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Ph.

A MULTIPLE CORRELATION AND REGRESSION ANALYSIS COMPARING FACULTY ACTIVITY SURVEY WITH OTHER METHODOLOGIES FOR ALLOCATING COSTS TO COURSES

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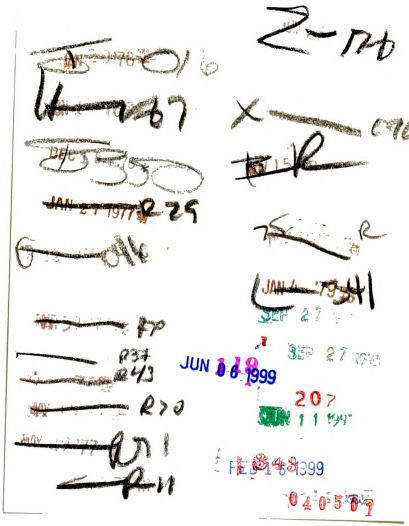
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ABSTRACT

A MULTIPLE CORRELATION AND REGRESSION ANALYSIS COMPARING FACULTY ACTIVITY SURVEY WITH OTHER METHODOLOGIES FOR ALLOCATING COSTS TO COURSES

By

William Clark Crothers

Efficient resource projection and allocation requires a thorough analysis of the faculty activities and their related costs. Effective utilization of faculty is a major responsibility of college and university administrators. Even in light of this, many institutions have little idea of how the faculty allocate their time or how this distribution effects costs. Few institutions have devised a meaningful method of gathering this information, analyzing the data, or costing out these activities. Only now is the concept of faculty activity analysis emerging with general interest and acceptance.

To manage the cost of instruction requires the identification of the major variables of costs. Yet research on costing methodology in higher education has lacked a thorough examination assessing what results when different costing methodologies are employed. To

generate a cost figure is not sufficient when it is realized that the costing methodology will to a degree determine that cost figure. A need for research which inquires into the nature of the costing methodology used for allocating costs to the individual units chosen has been reflected in the literature.

Methodology of the Study

The population from which the data were drawn for this study were the faculty and course offerings of one college at Michigan State University. This college offers both undergraduate and doctoral level programs, and its five departments are diversified in both the nature of their activities and course offerings. The entire faculty were surveyed and a usable return rate of 86.3 per cent was realized. All of the data, except salaries, were collected for the fall term of 1972 through a faculty activity survey instrument designed by the National Center for Higher Education Management Systems.

The objectives of this dissertation were divided into two parts. The first was to examine the inter-relationships of selected instructional workload factors through determining the distribution of faculty time among several activities and assigning costs to these activities based on the salaries of the faculty. The profile analysis was developed by department and by rank.

The second objective was to compare four costing methodologies used in allocating costs to courses. The bases of allocating costs were: (1) the total course time, (2) formal contact hours, (3) student credit hours, and (4) course credit hours. This comparison was not only based on the costs per course, but it also considered the differences in selected variables of costs and the respective costing methodology. The five variables of costs which were examined were: (1) faculty rank, (2) course level, (3) class size, (4) number of courses and/or sections taught by the faculty member, and (5) the method of instruction. The comparison of costing methodologies as related to these variables centered on answering four research questions which addressed the comparability of these methodologies.

Findings of the Study

The findings must be interpreted in light of the limitations of the study. The costs were developed from only the instructional portion of the faculty's time and from one college at one university.

1. A large portion of faculty time (45%) was devoted to noninstructional activities. The distribution of time spread over activities was consistent with the mission of the departments and representative of other similar studies.

2. It appeared that the total workweek was relatively fixed as instructional workload factors increased or decreased. The total time devoted to a particular course correlated highly with formal contact hours, but not with other factors such as class size, course credit hours, student credit hours, or level of instruction.

3. As the level of instruction increased, the size of the classes tended to get smaller, while the total time devoted to the class changed little.

4. As faculty rank increased there was a slight decrease in total course time, formal contact hours, and the number of sections taught.

5. A very high correlation was realized in comparing costs allocated on total course time and costs allocated on faculty reported formal contact hours. Costs developed on total course time correlated higher than any other method with each of the other costs except those developed on credits.

6. Costs developed by level of instruction were highly similar when based on total course time and formal contact hours.

7. Although previous research suggested that graduate instruction was four times the cost of lower

undergraduate instruction when determined on a per student credit hour, this research, while supporting that conclusion for that one methodology, found lower undergraduate instruction more costly under the other methodologies. However, these other methodologies were costing on the basis of a unit related to the course, whereas the student credit hour is related to the student and is really a subset of course credit hours. This finding supports the contention that the costing methodology will to some extent determine the cost.

8. Class size, the number of sections taught by the faculty member, and method of instruction were found to be significant variables of course costs.

9. The dependent variable used in the multiple regression analysis which explained the greatest amount of variance in costs was the method for which costs were developed on total course time as reported in the faculty activity survey.

10. A costing methodology should not be developed on the presumption that a relationship exists between time and some other basis of allocation.

A MULTIPLE CORRELATION AND REGRESSION ANALYSIS COMPARING FACULTY ACTIVITY SURVEY WITH OTHER METHODOLOGIES FOR ALLOCATING COSTS TO COURSES

By

William Clark Crothers

A DISSERTATION

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DEDICATION

This dissertation is dedicated to my parents whose expectations have always been worth fulfilling and to my wife whose love, patience, encouragement, and confidence have been the foundation of my efforts.

ACKNOWLEDGMENTS

The writer wishes to express his sincere appreciation to the chairman of his doctoral committee, Dr. Walter F. Johnson. His friendship, encouragement, advice, and sensitive criticism have been a major motivator for completing the program and dissertation. Dr. Richard L. Featherstone has also provided gracious support, friendship, and guidance throughout the program and dissertation. Both of these men have had a profound influence on this writer.

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It has been a unique pleasure for me to have attended Michigan State University and to have had the privilege of working with distinguished scholars and professionals. However, none of this would have been possible without the loving assistance of my wife, Rilla, who spent many hours typing, in addition to raising our family and maintaining employment.

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CHAPTER I

RATIONALE FOR THE STUDY

Institutions of higher education are facing some of the most significant issues they have had to face with regard to their own survival and the nature of their existence. The literature is filled with concepts of accountability, collective bargaining, tenure, resource allocation, program budgeting, and evaluation. Effective resource allocation and projection requires a thorough understanding of faculty activities and the related costs. To manage the cost of instruction requires the identification of the major variables of cost. Yet research on costing methodology is so limited that major questions concerning the use of cost studies cannot be answered. However, administrative decisions continue to be made, often without a full understanding of the costing methodology employed.

The Problem and Need for the Study

The institutional resource which will realize the greatest impact from the application of the current

concepts of accountability, resource allocation, program budgeting, and evaluation will be the faculty. Yet many institutions have little idea of how the faculty allocate their time or how this distribution effects costs. "One has only to raise the question as to what professors in a given department actually do, to learn that in most departments and most universities only the professor can provide an answer."[1] Few institutions have devised a meaningful method of gathering this information, analyzing the data, or costing out these activities. Research to this end must be conducted if higher education is to meet the issues it is facing in a manner that is constructive and educationally sound.

Although faculty workload has been discussed in the literature for some time, recently it has taken on a new emphasis because it is becoming an integral part of management systems. Cost studies which focus on faculty utilization are being conducted due to the new financial squeeze facing higher education. This movement toward financial accountability is accelerating without a good understanding of costing methodology or of the activities of the faculty. Yet the faculty represents the most significant factor in the educational process and it often accounts for the allocation of 60 to 80 per cent of the budget.

There is a great need for research in costing methodology. In a 1969 paper in which he examines the value and validity of cost studies, Alfred D. Cavanaugh, from the Office of Institutional Research at the University of California, Berkeley, stated that,

> Any study of cost analysis procedures is severely handicapped by the scantiness of the literature. The work of cost analysis is largely done by staff personnel associated with colleges and universities, with state budget offices and with coordinating councils. The work of most analysis is tied down to administrative demands for information and to the exigencies of state budget procedures; the pressure of time precludes significant publication in methodological problems although it is sorely needed.[2]

The need for information related to costs and faculty has been recognized by the federal and state government as well as the National Center for Higher Education Management Systems (NCHEMS). For example, the 1972 Federal Education Bill has authorized a commission to study per unit cost in higher education. The demand for this kind of information is already being felt in Michigan. The 1972 Michigan Senate Bill number 1141 of the legislature has called for an "academic staff performance audit." The bill states that, "The academic staff performance audit shall include measures of experience, training, salary and other compensation, rank, and productivity in terms of instruction and other duties of all academic staff."[3]

It has been pointed out by NCHEMS that while cost studies have been conducted since the early 1920's, each

study approaches the costing in methodologically different ways.[4] Furthermore, the literature is very limited in research on the differences in methodologies which is one purpose of this study.

This need for better research in cost analysis was confirmed in a recent publication by the Carnegie Commission on Higher Education. In 1971 Howard R. Bowen and Gordon K. Douglass authored a Carnegie Commission report entitled Efficiency in Liberal Education in which they present a comprehensive cost study of liberal arts colleges. The methodology which they employed was based on a faculty workload study. "If professional labor is the primary input into higher education's processes of production, then learning how faculty members spend their professional time ought to help us calculate the costs of alternative instructional modes."[5] A factual profile of workweek activities is only now beginning to emerge from faculty activity analyses at a few universities.

The use of faculty activity surveys in calculating costs was one of the reasons the National Center for Higher Education Management Systems developed an instrument for gathering this information. Data provided through a survey using this instrument will allow a comparison of several variables of cost given different methodologies.

Purposes of the Study

This study was intended to fill, in part, the need as already expressed for research in faculty activity analysis and costing methodology. The need has been stated at the federal, state, and local levels.

The purposes of this study were the following:

1. Develop a faculty time allocation profile, by department and rank, of the major activities in which the faculty participate; assign costs to these activities based on the allocation of time as determined by a faculty activity survey; and examine the interrelationships between several workload factors.

2. Compare four costing methodologies as a basis for examining the relative importance of some major variables in determining instructional costs and for considering their interrelationships.

This was a descriptive study, as opposed to an experimental or evaluative study. Evaluative research is a comparison with a standard which has been developed from a value position.[6] Whereas the purpose of experimental research is to test hypotheses, descriptive research seeks to examine relationships of basic

information in order to identify probable cause and effect relationships or to characterize the nature or status of a phenomena.

The faculty activities of one college at Michigan State University were examined in this study through the development of a faculty activity profile. This study sought to examine the relationships between different costing methodologies as they were applied to the instructional costs of the faculty activity profile. The relationships of several major variables of costs with the different costing methodologies were examined. This study not only generated costs based on different methodologies, but it also explored what type of differences, depending on the methodology employed, resulted in several independent variables.

Research Objectives

The objectives of this dissertation were divided into two parts. The first was to determine the allocation of faculty time among several activities and to assign a cost to these activities based on the salaries of the faculty. The profile analysis was developed by department and by rank for one college at Michigan State University during the 1972 fall term. The interrelationships of selected instructional workload factors were examined.

The second objective was to compare the four costing methodologies used in allocating costs to courses. The scheduled teaching section of the faculty activity profile served as the source of information for this part of the research. This comparison was not only based on the costs generated per course, but also considered the differences in selected variables of costs and the respective costing methodology. The comparison was made by answering the following research questions:

1. Is there a relationship between each independent variable and section cost for each costing methodology?
2. What is the relative importance of the independent variables for each costing methodology?
3. Under which costing methodology do the variables explain the greatest amount of the variance in the costs?
4. To what extent is there agreement in the rank ordering of independent variables across the costing methodologies?

Definition of Terms

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

Faculty Activity and Outcome Survey.--is a questionnaire designed to measure faculty time allocations for different functions. For the purposes of this study the outcomes section of the questionnaire was not used.

