(28.0907370)
1970-1971 (70055)(3.7003212) = 259226 = (1086)(33.7200737)(28.0228461)(25.2608510)
1971-1972[e](70700)(3.7057992) = 262000 = (1065)(33.7652582)(28.0225892)(26.0000000)
1971-1972 (71305)(3.6918589) = 263248 = (1046)(33.7342256)(28.9772288)(25.7457650)

DEPARTMENT OF MATHEMATICS
1967-1968 (21548)(4.4945239) = 96848 = (197)(52.2994924%)(28.7635969)(32.6801291)
1968-1969 (21552)(4.5028768) = 97046 = (199)(50.8844221)(30.8293543)(31.0867476)
1969-1970 (21512)(4.5070193) = 96955 = (219)(47.9178082)(30.0376423)(30.7584719)
1970-1971 (20268)(4.4590981) = 90377 = (225)(29.5022222)(28.7523348)(28.2213374)
1971-1972[e](20500)(4.4878049) = 92000 = (220)(50.0000000)(28.3522342)(29.5000000)
1971-1972 (20239)(4.5260141) = 91602 = (217)(52.0460829)(27.5548479)(29.4346689)

EQUATION #26

(Total Credit Hours)(Fees Per Hour)(1 + State Appropriation %)(1 + Other Revenue %)
= (Total Credit Hours)(Instructional Expenditures Per Hour)(1 + Overhead %)

EAST LANSING CAMPUS

1967-1968 (1649808) (13.1029853) (1 + 2.0860314) (1 + .0290550)
= 68,650,324 = (1649808) (19.949414) (1 + 1.0858306)

1968-1969 (1723824) (13.7272894) (1 + 2.0717291) (1 + .0533742)
= 76,567,298 = (1723824) (20.685794) (1 + 1.1472282)

1969-1970 (1749494) (15.8705208) (1 + 1.9585371) (1 + .0566837)
= 86,801,189 = (1749494) (21.894290) (1 + 1.2661171)

1970-1971 (1732082) (16.7847082) (1 + 2.0412541) (1 + .0614897)
= 93,853,560 = (1732082) (24.392236) (1 + 1.2214201)

1971-1972[e] (1735000) (17.6069164) (1 + 2.0299856) (1 + .0600043)
= 98,114,000 = (1735000) (24.379256) (1 + 1.3195890)

1971-1972 (1732758) (17.8997875) (1 + 2.0000000) (1 + .0625591)
= 98,869,000 = (1732758) (24.350000) (1 + 1.3432750)

EQUATION #26 (Cont'd)

COLLEGE OF NATURAL SCIENCE

1967-1968 (256538) (10.5533488) (1 + 1.2329143) (1 + .0212145)
= 6,173,494 = (256538) (23.7152001) (1 + .0147347)

1968-1969 (259845) (10.9921992) (1 + 1.2753376) (1 + .0210650)
= 6,635,875 = (259845) (25.1563317) (1 + .0151647)

1969-1970 (264563) (12.7032956) (1 + 1.1310260) (1 + .9992809)
= 7,156,849 = (264563) (26.7740954) (1 + .0103642)

1970-1971 (256226) (13.3022189) (1 + 1.2608358) (1 + .9933752)
= 7,744,350 = (259226) (29.5561594) (1 + .0107841)

1971-1972[e] (262000) (13.5618053) (1 + 1.1635335) (1 + .9899999)
= 7,610,577 = (262000) (28.7604008) (1 + .0100000)

1971-1972 (263248) (13.8728803) (1 + 1.1221202) (1 + .9900000)
= 7,672,500 = (263248) (28.6921838) (1 + .0158000)

DEPARTMENT OF MATHEMATICS

1967-1968 (96848) (7.5328556) (1 + .6872339) (1 + .0212145)
= 1,253,295 = (96848) (12.9408454) (-)

1968-1969 (97046) (7.3427653) (1 + .3427653) (1 + .0210650)
= 1,315,081 = (97046) (13.5511098) (-)