Activities.--include those functions normally considered part of the responsibility of faculty. They are the tasks actually performed. These include: teaching activities, unscheduled teaching, academic program advising, course and curriculum research and development, research, scholarship, creative work, public service activities, internal service. Each of these activities are defined in Chapter III under "Profile Development."

Workload.--is defined as the "full professional life," that is, the full range of faculty activities as defined under activities above.[7] It is clear that the workload is much greater than simply the assigned teaching or committee work. It is the total professional involvement of the faculty member as included in the profile analysis.

Workweek.--is the total number of hours worked on an average per week.

Formal contact hours.--are the scheduled contact or class hours per week.

Other contact hours.--are the unscheduled contact hours with students that are related to the particular course.

Total course time.--is the total number of hours devoted to the course.

Frequency.--is the term used to indicate the number of times the teacher has taught the course.

Method of instruction.--indicates the means and extent of communication used between the teacher and the student.

Course.--is a unit of the curriculum covered in a quarter or ten-week period.[8]

Course section.--applies to one group of students in a course which is given concurrently to more than one instructional group. Sectioning of classes may be due to class size or for convenience of scheduling or for both reasons.[9]

Course level.--suggests the general level of maturity which the course demands of the students. Three levels are used in this study: lower undergraduate, upper undergraduate, and graduate.[10]

Course credit hours.--are the number of units granted to a student toward a degree for taking one course.

Student credit hours.--are the total number of credits for which students are registered in a particular course. A student credit hour would be a unit of measurement which represents one student taking a course for one credit. Class enrollment times course credit hours gives the student credit hours for one class.

Fixed credit sections.--are organized classes or sections meeting for a specific number of hours per week and assigned fixed credit values.

Variable credit sections.--are classes taught by independent study or for different credits depending upon the nature and extent of the study.

Cost.--is the measure in dollars of instructional resources (faculty salaries) used in the process of producing outputs during the term.[11]

Overview of the Dissertation

In Chapter II, the pertinent literature is reviewed. This includes a review of both the costing literature in higher education and the methods used in assessing faculty activities. The design of the study

is presented in Chapter III which includes the description of the data, variables, and procedures of analysis. In Chapter IV the results of the analysis are reported. The summary, findings, conclusions, and recommendations are included in Chapter V.

NOTES--CHAPTER I

[1]Paul L. Dressel, F. Craig Johnson, and Philip M. Marcus, The Confidence Crisis (San Francisco: Jossey-Bass, 1970), p. 186.

[2]Alfred D. Cavanaugh, "A Preliminary Evaluation of Cost Studies in Higher Education" (Berkeley: Office of Institutional Research, University of California, October, 1969), p. 1.

[3]State of Michigan, 76th Legislature Regular Session of 1972, Michigan Senate Bill 1141 (1972), Sec. 16.

[4]Gordon Ziemer, Michael Young, and James Topping, Cost Finding Principles and Procedures (Boulder, Colorado: National Center for Higher Education Management Systems at WICHE, November, 1971), p. 6.

[5]Howard R. Bowen and Gordon K. Douglass, Efficiency in Liberal Education, Carnegie Commission on Higher Education (Hightstown, N.J.: McGraw-Hill, 1971), p. 23.

[6]Malcolm Provous, Discrepancy Evaluation (Berkeley, Calif.: McCutchan, 1971), p. 373.

[7]R. J. Henle, "To Devise and Test Simplified Adequate Systems of Measuring and Reporting Financial, Manpower, Facilities, Research, and Other Activities in Colleges and Universities, A Final Report," National Science Foundation and National Institute of Health, June, 1965.

[8]Floyd W. Reeves, Nelson B. Henry, and John Dale Russell, Class Size and University Costs (Chicago: University of Chicago Press, 1933), p. 8.

[9] Ibid., p. 9.

[10] James I. Doi, "The Analysis of Class Size, Teaching Load and Instructional Salary Costs," in College Self Study: Lectures on Institutional Research, ed. by Richard G. Axt and Hall T. Sprague (Boulder, Colorado: Western Interstate Commission for Higher Education, 1960), p. 191.

[11] Ziemer, op. cit., p. 286.

CHAPTER II

REVIEW OF THE LITERATURE

Search Approach

The literature reviewed for this dissertation was approached from several different directions. A systematic perusal of leading journals, publications, and dissertation abstracts was conducted to search out the pertinent literature. In addition, the private library of the Office of Institutional Research at Michigan State University, which consists of many of the unpublished reports and analyses conducted within the universities across the country, was used to identify the related research. Of course references cited by the writers in the field were obtained and evaluated for their inclusion in this review. Finally, the services of two computer search corporations were employed to identify related research. Although an extensive bibliography could be assembled, the bibliography included in this dissertation consists only of those references actually cited.

This review of the literature will include both the kinds of relationships found in previous research and the techniques employed in faculty activity analysis

and costing methodologies. The ideas and observations of past and present scholars in the field will be considered. At the conclusion of this chapter a comparison will be made between the literature and the purpose of this dissertation.

Societal Pressures

Societal issues are having a significant effect on institutions of higher education and therefore, the faculty. The economic pressures resulting from inflation, unemployment, and increasing interest rates are being felt by the tax payer and the educational institutions. Decreasing population growth, changes in public policy--both federal and state, and signs of the general public's questioning of extensive higher education all indicate problems ahead for colleges and universities.[1] Since higher education is a societal institution, it is not surprising that such anti-establishment sentiment should be transferred to the colleges and universities. The citizenry are concerned with high taxes, inflation, and their cost of living. Higher education must now compete for its funds with other higher priority functions with which the government is concerned. Added to these societal issues are student disenchantment, faculty involvement in national issues, the onset of collective bargaining, and the seeming lack of control by the

administration which have all culminated in a "Confidence Crisis" in higher education.[2]

There appears to be a growing public sentiment that higher education is a right, not a privilege. The parents of many young people feel that since it has been their tax money which has supported the state university, their sons and daughters have the right to try. The community college's open-door concept has been a response. Societal accountability is not restricted to public higher education for the private schools have had to adjust in light of the changes in the public institutions. The relationship between the community and higher education is of primary importance given the concept of accountability. Briner emphasized this point when he stated, "Accountability in education must be the result of rational understanding and communication between the public and educators about the discharge of responsibility for determining educational purpose, defining function, judging results, and taking corrective actions to improve learning."[3]

The implications of these societal issues for the administration and the faculty are significant. The administration will have to be prepared to discuss the utilization of the faculty, their activities, the related costs, and the rationale for that cost. Perhaps one of the more important administrative functions will be to

assist and protect the faculty so that the pressures will not reduce their effectiveness.[4]

The early history of higher education reflects the vulnerability of the faculty. Falvey observes that "The first medieval universities were owned and operated by the students, who hired the faculty, chose the towns in which the universities were set up, formulated the rules by which the schools were governed, and dealt directly with the municipalities when difficulties arose."[5] Haskins indicates that the students at Bologna organized the university to protect themselves from usury by the townspeople. Once they were successful with the townspeople, they turned their attention toward the professors, requiring that they live up to a set of regulations which guaranteed the students a fair return for the payments they made.[6] Doi reminds us that the origin of the pocket in the hood of the academic attire was to allow the students to pay for the master's services without the embarrassment of direct hand-to-hand transfer of money.[7]

Rudolph documents the exploitation of faculty in American colleges and universities. Not only were workloads often increased and salaries cut, but one institution closed down for a year so the professors could go out and raise money.[8]

In light of the societal pressures which higher education will face in the next few years, it is imperative that the most efficient utilization of faculty resources be achieved. "The really essential task for the university does not lie in convincing the public by some sleight of hand ratio that its instruction is 'efficient' or cheap but in conveying the full scope of university activity--its research, its public service, and its instruction--to a variety of new publics."[9] Faculty activity analysis will assist in conveying to the public the nature and extent of the many activities in which the faculty are justifiably involved.

Purposes of Faculty Load Studies

Doi suggests several purposes of faculty load studies. The studies may be used:

> 1) for assessing the general efficiency and economy of institutional programs . . . 2) to assist in development of objective criteria for determining instructional loads and staffing needs. . . . 3) to stimulate experimentation with instructional techniques and various class sizes. . . . 4) to provide information for the planning of future expansion and changes in instructional programs. . . . and 5) to provide the kinds of information necessary for making the wisest allocation of instructional funds.[10]

Two purposes of measuring the faculty load are seen by Bolton, "1) to acquire adequate faculty, and 2) to divide responsibilities among faculty members."[11] Young sees such studies as being useful for providing information for decisions related to 1) increases in

staff, 2) additional course offerings, 3) salary increases, 4) realignment of teaching duties, and 5) adjusting inequity in faculty load.[12] Hicks believes that the faculty will gain through a re-examination of their own priorities. He states that,

> Perhaps the greatest value which can be gained from faculty workload studies comes when we, in our institutions, take the time to analyze and define what each of our faculty is doing. We will find, I think, that our good professors are always really "overworked." It is their nature to be so. The duty of the administrator is to protect the time of these professors so that it may be used to the fullest extent for what they can do best.[13]

Faculty Workload Studies

Studies of faculty workload generally fall into two categories, 1) those that are restricted to the teaching or instructional load, narrowly defined, and 2) those that deal with the total service load or all the professional activities.[14]

Teaching Load Studies

The issue of faculty workload has been in the literature for decades and it is still a current concern. The American Association of University Professors has recently set maximum workload limits of twelve hours per week undergraduate instruction or nine hours of graduate instruction. They went on to say that this maximum workload "presumes no unusual additional expectations in terms of research, administration, counseling,

or other institutional responsibilities."[15] Although this standard has been stated in teaching hours, other units of measurement are often used. Young reported on a faculty load profile used at Capital University and built upon six criteria which included: (1) student credit hours, (2) semester credit hours, (3) class-contact hours, (4) number of class preparations, (5) hours of upper division work, and (6) committee, research, and administrative assignments as determined by the administration. Ratings of light, average, and heavy were assigned to each criteria and the individual was then compared to his colleagues in his department.[16]

A 1968 survey of 206 colleges and universities, conducted by Bolin and McMurrain, found that the average full-time instructional workload was 12.76 credit hours, a little less than that of the students. The range, however, extended from a low of seven hours to a high of twenty. The standard deviation was 4.08 credit hours. The average instructional workload declined as the size of the institution increased. At the small institutions the average was 13.73 hours; at the medium institutions, 12.10 hours; and at the large universities the average credit hours per week was 10.81.[17] Hobbs found that although two-thirds of the colleges in her sample reported a maximum teaching load of 12 hours per

semester, the median average load was 10 hours and the mean was 10.1 hours.[18]

Williams reported that contact hours decreased as rank increased. In a study primarily based upon an analysis of faculty workload in several midwestern universities, he found that the average contact hours per full-time equivalent instructor was 13.19; assistant professor, 12.02; associate professor, 12.12; and professor, 10.84.[19]

Through a questionnaire sent to 500 teachers and administrators in 200 colleges and universities across the country, of which 228 were returned, Knowles and White found that the actual clock hours per credit hour ranged from 2.9 to 5.5. "There appeared to be no significant relationship between the semester hour credits carried by a course and the amount of time and effort required of an instructor assigned to teach it." This led the researchers to conclude that, "In short, each instructor's assignment needs to be individually evaluated in clock hours per week if it is desired to measure his load in a reasonably accurate and meaningful way."[20]

Faculty Activity Analysis

One of the major weaknesses of teaching load studies is that it ignores the many other activities of the faculty member. The faculty activity analysis

involves the total professional life of the faculty member including his instruction, research, service, and administration.

One of the first articles calling for the adoption of a faculty activity survey which requested a time distribution for all activities was written by Heilman in 1925. He argued forcefully for the total activity survey and against surveying only the teaching load, which he considered "about as reliable a method of determining the teacher's total timeload as is the method of getting a man's height from the measurement of his head."[21] Prior to this study, in 1919, a time study of instruction was made by Koos to see if the method of instruction correlated with the time required for effective teaching. He found that the lecture method required the most time followed by discussion, recitation, and laboratory.[22]

In a recent book on the evaluation of faculty, Miller points out the lack of understanding by the community outside of higher education of the workload for the average professor.

> The overall academic load of the average professor is seriously misunderstood by those outside the academic community. The hours spent in the classroom need to be considered on a two-to-one basis: two hours of preparation and evaluation for every hour in the classroom. A twelve-hour classroom teaching load, considered normal for most undergraduate teaching assignments, becomes thirty-six hours of teaching and teaching-related activities. Add a conservative estimate of five hours a week for

> advising and counseling, five hours for committee and departmental activities, four hours for correspondence and other academic housekeeping details, and the total becomes fifty hours per week--and the professor has not even begun to do the reading, studying, and research that are essential to keep him on the growing edge of his field. This being the case, and with every field of knowledge literally bursting at the seams, it is not difficult to make the case for professional leaves and sabbaticals for all academic personnel.[23]

One of the outstanding scholars in faculty activity analysis is John E. Stecklein. He reported that the University of Minnesota had conducted three comprehensive faculty workload studies since 1940. The 1941-42 study asked the faculty to allocate their time among the many activities included in the total professional life of a faculty member. They found that a fourth of the returns reflected forty hours or less and a fourth reflected seventy hours or more. The average was between fifty-five and sixty hours.

Just as the 1941-42 study was requested by President Coffey, the 1950-51 study was initiated by President Morrill. "He believed a comprehensive study of faculty activities would be helpful in appraising programs, in evaluating or equalizing faculty work loads, and in documenting needs to the Board of Regents and the legislature."[24] In this second study it was decided to use a diary maintained by a sample of the faculty to validate the time estimates on the questionnaire. "Analysis of these reports showed very close agreement

with the estimates which the faculty members had made on the survey forms and the results seemed to substantiate the ability of individuals to estimate the allocation of time accurately."[25]

The third study was done in 1959-60. It requested the data as percentages of total. After converting the previous studies to percentages the three studies seldom differed by more than 5 per cent. "Although additional comparative studies have not yet been completed, the initial impression is that, even with the variability expected due to changes in personnel and programs, the data gathered in the two just described provide essentially the same kind of results."[26]

During the fall term 1970 the Office of Institutional Research surveyed the faculty at Michigan State University to obtain information on faculty time distribution. A return was realized of 2,012 or 90.5 per cent of the regular faculty and 1,232 or 49 per cent of the temporary faculty. The analysis indicated an average work week by rank of 59.1 hours for professors, 58.2 hours for associate professors, 57.8 hours for assistant professors, and 54.2 hours for instructors.

Peltier noted that,

> These values appear to be typical of other universities which have surveyed workloads. The University of Minnesota in the fall of 1969 reported an average of 57 hours per week for all ranks. The University of Wisconsin reported 54 hours per

> week and the institutions in California reported a range of 50 - 71 hours per week, depending on the type of institution and rank of faculty."[27]

This study involved the total professional life of the faculty including teaching, research, and service. The distribution on a percentage basis for all ranks shows 43.8 direct instruction; 4.4, curriculum development; 11.0, additional instruction; 20.4, research; 2.8, public service; 11.7, administration; and 5.9, other.

Faculty activity analysis is increasingly being accepted as a methodology for assessing the activities of faculty in medical colleges. Some of the leading studies include a 1964 study of thirty-nine dental schools, a 1969 study of seven medical centers, and a 1971 HEW study of eleven medical centers receiving financial distress grants. All of these studies used data collected through a faculty activity survey.[28]

Sexson conducted a study on faculty load by employing a letter of inquiry, questionnaire, diary, and personal interviews. He found that none of the seventy-five colleges and universities surveyed had a method or formula for computing load on positively identified load factors. Fifty-two per cent had a policy of assigning the same number of contact hours to all instructors regardless of discipline.

A faculty activity survey was conducted at a college of approximately 300 faculty over the four quarters in the academic year. A random sample of the faculty also kept a diary which was used to verify the activity survey. A personal interview with each faculty member was held after the diaries were completed. Five load factors were identified which included: (1) classroom function, (2) advising students, (3) committee assignments, (4) official correspondence, and (5) special assignments. Research was considered a special assignment and was granted upon presentation of a request to an internal committee. A faculty workload was developed based on the average time for each function as it related to factors of contact hours, class size, number of advisees, and number of committees.[29]

Sullivan compared the bias associated with faculty self-reporting of time and effort through a diary and a questionnaire. As an initial step he surveyed the forty largest universities in 1971 to determine how other universities obtain information on faculty activity distribution. It was found that a mail questionnaire was the most common method of collecting faculty time information.[30]

The results of the poll led to the decision to use a faculty activity survey at Florida State University. Sullivan notes that,

> The reaction to the questionnaire itself, the faculty concepts of the reasons for it, their apprehensions about the uses or the misuses of the data, and their view of the process as a threat impinging upon academic freedom were revealed as real forces at work among the faculty. These factors were seen to be significant and unavoidable forces impinging upon the reporting process.[31]

This study led to the comparison with a diary maintained by forty-eight faculty members. Unfortunately only three categories of instructional activities were examined. It was found that the time reported on the questionnaire exceeded the diary in all three categories. However, there were no significant differences between ranks. That is, rank made no difference in the bias in reporting. There were differences between disciplines with the greatest bias in Arts and Letters.

Sullivan points out that the diary approach is quite costly to carry out and that with substantial savings, and with somewhat less precision in results, one might consider using a questionnaire approach. He goes on to say, "The researcher believes that for most applications it is neither necessary nor desirable to incur the costs associated with obtaining precise estimates of employee time/effort expenditure."[32]

The Pennsylvania State University was required by the 1972-73 Appropriation Act to submit "an analysis of the average weekly workload of each full-time faculty member" along with a series of reports summarizing course credit, student credit hours, enrollment, degrees

awarded, course and section size, and salary costs. A form entitled Analysis of Faculty Activity was completed by each full-time regular faculty member and reviewed by the department heads, deans, and campus directors, to insure completeness and accuracy. The form asked each faculty member to report his average weekly workload in instruction, research, public service, and other activities for summer and fall terms, 1972 and estimated activity for winter and spring terms, 1973.[33]

The composite data for fall term 1972 show a total average hours per week of 50.6 with the average hours and percentage of total for instruction as 27.5 hours and 54.3 per cent, research as 13.6 hours and 26.9 per cent, public service as 3.1 hours and 6.1 per cent, and other as 6.4 hours and 12.7 per cent. In addition to submitting the individual forms and summary reports, interviews were conducted for a sample of the faculty randomly selected from the survey forms. A written summary of these interviews was also submitted to the State.[34]

The state of Tennessee conducted a faculty time distribution for the fall term of 1972 for all of the public institutions of higher education. Bogue, Stovall, and Norman found that there were no major variations in the average hours per week for the four faculty ranks and that the pattern of time distribution was consistent

with general role expectations. The top three ranks spent an average of seven hours per week beyond the 48-hour week in professional but unassigned activities in public and institutional service and research. Instructors spent an additional five hours. It was also found that there was a heavy emphasis on instruction and the faculty were less involved in research and service than in other states.[35]

Eckert reported on a survey of Minnesota institutions. In the spring of 1968 a questionnaire was sent, based on a 20 per cent random stratified sample, to the faculty members in Minnesota's 43 recognized private and public colleges. Of the 1,678 faculty members surveyed, 82 per cent completed and returned the questionnaire.

In the state colleges and private liberal arts colleges approximately three-fourths of the faculty time was devoted to teaching and other instructional tasks, whereas the university faculty devoted slightly more than half of their time to instructional tasks. The other major difference was in research. Forty-five per cent of the faculty in liberal arts colleges said they gave no time to research, whereas the comparative figure for the university was 21 per cent. The median percentage of time spent by faculty on various professional functions is: teaching activities, 64.9; counseling, 9.6; services to student groups, 0; research and scholarly writing, 10.4;

committee and administrative duties, 11.0; and off-campus services, 4.1. Eckert also found that, "Compared with correlate figures for 1956, the four-year college faculty is spending less time now (by 10 per cent) in teaching and somewhat more time (6 per cent) in research."[36]

This finding of Eckert is partially supported by a study cited by Light entitled Careers of Ph.D.'s. He states that:

> From 1940 to 1963, the proportion of time spent on teaching decreased overall from 66 per cent to 50 per cent. Research remained constant at 25 per cent, but administrative duties increased from 8 per cent to 20 per cent. . . . These percentages indicate a reduction in hours spent teaching over three decades, but a change in the total work week is not evident.[37]

Light also cites a study by Parsons and Platt in which they compared the actual use of time and the faculty ideals about time. At every level, faculty desired more time to teach graduate students and to do research, with less time involvement in administration.[38]

One of the significant contributions in the last decade was a report sponsored by the National Science Foundation and the National Institute of Health. This study established criteria for testing and developing the activity categories. The criteria included: (1) consistency with a sound philosophy of university activity, (2) realistic categories, (3) differentiation from the purely personal, (4) consistency with other data systems, (5) fundamental or irreducible categories, and (6) practicality.

The term "full professional life" originated with this report.

> In approaching the problem of understanding, interpreting and measuring the activities of academic/academic-professional personnel, it is important that whatever measures or systems of measurement are adopted be in accord with, if not based on, a sound philosophical understanding of the academic or academic-professional man.
>
> These two types (or perhaps this one type) fall within a roughly recognizable group of people in society called "professional" people. Professional persons play a peculiar kind of role in society. They have a kind of pervasive and general obligation to society which is, in a sense, a public trust.
>
> . . .
>
> In playing this role in society the professional person carries on a wide range of activities. His total activities can be divided into two groups, (1) those which are related to, or in function of, his professional life, and (2) those which are not and which are personal to him, or at least relate to some aspect of his life not part of his professional role. Thus, a physician may have a determinate private practice, do charitable work in a clinic or asylum, sit on local A.M.A. committees, work in public health education programs, and advise national bodies. All these activities relate to his professional role and these activities, plus all like them, constitute the full professional life of the doctor. They can rather easily be distinguished from the purely personal phases of his life. His picnicking with his family, his fishing, his interest in rare stamps or rare steaks--all such matters are personal to him, not professional.
>
> It is important, therefore, that both the professional person himself and those dealing with him, either as an active participant in an operational setting or as an abstraction in a theoretical theme, should think of his professional activities as organically interrelated, as a totality of activity. This totality we here refer to as his "full or total professional life."[39]

The most recent significant impetus given to faculty activity analysis is from the National Center for Higher Education Management Systems (NCHEMS). The

purposes of the faculty activity project at NCHEMS are to develop techniques for collecting data and to standardize procedures for analyzing faculty activity.[40] Thus far the center has published an overview of faculty activity analysis and a preliminary unedited draft of a procedures manual has been assembled.[41] The procedures manual will be published in the fall of 1973 followed by an analysis manual. The questionnaire used in this dissertation was developed and pilot tested by this organization.