1969-1970 (96955) (8.7553814) (1 + .7439832) (.9992809)
= 1,465,051 = (96955) (15.1106286) (-)

1970-1971 (90377) (9.4016287) (1 + .9515542) (.9933752)
= 1,624,616 = (90377) (17.9759895) (-)

1971-1972[e] (92000) (8.9126957) (1 + 1.0022476)(.9858402)
= 1,616,778 = (92000) (17.5736739) (-)

1971-1972 (91602((8.4142813) (1 + 1.1300630)(.9799997)
= 1,608,942 = (91602) (17.5644855) (-)

EQUATION #27

(Headcount Enrollments)(Fees Per Student)(1 + State Appropriation %)(1 + Other Revenue %)
= (Teaching FTEF)(Instructional Expenditures Per Teaching FTEF)(1 + Overhead %)

EAST LANSING CAMPUS

1967-1968 (38758)(557.7534961)(1 + 2.08603144%)(1 + .02905499)
= 68,650,324 = (1700.53)(19354.3795170)(1 + 1.0858306)

1968-1969 (39949)(592.3410098)(1 + 2.07172911)(1 + .05337423)
= 76,567,298 = (1800.59)(19803.8798394)(1 + 1.1472282)

1969-1970 (40820)(680.1906173)(1 + 1.95853721)(1 + .05668368)
= 86,801,189 = (1842.44)(20789.7836565)(1 + 1.2661171)

1970-1971 (40511)(717.6443682)(1 + 2.04125408)(1 + .06148973)
= 93,853,560 = (1865.10)(22652.5939628)(1 + 1.2214201)

1971-1972[e] (41912)(728.8604696)(1 + 2.02998559)(1 + .06000434)
= 98,114,000 = (1857.45)(22772.0853859)(1 + 1.3195890)

1971-1972 (41649)(744.6997527)(1 + 2.00000000)(1 + .06255910)
= 98,869,000 = (1822.42)(23151.9940591)(1 + 1.3432750)

EQUATION #27 (Cont'd)

COLLEGE OF NATURAL SCIENCE

1967-1968 (4954)(557.7534961)(1 + 1.23291428%)(1 + .0212145)
= 6,173,494 = (330.17)(18426.4166944)(1 + .0147347)

1968-1969 (4822)(592.3410098)(1 + 1.27533760)(1 + .0210650)
= 6,635,875 = (342.78)(19069.8027890)(1 + .0151647)

1969-1970 (4941)(680.1906173)(1 + 1.13102598)(.9992809)
= 7,156,849 = (351.70)(20140.5601365)(1 + .0103642)

1970-1971 (4805)(717.6443682)(1 + 1.26083576)(.9933752)
= 7,744,350 = (366.20)(20922.2419443)(1 + .0107841)

1971-1972[e] (4875)(728.8601026)(1 + 1.16353347)(.9899999)
= 7,610,577 = (359.60)(20954.4632925)(1 + .0100000)

1971-1972 (4904)(744.6998369)(1 + 1.12212021)(.9900000)
= 7,672,500 = (352.86)(21405.5432750)(1 + .0158000)

DEPARTMENT OF MATHEMATICS

1967-1968 (1308)(557.7534961)(1 + .68723390)(1 + .0212145)
= 1,253,295 = (103.03)(12164.3696011)(-)

1968-1969 (1203)(592.3410098)(1 + .83658533)(1 + .0210650)
= 1,315,081 = (101.26)(12987.1716374)(-)

1969-1970 (1248)(680.1906173)(1 + .74398323)(.9992809)
= 1,465,051 = (104.94)(13960.8442920)(-)

1970-1971 (1184)(717.6443682)(1 + .95155415)(.9933752)
= 1,624,616 = (111.38)(14586.2452864)(-)

1971-1972[e] (1125)(728.8604444)(1 + 1.00224764)(.9858402)
= 1,616,778 = (110.00)(14697.9818182)(-)

1971-1972 (1035)(744.7004831)(1 + 1.13006298)(.9799997)
= 1,608,942 = (112.94)(14245.9890207)(-)