Cautions and Observations

Although faculty activity analysis has a relatively long history and is becoming increasingly useful, not everyone supports the concept. "Some feel that the teaching profession is lowered in dignity and prestige when the service loads of its membership are subject to such an evaluation."[42] Even though Toombs supports the concept of faculty activity analysis,[43] he points out that higher education is classified as an industry considered to be "labor intensive." This means that the personnel represent a large part of the operation. Although most service industries are in this classification, colleges, hospitals, and to some extent government, with their large professional staffs, are often distinguished within the classification.[44] He further states,

> It is not only labor intensive but also "quality intensive." That is to say, the way in which education is carried out has qualities that must be preserved. How it is done, what happens between input and output, is the heart of the matter. Earl Cheit and others have used the analogy of the symphony orchestra, also a labor intensive and quality intensive organization. The orchestra is limited in how many engagements it can play per week before its repertoire deteriorates and the performance declines. It cannot play faster or louder. The number of members cannot be increased to 200 to yield more output. In short, the quality of the process itself, not just the outcome, is a part of "production."[45]

Dodds suggests that there is a certain incompatibility between "economy and efficiency" and the inspired teacher.[46] Although Bailey recognizes the importance of efficiency, he believes, as most authorities do, that it can be over emphasized.

> Our supreme function is not to improve managerial efficiency in education. We cannot countenance obvious waste, and we have obligations to the public to see that money is not used frivolously. But our supreme obligation is to remind ourselves and our public and private benefactors that a partially unquantifiable and inherently untidy system of higher education must routinely make legitimate demands upon the treasuries of the purse in order to nourish the treasuries of the mind and spirit. For freedom is the condition of nobility, and knowledge is the condition of freedom.[47]

Etzioni and others have demonstrated the professional status of college teaching[48] and because of the very nature of a professional organization, change, if it is to result, must be produced by the faculty. Simonds argues that all of the effort toward increasing faculty productivity has failed to include one essential component--the faculty member. It is his position

that faculty members need to be given incentives for finding new ways for increasing their productivity. In industry several approaches have been used to enlist the minds of the employees. "Among them are 1) a guarantee that no one will be laid off as a result, and 2) provision for reward to individuals for the improvement." This reward is usually a percentage of the first year's savings resulting from the change or a profit sharing such as a bonus to all the workers based on a ratio of labor costs and total sales. Executives often are rewarded with bonuses, salary increases, and promotions in return for their efforts toward increased productivity.[49]

It is not enough to develop better methods of educating students, the faculty need to be convinced that it is in their best interest to make use of the new methods. Ruml believes that the faculty lack the necessary information to cause them to respond positively.

> If information about teaching loads, course offerings and enrollments is available to administrative officers, it is not 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.[50]

The lack of productivity increase in higher education has been well documented by O'Neill. Historically, most industries in the American economy have increased

steadily their productivity per unit of input. However, higher education has not done so well.

> Between 1930 and 1967, instructional inputs and credit hours appear to have increased more or less proportionately. If growth in credit hours is a reliable indicator of growth in real instructional output, then there is the strong possibility that there has been no productivity change in the production of higher education over the time period--and this despite the very rapid growth rates in higher education.[51]

A change has been called for by several writers including Reeves, Russell, and Dressel in the plan for administering the faculty workload whereby each faculty member would normally be given a teaching assignment to occupy his entire working time, but he would receive release time from teaching while involved in research and administration. The amount of release time would be a matter of individual adjustment. Under this plan the distribution of faculty time would be fixed administratively.[52]

Millett has made some more general recommendations based on the financial pressures higher education is facing. These include: (1) preparation for a slower rate of growth, (2) more attention to cost reduction through increased faculty instructional loads, and (3) more self-consciousness about their academic planning and about the management of their resources.[53]

Faculty activity or workload studies have been used for assessing productivity, effectiveness, and

efficiency. The limitations discussed in this chapter need to be kept clearly in mind as this method of data collection is utilized. The faculty activity survey can be a meaningful instrument for planning and for costing. Misused or misunderstood, it can be destructive; but if wisely used it can be constructive. John Dale Russell states:

> A vital issue is at stake. If unwise formulas, standards, or other measures are devised and employed, great damage can be done to higher education. At the same time, unnecessary and ill-founded opposition to the use of any measure, no matter what its form, is a barrier to good government and the pursuit of excellence in public services. Good will alone won't solve the problem. What is necessary is thorough analysis and clear thinking as a basis for consensus.[54]

Costing Methodology

The term "cost" has several different meanings.[55] McConnell states that the economist's notion of costs is built upon the fact that resources are scarce and they have alternative uses. Thus cost in an economic sense implies missed opportunities or foregone alternatives.[56] The American Institute of Certified Public Accountants define cost as the "amount, measured in money, or cash expended or other property transferred, capital stock issued, services performed, or a liability incurred, in consideration of goods or services received or to be received."[57] Business managers, in addition to

economist and accountants, have made use of costs. Moore and Jaedicke state,

> Costs are important in the income measurement process, but they are also important because of their value to management in controlling and planning business operations. Costs can be defined in various ways, and cost data can be rearranged or adapted to serve different purposes.[58]

In general financial accounting costs are reported in the aggregate; but in unit cost studies in higher education, as in cost accounting in business, the costs are broken down on a unit basis. Horngren states that,

> A unit cost is calculated by dividing a total cost by some related base. A unit cost is a useful communicative device because it often expresses costs as they are best understood. . . . Generally, unit costs should be expressed in terms most meaningful to the people who are responsible for incurring the costs.[59]

The National Center for Higher Education Management Systems defines cost as, "The measure in dollars of institutional resources used in the process of providing institutional outputs during a given time period."[60] It is apparent that there is no established definition which extends across all institutions which make use of the term. It is also clear that costs must be understood in relationship to the purposes for which they are to be used.[61]

Although the American Institute of Certified Public Accountants will be publishing a document in the next few months entitled Audits on Educational

Institutions, they have published very little directly related to educational institutions.[62] They have, however, made use of College and University Business Administration, a manual revised in 1968, which attempts to bring standards to the accounting and financial operation of higher education. This manual represents a consensus among the college and university business officers. It defines principles and procedures for fund accounting in higher education.[63]

It has been pointed out by several writers, including Cavanaugh, Jones, and Withey, that the fund accounting procedures of higher education do not provide an adequate way of identifying the resources used in different activities.[64] Withey states that,

> There has been growing concern in recent years that reporting of expenditures on a natural or objective classification by nonprofit organizations does not present a meaningful statement of stewardship. Any substantial organization which reports to the public only in terms of salaries, rent, telephone, travel, supplies, and so on, is not informing its readers on the real activities of the organization. It should be obligatory to inform the public of its expenditures in terms of program, project and management functions.[65]

Collier points out that now institutions are being asked to report in terms of a broader concept of accountability than simply their fiduciary responsibility. The public wants to know what was accomplished with the dollars received, not simply, were the dollars spent on the activities for which they were given.[66]

Early History

Doi traces the concepts of "course offerings," "class size," "teaching loads," and "instructional costs" to the ancient teachers. The professors of the medieval universities were quite concerned about class size, since their pay usually was determined by the number of students they served.[67] Sherer noted that unit instructional costs were being developed in this country as early as 1894.[68]

John Dale Russell, in The Finance of Higher Education, traces the historical development of attempts at standardizing income and expense accounts. The first major contribution was in 1910 by the Carnegie foundation. In its annual report, they made a series of recommendations for improving financial reporting. The second land mark was in 1917 and became known as the Christensen report. It was a committee report on uniform classification of expenditures of the Business Officers Association of the Middle Western Universities. The third major contribution was the work of Arnett in 1922 which called for a separate fund for endowments and plant. The fourth land mark mentioned by Russell was the 1935 National Committee on Standard Reports. Only the 1935 study dealt with unit costs.[69]

One of the early attempts in research on unit costs in higher education was conducted by the Educational

Finance Inquiry Commission and published in 1925. The commission was organized as a result of a meeting of the Department of Superintendents of the National Education Association and it was funded by several foundations. The unit of study was mainly the student clock hour defined as one hour of instruction for one student. The conclusions and findings of this commission with respect to unit cost studies were the following:

1. That there is a need of systematizing the accounting method of higher education as a basis for intelligent and effective economy in internal administration.
2. That there is a need of differentiating between instruction and non-instructional service, such as research and extension.
3. That unit costs of instruction point to ways and means for promoting economy.
4. That the unit costs of the same kinds of work in different institutions tend toward similar levels.
5. That the unit costs in curricula and in departments with small enrollments will tend to be high.
6. That the purpose of unit costs is to make more effective the work of higher education.
7. That unit costs have decreased during the recent period of increasing enrollments.
8. That demands for better service will, in the next few years, tend to increase costs as the equipment catches up with the enrollment.
9. That the unit-cost figures are needed to permit the claims of higher education to be presented to the public in terms of service.
10. That there is a need of standardizing the financial accounting of the institutions of higher education in order to make possible satisfactory cost comparisons and judgments based on such comparisons looking to wise public policy with reference to the support of higher education.
11. That such work should be undertaken and developed by a representative agency such as the American Council on Education.[70]

Ten years following this commission another major publication was released. It was an attempt at

standardizing costing methodology by the National Committee on Standard Reports for Institutions of Higher Education in 1935. This report was later reprinted by the American Council on Education for use with College and University Business Administration. Some of the purposes of unit cost studies and the methodology utilized were discussed in the report.

> If properly conducted, cost studies should be of value in the internal administration of educational institutions. The determination of costs may well be considered one of the first steps in a complete analysis of the administrative and financial practices within an institution. Variations in costs between departments of instruction, schools and colleges, curriculums, and levels of student achievement, or variations in costs for the institution as a whole over a period of years, should lead at once to a further examination of enrollment, size of classes, number of faculty members, teaching loads, salary schedule of faculty members, curricular offerings, and efficiency of use of the facilities of the educational plant.
>
> Unit-cost studies, furthermore, may be of value in the determination of the rates of student fees, in the preparation of the budget, in educational surveys, in the accreditation of educational institutions, and in the determination of desirable reorganization within an institution or within systems of higher education.[71]

Since 1935 some individuals in higher education have come to realize the important uses that industry has made of cost accounting. Much of the increased productivity can undoubtably be linked to the costing methodologies developed.

Higher education has in the past found it easier to engage in fund raising than to examine its operations to discover places where savings could be achieved.

However, it is interesting, but not unexpected, to note that higher education has historically turned its attention to finance and cost studies when the country was experiencing economic depression. Of the six studies mentioned in this section, four of them, 1894, 1910, 1922, and 1935 were during depression years.[72] Only the studies of 1917 and 1925 were during economically good years; and of these, World War I would have cut enrollments making 1917 a financially difficult year.

Russell notes that not much was accomplished in the 1940's. The Financial Advisory Service of the American Council on Education was discontinued and by midcentury standardization appeared to be a "distant, though desirable goal."[73]

Recent Studies

Of the cost studies conducted in the last twenty years, one study which continues to be cited was a cooperative venture of ten universities which is sometimes referred to as the "council of ten study." The California and Western Conference Cost and Statistical Study for the Year 1954-55, under the direction of William T. Middlebrook of the University of Minnesota, concluded among other things that (1) cost per student is affected by the composition of the student body, instructional level, curriculum, and so on: the "student mix," (2) other factors are of greater

importance than teaching salaries in relation to cost per student, and (3) although methods of instruction definitely affect cost, it is in terms of their influence on class size, teaching load, and other cost factors.[74]

Regrettably, this cost study and others[75] have disseminated the idea that the product of higher education is the environment produced.[76] The environment is not the end but only a means to an end. It is the educated student that is the product of higher education.

Doi classified cost studies into two categories, "a) those that are limited only to salaries paid persons who actually taught a class or classes during a given term or year, and b) those that attempt to take into account not only salaries for teaching but also expenditures for instructional supplies, faculty benefits, secretarial and clerical services for faculty members, and for other items directly related to the function of instruction."[77] Of the two classifications, Tydall and Barnes argue that allocation of salary costs only is preferred for the inclusion of indirect costs may make the results less useful.[78]

Hull and McWhirter conducted a cost study in 1962-63 at Indiana University using a faculty activity survey to determine the cost per student by class level. To allocate salary to each course taught by the faculty member, a ratio of time spent on each course to the

total work week was made and multiplied by the salary paid. The salary was then allocated to each student in the class by class level to produce a cost per student.[79]

A cost study which used a faculty time allocation survey was also reported by Hubbard. The three basic steps in allocating cost to courses were: (1) determine time allocation, (2) convert time reported to a percentage basis, and (3) multiply the percentage of time for each course by the appropriate individual's salary.[80]

He noted that there was some apprehension in allowing faculty to allocate their time among the functions. "The reporting of suspiciously high percentages of time to 'filling out questionnaires' by a couple of faculty members suggests that the concerns were not unfounded." It appeared that faculty became increasingly accurate in their judgments of the percentage distribution as they made the judgments over several terms.[81]

In one of the better methodology allocation studies, Bogue compared the effects of allocating instructional salaries based on course credit and based on faculty time. He found that there is a tendency toward higher student credit hour costs at the doctoral level when faculty effort is the basis of allocation as opposed to the course credit value. This

cost study conducted at Memphis State University in 1970 also found that there is a definite stairstep increase in unit costs when allocation to instructional level is based on course number rather than student classification.[82]

This study resulted in the development of a more complete program of academic management at Memphis State University, one which, in Bogue's words, "will a) permit the identification of faculty resource potential, b) make clear the pattern of faculty workload assignments, and c) provide bases for qualitative assessment of both personnel and program performance."[83]

Anderson studied the relative influence of selected factors upon instructional unit cost of higher education. The factors included in the study were: individual institutions, institutional types, faculty rank, class size, level of instruction, type of instruction, and subject field. Only one costing methodology was employed which reduced the data to the mean unit instructional costs which were then tested for significant differences. Anderson found that,

> Statistically significant differences existed between the subdivisions of each of the selected factors. University-type institutions incurred costs 1.6 times greater than those of the state colleges and municipal institutions which were comparable. Class size costs were inversely proportional to class enrollments. Level of instruction differences approximated a 1:2:4 ratio for lower, upper, and graduate divisions, respectively, although the non-state universities had

> lower ratios at the graduate level. Lecture-discussion type of instruction, by far the most popular, was also least costly with a unit cost .7 of laboratory-type costs and .2 that of "other" modes of instruction. Subject field costs varied to the extent that the one extreme was less than half the other. The specialized subject fields of agriculture, art, engineering, and law comprised a costly group while the more universal offerings of social studies, business, science, and mathematics were least expensive. A median group included the humanities, home economics, and education.
>
> Individual institutional and faculty rank differences were less strong and were overshadowed by more powerful factors in several of the analyses. Only the state universities showed regular cost differences among the several ranks and institutional type differences tended to outweigh individual institutional differences.[84]

Siegel reported that during the fall term of 1964 and 1966 the University of Oregon was the subject of a pilot unit cost study. Built upon a "course enrollment matrix," costs were developed on a course basis using only faculty salaries. This direct salary cost is allocated to each course based on university reports of the faculty members' distribution of their teaching time. These costs were then allocated by student level. In this study Siegel found, among other things, that, (1) the average cost per course taken rises with the level of student, (2) there is great variability in average cost per course, (3) there is a lack of flexibility of resources in a university, and (4) rigidities limit the reallocation of existing faculty and necessitate a more optimum allocation of new staff members.[85]

Witmer conducted a unit cost study of the state universities in Wisconsin in 1966-67. After comparing the cost per credit between the state universities he concluded that since the large universities had a lower cost per credit than the smaller universities, the economy of scale was operating.[86] However, at least one of those small universities in the Wisconsin system, Stout, has a highly specialized curriculum. Witmer failed to note that the academic mission of an institution may be just as important as size in cost relationships between institutions.

The Oklahoma State System of Higher Education developed a teaching load and cost study based on the number of semester hours of classes taught. However, they did recognize that this measure may not adequately reflect the actual teaching load since the methodology did not consider actual time or contact hours. The analysis was aggregated on the three academic levels--lower division undergraduate, upper division undergraduate, and graduate--so comparison between institutions could be made by level of instruction. Instructional salary costs were examined with the suggestion that salary costs could be reduced by (1) filling vacancies with individuals of lower academic rank, (2) limiting courses, which forces students into fewer courses

thus raising class size, and (3) absorbing additional students without adding faculty or courses.[87]

Adkins examined the volume and cost of instructional services in the colleges of Virginia. In this cost study costs are allocated on a student credit-hour basis without reference to student contact hour or clock hours. Only faculty time devoted to teaching is included, other functions have been excluded based on the institution's allocation of their faculty members' time. Allocating student credit hour costs by student level and by course level revealed that "the two methods result in substantial differences for some institutions while the differences at others are slight."[88]

Scheerer developed a formula to produce a cost per equivalent student credit hour. The formula takes into consideration the level of instruction by assigning weights which represent the collective judgment of the deans as to the relative demand on faculty time. Additional direct and indirect costs are included to give a complete cost figure. Unfortunately, the formula was not built upon research data and it ignores other variables such as contact hours, class size, faculty rank, and so forth.[89]

Peltier and Ingall examined degree costing for the Michigan Council of State College Presidents. They suggested that one alternative to degree costing is to

track individual degree recipients through their course work and accumulate the costs by course, the total of which would be the degree cost. The basic requirement is differential cost data for each course based upon student credit hours (or some other unit) if equal expenditures for all levels are to be avoided. This presents several problems, including the actual tracking of students through the courses. After conducting a pilot study, they came to the conclusion that "the pattern of cost per degree is influenced by the choice of programs, as well as the design of the alternative procedures."[90]

Austin conducted a degree costing study in the College of Education at Michigan State University which included five component cost categories: (1) instructional costs, (2) faculty support costs, (3) research costs, (4) space costs, and (5) administrative costs. The dollar costs for the B.A., M.A., and Ph.D. were calculated and then they were used as the dependent variables in a multivariate regression analysis to test the hypothesis that the following factors would explain the differences in degree program cost: (1) class size, (2) level of study, (3) curriculum, (4) number of College of Education student credit hours in the degree program, and (5) ratio of graduate to total student

credit hours in the degree program. Each of the factors were found to be statistically significant at the 5 per cent level.[91]

The lead article in the first publication of a new research journal in higher education involves the use of a faculty activity survey and cost studies. Yet this research does not compare methodologies, but simply adopts an approach for degree costing. In this article Blackburn and Trowbridge reported on their research of faculty workload and cost analysis with the unit of study consisting of a Ph.D. degree. Through a faculty activity survey, time was allocated to the production of a Ph.D. The authors note in conclusion that there is no evidence of the faculty falling short with regard to accountability. "They are hard at work, a number of hours exceeded by no other occupation."[92]

Stuart examined three representative types of formulas used in state-wide budgeting to determine which procedures might be relevant and appropriate for improving the internal budgeting process of academic departments. Using fifteen departments at Michigan State University and data derived from the 1962-65 records of the Office of Institutional Research, he found that,

> The variation in budget projections derived from different combinations of objective procedures and various combinations of normative data indicate that the degree of equity achieved depends upon the

way in which workload is defined and measured. For some departments it makes little difference which procedure is employed, but for certain departments the budget allocation resulting from the application of objective procedures varies considerably, depending upon whether objective measures of departmental input or output are the primary determinants of staffing requirements.

. . . . . .

The results of applying state-wide budget procedures to the internal budgeting of academic departments seems to indicate 1) that university budgeting can be moved in the direction of greater objectivity and equity through the selective application of various types of formula or cost analysis techniques; 2) that a more rational approach to effective resource allocation and utilization is possible with objective budget procedures than with traditional budget approaches; 3) that given adequate study and careful testing, objective procedures can be developed to the point where they are both sensitive to departmental differences and flexible enough to accommodate the inevitable changes that occur from year to year in any dynamic institution; and 4) that by making explicit the various relationships that enter into resource utilization, more effective management of resources and better evaluation of management effort are possible.[93]

Selected Variables and Relationships

Whether there are severe external pressures or not, higher education should be interested in maximizing the use of its resources. Unfortunately the organizational structure and patterns in higher education do not lend themselves to cost cutting and retrenchment. Decision by consensus is a tradition in the management style of college administrators and faculty. New special interest groups are emerging such as minorities, women, and the bargaining units for faculty, all of which are insisting upon a voice in decision-making. The input from the

academic side of higher education, no matter how slow and indecisive, must be maintained if the quality of higher education is to be maintained.

Balderston believes that,

> We are beginning to develop a new breed of analytically trained persons who can operate with some grace at the crossing points between the academic and the administrative sides of our institutions. There is a considerable way still to go, both in developing the techniques of cost analysis and in finding ways to weave into the pattern of decision the systematic judgements of educational effectiveness that are needed from the teachers and scholars in each discipline and profession.[94]

One of the outstanding contributions to the literature on cost analysis in higher education was written by John Dale Russell and James I. Doi and published in a series of twelve articles in College and University Business between September, 1955, and August, 1956.[95] They recommend nine kinds of data for examining the efficient use of faculty.

(1) Extent of different courses taught;

(2) Semester hours of classes taught;

(3) Student credit hours produced;

(4) Percentage of credit hours taught in small classes;

(5) Credit hours taught in unneeded duplicate sections;

(6) Unnecessary repetition of courses during the regular academic year;

(7) Average (weighted) size of classes;

(8) Average student credit hours produced per full-time-equivalent faculty member;

(9) Instructional salary cost per student credit hour produced.[96]

They believe this data will provide the necessary information to examine the cost factors related to proper utilization of faculty. The use of faculty manpower is the most relevant factor in measuring economy.

Kettler suggests several factors which offset instructional costs. Some of these factors are: (1) the scope and type of the educational program, (2) the distribution of faculty time, (3) the level of instruction, (4) faculty rank, (5) class size, (6) teaching load, and (7) the general level of faculty salaries. It is Kettler's opinion that, "these factors affecting costs are so inter-related that each must be considered separately and in relation to all other factors if an accurate cost analysis is to be made."[97]

Several units have been used in unit cost studies. Perhaps the most common unit has been the credit hour. Just how representative this unit is of academic output has been questioned.[98] McGrath states that, "One

accepted index of instructional costs is obtained by dividing total expenditures for full-time faculty salaries by the aggragate number of student credit hours of instruction given."[99] Toombs challenges the use of student credit hours, or other similar factors for two reasons. First, it suggests that faculty only teach and it ignores other areas such as research and public service. Secondly, it confuses instruction and learning, since activity outside the classroom may contribute to learning.[100] Other units that have been used are the contact hour,[101] the degree,[102] the student,[103] the class,[104] the matriculated student,[105] and the program.[106]

In addition to the units already discussed, other factors are often considered as variables of costs. Evans and Hicks state that, "Any discussion of the major factors affecting instructional costs would necessarily include faculty teaching loads, faculty nonteaching functions, class size, salary analysis, and other instructional department expense analyses."[107] Tydall and Barnes argue that the most important single determinant of instructional cost is salaries of the teachers.[108] Reeves found that class size was not a major factor, for as class size increased from nine or less up to thirty, there were only moderate increases in time required for the course. Beyond this point there was no increase.[109] However, McGrath found that institutions

with relatively small class size had a relatively large teaching load.[110]

Method of instruction is a major cost factor to Ruml and Morrison. They state, "The selection of the most effective and efficient methods of instruction is a matter of overwhelming importance to the liberal college since, at any level of tuition income, faculty salaries are sharply affected by how the curriculum is administered."[111] They recognize that class size may determine the method of instruction.

Eckert reviewed the pertinent research concerning the relationship between class size and instructional quality and concluded that, in general, large group instruction is as effective as small group instruction as reflected in student achievement.[112] An increase in class size would decrease the cost per student and this does not necessarily mean a reduction in instructional quality. Ikenberry states that,

> Quality can be sacrificed on the altar of instructional economy if (1) faculty salaries fail to receive adequate increments; (2) faculty members are requested to teach an increasing number of classes and also expected to perform creditably many other functions such as student advising, research, committee work, and public service; and (3) large group instructional methods are used irrespective of educational objectives and subject-matter requirements and merely because a large group of students is enrolled and available for instruction.
>
> Instructional quality, on the other hand, can be increased and costs of instruction controlled when curriculum reorganization reduces the number of courses, so that (1) institutional objectives can

> become useful guides in the selection of educational experiences; (2) educational experiences can be better integrated, both during a single point in time and over the four years of college; and (3) the majority of courses enroll a sufficient number of students to allow a choice of instructional method when all factors, including costs, are considered.[113]

Dressel suggests that, if course proliferation is stopped as a result of a decrease in educational costs, then the effect may even be an improvement in education.[114] It appears that course proliferation and class size are two areas where significant savings are possible.[115]

Saupe reported on a study of the relationships between selected variables and the amount of total time devoted to instruction as assigned by the department chairmen. He found correlations between time and the following variables to be: credits, .28; student credit hours, .40; class hours, .32; student class hours, .46; and enrollment, .33. In addition he found faculty rank had a negative relationship with: (1) percentage of time assigned to instruction, (2) class hours, (3) enrollment, and (4) student credit and class hours.[116]

Alternative Management Tools

Berdahl distinguishes between cost analyses and formulas by stating, "cost analyses are attempts to measure past actual costs per unit . . . by dividing total institutional expenditures into various cost categories; whereas formulas are attempts to estimate future fiscal needs on the basis of certain assumptions about

enrollments, faculty/student ratios, average teaching salary, ratios of instructional expenses to other institutional outlays, etc."[117]

Formula budgeting has been one method used in statewide allocations to higher education. Rourke and Brooks note that while cost analyses are extremely useful for internal management, they are used less frequently than formulas for external budgeting at the statewide level.[118] James Miller, who has made the major contribution to the research in this field, states that,

> . . . the greatest single limitation of formulas and cost analysis procedures is that they cannot make policy. . . . The intervening value judgements--the policy decisions--must still be made by responsible individuals: higher education officials, state fiscal officials, governors, and legislators.[119]

It has been generally agreed, that formulas used in the analysis of budgets are useful if: "(1) their purpose is clearly understood; (2) they are based on adequate, dependable data concerning institutional activities and the context in which institutions grow and change: they are sensitive to differences, and are subject to change when change is required; and (3) they are applied with good judgment and are acceptable to parties concerned with their use."[120]

One of the alternatives to unit cost studies for resource allocation is internal pricing. Breneman, in a report describing the proceedings of the "Conference on Internal Pricing" held at Berkeley in July, 1971,

stated that, ". . . it should be clear that internal pricing is not synonomous with cost accounting."[121] The theory of internal pricing is built upon the economic principles of the interaction of the market place.

> Each department "earns" a budget based upon the value of its output (measured by a schedule of internal prices), and uses this budget to purchase resources, internally priced at opportunity cost. Each department has an incentive to minimize costs for any level of output, since it seeks to maximize output from available resources in order to increase its budget.[122]

This theory is sound and supported by a significant base of research in economics. However, there are several problems in applying it to higher education including the inability to define and measure outputs and the inflexibility due to tenure. It may have some value in simulations after some solutions are found to some very real problems.

Another alternative which has received much discussion in the literature in recent years is (PPBS), planning-programming-budgeting systems. Judy believes it can "substantially contribute to the efficient allocation of resources in higher education."[123] Weathersby and Balderston state that,

> The key conceptual components of a PPB System are: systematic long-range planning (5-15 years) which clearly articulates objectives and carefully examines the costs and benefits of alternative courses of action which meet these global objectives; a selection process for deciding on a specific course of action (1-5 years) in objectives (programming); translating these decisions into immediate

> (0-1 years), specific financial, manpower, and policy plans (budgeting); and recognizing a multi-year planning horizon and incorporating to the fullest extent possible the total long-term costs and benefits attributable to each course of action.[124]

The application of PPBS at the University of California was not totally successful. The political considerations took over and the emphasis became one of input-control rather than output. However, " . . . it contributed to, but was not necessarily the controlling influence on, the policy decisions that were made."[125] Weathersby and Balderston stated that, to their knowledge, "a total, comprehensive implementation of PPBS has not been achieved in any college or university in the United States."[126]

Related to PPBS is the work being done in mathematical model building. Koenig developed one of the more comprehensive and often cited management systems for higher education. He states that,

> The objective of the development is to structure a mathematical model of an educational institution that will provide the "logic" of information processing programs to aid university administrators in the overall allocation of resources. . . . The model itself, then, consists of sets of equations which describe the relationship of resources to production, and, based on these, the associated unit costs of production. It is therefore a mathematical description of the way the university utilizes its resources in production. The resources of the university are described, broadly, as personnel, space, and equipment. The products are identified as developed manpower, research, and public or technical services.[127]

Basic to the systems approach to management is the concept of cost-effectiveness, relating inputs and outputs.[128] This has also been referred to as the value-added. To determine what an institution does for its students requires knowing their condition as they enter and leave. The value-added is assessed and a cost per unit of value-added determined.[129]

All of the alternatives discussed in this section are built upon some costing methodology. The way costs are defined and allocated varies but each approach requires some methodology. Unfortunately, with all of the literature in costing, there is little research in comparing the effects of different methodologies.

Advantages and Disadvantages of Cost Analysis

The advantages of cost analysis in higher education has been cited by many writers. It has been suggested that cost analysis could be used for evaluating efficiency and economy, comparing purposes internally and externally, studying alternatives, reporting to legislators and others, justifying the fees charged, budgeting, program planning, assisting in policy modification or formulation, evaluating different methods of instruction, answering questions on costing methodology, introducing logic rather than snap judgment into decision making, and serving as an indicator where thought is needed.[130]

Although generally supportive of the need for analysis, the weaknesses, pitfalls, and disadvantages of cost analysis have been expressed by several writers. Cooper says, for example,

> Preoccupation with detail and accountability takes the vitality out of administration, and creative dreams are drowned out, leaving only a shell without life, direction, or purpose. . . . And some in administration have found a certain kind of safety in their retreat from responsibility, a retreat behind the curtains of electronic gadgetry and technical detail.[131]

Johnson points out that, "The 'human' element of management is still a prime ingredient." Systems are necessary for complex organizations, but " . . . they are not in and of themselves a substitute for effective leadership."[132]

Although he sees the need for unit cost studies, Logan Wilson emphasizes caution in how cost data are used.

> The use of averages as norms, for example, carries with it the virtue of standardization, but it also may lead to the vice of leveling down to mediocrity. . . . When applied indiscriminately, without regard to institutional differences in role and scope and heedless of quality, they can nullify the meaning of the one adjective in the phrase "higher education."[133]

The disadvantages mentioned by the writers in the field are varied. Some writers mention that cost studies lack accuracy, may imply cost is the most important aspect, are opinions not facts, are crude instruments, are partial measurements, are quantitative rather than qualitative in nature, often are not pointed toward

specific objectives and thus waste time, may lead to excessive zeal at reducing costs, and are vulnerable to misuse and misinterpretation.[134]

John Dale Russell succinctly stated his position with regard to the use of cost analysis in higher education and it best represents the consensus today.

> It is the considered judgment of the writer that the calculation of unit-expenditure data has a distinct place in the administration of higher institutions. The data must, of course, be treated somewhat cautiously; but this is true of almost every kind of factual data used in administering a college or university. Unit costs cannot be considered a substitute for administrative intelligence. As the financial reports of institutions take on a larger degree of uniformity than they have displayed in the past, an increased use of unit-expenditure data may be expected. The result may well be an improved efficiency in the operation of American colleges and universities.[135]

Comparison of Dissertation and Literature

A perusal of the cost analysis literature in higher education reveals several phenomena including the following:

1. Authorities recognize the need to examine costing methodologies, but they are quick to mention the limitations.

2. There are several cost studies, each with its own methodology; but a serious lack of comparative analysis of methodologies is evident.

3. There are several variables considered individually to be significant cost factors, but little comparison is being done with different costing methodologies.

4. Faculty activity surveys have been in the literature for a long time, but they are just now emerging in general acceptance and application.

What is needed at this juncture in the development of cost analysis is a study to compare the several costing methodologies. This dissertation has the major objective of comparing four costing methodologies used in allocating costs to courses in conjunction with examining the importance of several variables of cost under each of these methodologies. Therefore, this research has some elements in common with previous research. The four costing methodologies used in this study have been previously employed and reported in the literature. This study will use a common set of data to compare the four costing methodologies and the relative importance of several variables of cost.

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CHAPTER III

RESEARCH DESIGN

Summary of the Rationale for the Study

Effective resource projection and allocation requires a thorough analysis of the faculty activities and their related costs. Wise use of faculty is a major responsibility of college and university administrators. Evans and Hicks remind us that, "Faculty teaching load is unquestionably the most important factor influencing instructional costs and therefore should be subjected to careful periodic analysis."[1] The control of instructional costs requires the identification of the major variables of costs and their interrelationships. Yet, costing methodologies have lacked a thorough examination to assess just what results when different methodologies are employed. To generate a cost figure is not sufficient when it is realized that the costing methodology will, to a great degree, determine that cost figure. What is needed is research which will inquire into the nature of the costing methodology used for allocation of costs to the individual units chosen.

Purposes of the Study

The purposes of this study were the following:

1. Develop a faculty time allocation profile by department and rank of the major activities in which the faculty participate; assign costs to these activities based on the allocation of time as determined by a faculty activity survey; and examine the interrelationship between several workload factors.

2. Compare four costing methodologies as a basis for examining the relative importance of some major variables in determining instructional costs and for considering their interrelationships.

This was a descriptive study which considered the major faculty activities of one college at Michigan State University. The intention of this study was to consider different costing methodologies and the importance of five major variables in determining costs. Most cost studies concentrate on arriving at a final figure, but few try to determine the reasons for a particular figure appearing as it is reported. This study not only generated costs based on different methodologies; but it also explored what type of differences, depending on the methodology employed, resulted in several independent variables.

Research Objectives

The objective of this dissertation were divided into two parts. The first was to examine the inter-relationships of selected instructional workload factors through determining the distribution of faculty time among several activities based on the salaries of the faculty. The profile analysis was developed by department and by rank.

The second objective was to compare the four costing methodologies used in allocating costs to courses. This comparison was not only based on the costs generated per course, but also considered the differences in selected variables of costs and the respective costing methodology. The comparison was made by answering the following research questions:

1. Is there a relationship between each independent variable and section cost for each costing methodology?
2. What is the relative importance of the independent variables for each costing methodology?
3. Under which costing methodology do the variables explain the greatest amount of the variance in the costs?
4. To what extent is there agreement in the rank ordering of independent variables across the costing methodologies?

Parameters of the Data

The population from which the data were drawn for this study were the faculty and course offerings of one college at Michigan State University. This college offers the Bachelor of Arts, Master of Arts, and Doctor of Philosophy degrees. Composed of five departments, it is diversified in both the nature of its departments and course offerings. It ranges from nonlaboratory departments to more scientific laboratory departments, and from the lower undergraduate courses to the advanced graduate programs. Some faculty and departments have gained international recognition for the contributions they are making to their field.

There were fifty-one full-time faculty members who taught during the 1972 fall term. They were all included in the faculty activity survey which was the method for collecting the research data. The part-time faculty were not included since the focus of this study was on the regular full-time faculty. All of the full-time faculty were within the ranks of instructor, assistant professor, associate professor, and professor, except one. There was one full-time lecturer who was considered an instructor for the purposes of this study. Although graduate assistants were excluded from the profile analysis, they were included as a cost factor in the costing methodology portion of the dissertation.

The salary for the graduate assistant was allocated to the course section based upon what the faculty member reported as the graduate assistant's total hours spent on the course.

Although some of the data can be verified with the records of the Office of Institutional Research, much of the data is a reflection of the faculty members' perception. Therefore, the data used for analysis reflects the faculty members' view of their workload with regard to activities and the distribution of the several variables.

Costs for this study were limited to salary expenditures; thus supplies, equipment, and capital outlay were excluded. The human resource is the major cost element of higher education and therefore has the greatest influence on the financial operation. Dressel and associates emphasized this point in The Confidence Crisis when they said, "Since salaries account usually for seventy per cent or more of departmental expenditures and represent that aspect of expenditures which is most immediately subject to modification, emphasis on personnel time and salary expenditures is the key to management."[2] A major thrust of this study was to examine the costing of faculty resources, and therefore salaries are our primary cost consideration.

Data Collection

A faculty activity survey of each faculty member in the college, which is the most predominant method for gathering data,[3] was the means for collecting all but the salary data. The survey was conducted during the 1972 fall term.

Over a period of several months the Office of Institutional Research staff and the advisory council for the college had been considering approaches to research within the college which would provide meaningful data for a cost study. The college faculty, representing five departments, received their forms during November 1-10 and were asked to return the completed forms to their respective chairmen by November 16. The survey forms were distributed by the chairmen of each department. The questionnaire which was used is entitled Faculty Activity and Outcome Survey[4] and was designed by the National Center for Higher Education Management Systems. Financial data from the Office of Institutional Research were used in conjunction with the data provided through the questionnaire. Although it is estimated to require one hour to complete the questionnaire, a very high return was expected since this was a faculty initiated study and they were very interested in examining the allocation of their time and the associated costs. The questionnaire permits a wide

range of activities to be included, thus facilitating a comprehensive look at the total faculty activity as it relates to time.

Although Campbell and Stanley in Experimental and Quasi-Experimental Designs for Research[5] present a series of factors which can jeopardize the validity of various designs, for this research two appeared to be of real concern. Since some of the data were collected by a survey, it was possible that a self-selection factor could result. For this reason an attempt was made to contact those faculty not responding to assess whether they were uniquely different from those responding. Of the three faculty not responding, two were contacted. One reported no teaching responsibilities with his full-time responsibility related to a funded research project. The other faculty member taught only one course and spent most of his time advising a student organization. Therefore, two of the three not responding were not typical teaching faculty.

The reactive effect of faculty being asked to provide this kind of information could result in distorted data. However, since this was a study which was initiated by the college with faculty participation, it was likely that the faculty would conscientiously complete the questionnaire.

One of the classical studies which illustrates the reactive effect was conducted at the Western Electric Company's Hawthorne Works in Chicago from 1927 to 1932. These studies have come to be known as the Hawthorne studies. Among other things, they found that, "The employees being tested were reacting to changes in light intensity in the way in which they assumed that they were expected to react."[6] The very fact that they were aware of the experiments affected their performance.

Since the data for this study came mainly from the faculty, it is possible that the reported hours could be distorted. As was noted by Hubbard,[7] Sullivan,[8] and others, some faculty may react negatively to a request for activity data and therefore not report accurately their time allocation. Although some express full confidence in the faculty reporting their time, many acknowledge that the possibility for error remains. Therefore, in this study, those returned questionnaires which exceeded a plus or minus three standard deviations from the mean of their respective departments were excluded from the analysis. In a normally distributed population 99.73 per cent will be within three standard deviations from the mean.

All of the other factors considered by Campbell and Stanley were either not relevant to this study or have been considered and ruled out as plausible extraneous variables.

The questionnaires were sent to all the faculty by the department chairman and returned to him. Of the fifty-one full-time faculty during fall term 1972, forty-eight returned the questionnaire which is a return rate of 94.1 per cent. Of the forty-eight returned questionnaires, three were not sufficiently complete to make them usable. One questionnaire exceeded the three standard deviations from the mean and was excluded. The total reported hours per week on this questionnaire were 126. Three standard deviations for this department totaled 53 hours and the mean was 69.8 hours. Thus, the range was 16.4 hours to 123.2 hours. The nearest high to the one which exceeded three standard deviations did not exceed two standard deviations. Therefore, the total usable returned questionnaires were forty-four, which was 86.3 per cent of the total full-time faculty during the 1972 fall term. Table 1 summarizes the return rates.

TABLE 1.--Returned questionnaires

Department	1972 Fall Term Full-Time Faculty	Usable Returned Questionnaires	Percentage
Dept. 0	6	6	100.0
Dept. 1	13	10	76.9
Dept. 3	15	13	86.7
Dept. 5	10	8	80.0
Dept. 7	7	7	100.0
Total	51	44	86.3

Assumptions of the Study

The assumptions of this study are the following:

1. The faculty member can work only 100 per cent, i.e., this study considers the total hours worked regardless of what should be expected as a normal work week.
2. Cost may be assigned to the total hours worked, i.e., the salary is for the total professional services of the faculty member.
3. There is a linear relationship between independent and dependent variables with the exception of one independent variable--method of instruction.

Limitations and Scope of the Study

The limitations and scope of this study are the following:

1. This study was limited to the faculty and course offerings of one college at Michigan State University.
2. Since human resources are the major cost factor in higher education, the costs for this study were limited to faculty salaries thus excluding supplies, equipment, and overhead.
3. The question of quality and value of activities cannot be evaluated solely on the basis of this study.

4. Generalizations to other colleges concerning faculty allocation of time or the cost of particular activities cannot be made on the basis of this study. These are highly institutionalized considerations. The distribution of time and cost patterns need to be evaluated as they relate to the mission and objectives of the department and the institution. For example, a department or institution which stresses research as opposed to undergraduate instruction will certainly have different cost patterns and distributions of time among activities. However, the procedure of analysis is applicable for use by other colleges and universities.

Instrument Reliability and Validity

As was pointed out in the review of the literature, there is no agreement as to reliability and validity of faculty activity surveys. However, some of the most current research is beginning to support such procedures.

The University of Michigan has conducted a university-wide faculty activity survey for several years. They conducted an experiment using the Faculty Activity and Outcome Survey to assess the reliability of the instrument. A comparison was made between a sample of the faculty who completed the NCHEMS form and the faculty who completed the Michigan form which they have used for

several years. Only two activity categories, credit instruction and professional development, were significantly different. The other four categories, noncredit instruction, research, service, and administrative activities, were not significantly different. It is meaningful that when the questionnaires were compared at the departmental level for the three departments which participated, there were no significant differences; the two differences only resulted in the aggregate.

One possible explanation of these differences may be due to reporting in percentages instead of average hours. Since the Michigan form allows reporting in percentages, the University's Office of Institutional Research has examined this issue.

> In the most recent comparison, made in the University's largest unit, the initial indications are that those individuals who report in percentages tend to report more time in credit instruction than those who report in hours. . . . This means that the possibility exists that the pilot study differences in credit instruction may be due to the unit of measurement used to report time rather than in the questionnaire used.[9]

In their conclusion, the observation is made that,

> Because of the consistency of the pilot results with other analyses in the area of differences caused by the use of hours or percentages as the reporting measure, one could conclude that the differences caused by the survey forms themselves are actually much smaller than those reported. . . . When it is remembered that virtually the same information concerning courses, sections, contact hours, etc. is reported in the category on both questionnaires, this conclusion seems more warranted. Therefore, to the extent that one is

> willing to attribute the credit instructional differences on the two forms to differences caused by the units of measurement, the two questionnaires are comparable and measure the same phenomena.[10]

Other institutions which have conducted faculty activity surveys such as Ohio State and the University of Missouri have found that the data can be a reliable indicator of faculty distribution of time.[11] The environment in which the survey is conducted and how the faculty are approached are critical factors in the success of the survey. The survey can be useful for monitoring activities but not for control. If changes in activities are desired, they will only be brought about by adjusting the reward systems and policies of the individual college.

Although Michigan State University does not routinely conduct a faculty activity survey as most of the other "big ten" universities do, a university-wide survey was conducted in the fall of 1970.[12] This survey, which became known as the "green form" survey, showed an average of 57.6 hours per week per faculty member. Since the basic data on the college used as the population for this dissertation were available from the 1970 survey, the means were compared with the 1972 survey. A t-test was used to test for significant differences in the mean total hours reported per faculty member between the two surveys for each department and

for the total college. No statistically significant differences exist. Table 2 below shows the mean number of total hours reported by department for each survey and the t score.

TABLE 2.--Test for significant differences in total hours between 1970 green form and 1972 NCHEMS form

Department	1970 Mean Green Form	1972 Mean NCHEMS Form	Degrees of Freedom	t Score
Dept. 0	57.8	61.9	12	- .87
Dept. 1	69.9	59.4	23	1.13
Dept. 3	68.6	69.9	26	- .19
Dept. 5	72.9	67.4	16	.83
Dept. 7	63.4	54.6	12	1.52
Total College	67.5	63.5	97	1.26

No significant differences

The question of validity was approached by Lorents in Minnesota.[13] A sample of faculty were asked to estimate, before the term and again after the term, how many hours per week they would spend in eleven categories. During the term a "work-study experiment" was conducted in which the faculty carried a "beep" device at all times. When the device beeped they wrote down their activity at that time. Only two categories were significantly different in the pre-term estimates and the post-term estimates. The point is that the survey

approach, which is much less costly, provided close to the same results as a relatively expensive work study experiment.

The debate over the issue of reliability and validity will likely continue, but from a practical administrative point of view, the loss in accuracy may be offset by the advantages of less cost and time required in procuring the data. "However, it does seem clear that a survey, if properly conducted, can result in data that are reliable and reasonably valid and that provide institutional managers with at the very least some rough answers rather than undocumented guesses."[14]

Profile Development

One of the two purposes of this dissertation was to develop a faculty profile of activities for each rank and for each department. The activities and their definitions come directly from the survey instrument and include the following:

Activity	Definitions
A. Teaching Activities	
A.1 Scheduled teaching . . .	All activities related to courses given in the current term.
A.2 Unscheduled teaching . .	Teaching not associated with the specific courses listed in A.1.
A.3 Academic program advising	Giving advice to students concerning course scheduling and academic programs.
A.4 Course and curriculum research and development	Developing and preparing for future courses.

B. Research, Scholarship and Creative Work Activity

B.1 Institutes and Research Centers . . . . . .Activity that is carried on for an institute or center. (This may include B.2 activity which is directly linked to a separate unit of administration)

B.2 Specific projects . . . .Work related to a specific project such as writing research proposals, books, articles; giving recitals; and performing your professional skill.

B.3 General scholarship and professional development.Work activities related to keeping current in a professional field.

C. Public Service Activities

C.1 General professional service/advice directed outside the institution .Activities that would not be considered C.2 and meant to benefit the community outside the institution, e.g., consulting, advising, and lectures for the public.

C.2 Extension service (not instructional) . . . . .Activity directed outside the institution where fiscal control is shared by the institution and government agencies.

D. Internal Service Activities

D.1 Student-oriented service.Activities related to student non-academic activities, e.g., preparing recommendations, social interaction, sponsoring student organizations and personal, career, and financial counseling.

D.3 Service reports and records . . . . . .Fulfilling institutional information requests, e.g., writing and answering memoranda, preparing minutes, and completing questionnaires.

E. Administrative and Committee Activities

E.1 Administrative duties	.Administrative functions which include helping during registration, gathering data, preparing budgets, and performing the duties of a department chairman.
E.2 Committee participation	.Committee involvement which might include committees for planning, budgeting, admissions, candidate selection, and faculty senate.[15]

Each questionnaire was examined by a representative of the Provost office for the purpose of noting which activities were not within the purposes of the university. Although many kinds of public service activities are encouraged by the university, some are up to the individual faculty member and may not be directly related to the disciplines of the college or to the purposes of the university. Examples might be political activities or church activities. Only three questionnaires included such activity which amounted to one hour each, two for church activities and one for political activities.

Among the above activities there were four distributions made by rank and department which are: (1) average number of hours per week, (2) percentage of the average hours per week, (3) average faculty salary, and (4) total salaries. This profile provides an approach for examining the utilization of faculty and the associated costs.

Since the second purpose of this dissertation was to compare costing methodologies which deal with the scheduled teaching section of this profile, several correlations were made between many of the instructional load factors. This instructional load correlational study provides some information for administrative decision-making.

Dependent Variables

The other purpose of this dissertation was to compare four costing methodologies as applied to the scheduled teaching section of the profile analysis. The dependent variables for this objective of the study were the course section costs generated by the four costing methodologies. The four costing methodologies are based on the course section's percentage of the faculty member's total number of:

(1) hours of total course time,

(2) formal contact hours,

(3) student credit hours, and

(4) course credit hours.

Each course section received four separate cost figures, one for each costing methodology. In this study the four methodologies for generating costs were the dependent variables.

Costing Methodology

The unit of study was the individual course. The focus of this research was on the methods used in allocating the costs to each of these course sections. Often cost studies concentrate on generating a cost per unit and the unit is frequently a contact hour, a student credit hour, or a course credit hour. Each of these units were considered in one of the costing methodologies used for allocating costs to the course sections in this study. The method of allocating the costs to the individual courses will to some extent determine what the cost figure will be when it is calculated for one of the smaller units such as per student credit hour, per course credit hour, or per contact hour.

Although all costs including secretarial assistance, supplies and services, and overhead could be prorated to each course, for the purposes of this study only faculty and graduate assistants' salaries were included in the course section costs. The primary focus of this dissertation was on faculty workload and costing of the instructional activities; therefore, salaries were the primary cost consideration. The salaries were taken from the Michigan State University Salary Budget for 1972-73.[16]

Included in the usable returned questionnaires were 124 course sections. For each course the faculty

member reported the total number of hours he spent on the course, including preparation, administration, formal contact hours, and other contact hours. He also reported the enrollment and the number of credits. By multiplying the enrollment times the credits, the student credit hours were derived.

First Level of Allocation

Two levels were developed for allocating the faculty member's salary to each course section for each of the four costing methodologies. The first level was used for all four of the costing methodologies. This first level of allocation was developed by multiplying the faculty member's salary times a ratio of total scheduled teaching activities divided by the total work-week. For example, if a faculty member spent half of his time in scheduled teaching, one-fourth in public service, and one-fourth in research, then his salary would be multiplied by 50 per cent. The scheduled teaching portion of his salary is the amount of salary which was then allocated by the four costing methodologies.

Second Level of Allocation

There were four methodologies for allocating salary under the second level of allocation. Each of the four methodologies is described below.

1. The first methodology was to allocate the scheduled teaching salary based on the course section's percentage of the faculty member's total hours devoted to scheduled teaching referred to as total course time.

2. The second methodology for allocating costs was to assign the scheduled teaching salary to the course sections by calculating the percentage between the faculty member's total formal contact hours and the formal contact hours for the given course section.

3. The third methodology was to assign the scheduled teaching salary based on the course section's percentage of the faculty member's total student credit hours produced.

4. The fourth methodology was to allocate scheduled teaching salary based on the percentage of the total credits taught by the faculty member and the credits for the given course section.

Table 3 provides an example of how the costs were calculated for each of the four costing methodologies and assigned to the particular course section.

Some issues of interest related to this study involve the value of a faculty survey as a methodology for costing. The value of such a survey for costing

could be challenged if the relationships between variables and costing methodology differ little. If on the other hand there are significant differences, then perhaps the faculty activity survey can provide the answers to the question of why there are differences.

TABLE 3.--Cost calculation

Professor John Doe	Term Salary	$8,000
Total hours per week 60	Scheduled teaching hours 15	25%
	Scheduled teaching costs	$2,000

Statistics

Course/Section	Credits	SCH	Contact Hours	Total Course Time
A	3	60	2	6
B	3	30	4	9
	6	90	6	15

Costs

Course/Section	Method 4	Method 3	Method 2	Method 1
A	$1,000	$1,333	$ 667	$ 800
B	1,000	667	1,333	1,200
	$2,000	$2,000	$2,000	$2,000

Independent Variables

The independent variables were factors considered to have a relationship to costs. Two of the variables, faculty rank and course level, were on the ordinal scale. Class size and number of sections taught were on a ratio scale. Method of instruction was on a nominal scale and was treated separately. After reading the literature,

several variables were added to the initial list and included in a correlation analysis from which a selection was made for additional analysis. All of these variables were on a ratio scale except graduate assistants, which was on an ordinal scale. The initial list of variables was the following:

1. Faculty rank, with four levels: instructor, assistant professor, associate professor, and professor.

2. Course/section level, with three levels classified as: lower undergraduate, upper undergraduate, and graduate.

3. Class size, which is the enrollment in the course section.

4. Number of courses and/or sections taught by the faculty member during the term.

5. Methods of instruction, which are defined in the questionnaire as:

Lecture	Formal presentation-primarily one-way communication
Laboratory	Instructing, preparing, and supervising student investigations
Recitation/Discussion	Two-way communication of course materials
Seminar	Students carry the major responsibility for preparation

Independent Study	Students work independently with only minimal faculty direction
Tutorial	Students work one-to-one with the instructor
Programmed Instruction	Course contents presented through programmed materials[17]

The other variables which were included in a correlational analysis were: (1) the faculty member's years of experience, (2) the number of fixed credit course sections taught by the faculty member, (3) his total workweek in hours, (4) the number of times he has taught the course, (5) the course credit hours, (6) the student-credit hours per course section, (7) the formal contact hours per course section, (8) the other contact hours per course section, (9) the preparation and administrative time per course section, (10) the total teaching time per course section, and (11) whether or not a graduate assistant was assigned to the course section.

All but one of the variables, method of instruction, were at least on an ordinal scale, which indicated a rank ordering of categories within the variable. Method of instruction was on a nominal scale which is simply the assignment of numbers to a qualitative category and it therefore had none of the properties of the other scales.[18] Hence it was treated by a separate analysis.

Research Questions and Statistical Approaches

Although this is a descriptive study in which a profile of faculty activity was developed and costs assigned to these activities, it was also the intention of this study to examine the influence of the four costing methodologies on the importance of five variables in determining cost. As part of the profile analysis, the instructional portion of the profile was examined by a correlational analysis since it related to the second purpose of this dissertation, namely, instructional costing methodology.

Comparing the costing methodologies and selected variables of cost using the instructional costs of the profile analysis was accomplished by answering the four research questions. The statistical approach follows each question as listed below.

1. Is there a relationship between each independent variable and cost for each of the costing methodologies?

Approach

Simple bivariate correlations and One-way Analysis of Variance

2. What is the relative importance of the variables within each costing methodology?

Approach

A multiple regression analysis--The relative importance was determined by the contribution each variable made to the total R^2 as developed by the stepwise addition and deletion methods.

3. Under which costing methodology do the variables explain the greatest amount of the variance in the costs?

Approach

Coefficient of multiple determination-R^2

4. To what extent is there agreement in the rank ordering of independent variables across the costing methodologies?

Approach

Kendall Coefficient of Concordance

Each of the statistical approaches mentioned as the method for answering the research questions is discussed below. The basic statistical measures are discussed here to facilitate reporting the results in statistics.

Correlation Coefficient

The simple bivariate correlation coefficient (r) is a single number which measures the extent to which two things are related, i.e., the extent variations in one variable change with variations in the other.

Correlations may vary from a +1.00, which is a perfect positive correlation, through zero, which means complete independence, to a -1.00, which is a perfect negative correlation.[19]

A general verbal description of correlation coefficients by Guilford provides a guide for interpretation.

Less than .20	Slight; almost negligible relationship
.20 -- .40	Low correlation; definite but small relationship
.40 -- .70	Moderate correlation; substantial relationship
.70 -- .90	High correlation; marked relationship
.90 --1.00	Very high correlation; very dependable relationship[20]

One-Way Analysis of Variance

The basic purpose of the one-way analysis of variance was to determine if the means for each method of instruction for each costing methodology varied significantly from the total population mean. Since method of instruction is on a nominal scale it was not appropriate to include it as a variable in a regression analysis. Although this was a population study and it was not therefore necessary to deal with inferential statistics, in this case an F test was used at a .05 level of significance as a guide for assessing the meaningfulness of the analysis of variance.

A significant F means that there is a relationship between the dependent and independent variables and it is not a result of chance. The F test does not tell where the differences are between the groups.[21] For this purpose the Scheffé method of multiple contrasts was employed. "According to Scheffé's theorem, it is possible to study observed data and search out meaningful contrasts and confidence intervals to help identify possible reasons for the rejection of a tested hypothesis."[22] By the Scheffé method each mean for each method of instruction was compared with each other. With this method it was possible to investigate each contrast while keeping the probability of making a type I error (the denial of a true hypothesis) equal to .05.[23]

Fifteen contrasts were made based on the cost per course. These course costs were converted to cost per course credit for the costing methodologies developed on total course time, contact hours, and student credit hours. Course costs developed on course credits could not be converted to costs per course credit since the mean for each method would be the same. The Scheffé method was then used on the cost per course credit for each of the three costing methodologies.

Multiple Regression Analysis

Multiple regression analysis was applied with cost as the dependent variable and the four independent

variables composed of faculty rank, course level, class size, and the number of sections taught by the faculty member. A multiple regression coefficient (R) indicates the extent of relationship between a dependent variable and two or more independent variables. "In the many areas of research in which controlled experiments are not practicable, multiple regression analyses are extensively used in attempts to disentangle and measure the effects of different X variables on some response Y."[24]

The multiple regression model which will be used is:

$$Y_i = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + e$$

where:

Y_i = (1...4) Cost based on the four methodologies

X_1 = Faculty rank

X_2 = Course level

X_3 = Class size

X_4 = Number of sections taught

e = the residual, assumed to be distributed independently of the X's with zero mean and variance 0^2

a = a constant

b_1 = the expected change in Y when X_1 increases or decreases assuming all other X's remain unchanged

b_2, b_3, b_4 = the same as b_1 respectively.

Since it was not necessary to deal with inferential statistics because the entire population was included in the survey, the correlations of each variable on each of the costing methodologies were compared.

The objective was not only to discover the relationship of the variables with cost, but to also rank the variables in order of their importance. Because high correlations between the X variables can upset the calculations, the methods employed were both the stepwise addition and the stepwise deletion.

Correlation and regression analysis is especially suitable for studies where no single variable has been established as a totally appropriate evaluation criterion. As Freeman points out, "Correlation and regression analysis, while used extensively in industry as a tool of budget evaluation, has not been effectively utilized in higher education budget analysis or at least it has not been reported in the literature."[25]

Stepwise Addition.--After a regression is computed, the utility of a variable may be questioned and its omission proposed. The most thorough approach is

to work out the regression of Y on every variable singly. The procedure for the stepwise addition process is to sequentially build the equation. The variable giving the greatest reduction in the sum of squares of Y is selected. This is called X_1. Then the bivariate regressions in which X_1 appear are worked out. The variate which gives the greatest additional reduction in the sum of squares after fitting X_1 is selected. This is called X_2. All trivariate regressions that include both X_1 and X_2 are computed, and the variate that makes the greatest additional contribution to them is selected. This process is continued for all independent variables.[26]

Stepwise Deletion.--The stepwise deletion method is basically the reverse process of stepwise addition. This process may not necessarily select the same independent variables nor will it necessarily account for the same amount of variation in the dependent variable. The regression of Y on all variables is worked out. The variable that gives the least additional reduction in sum of squares is then dropped, and so on.

Coefficient of Multiple Determination.--The R^2 is the coefficient of multiple determination of variance (the square of the multiple correlation coefficient). This measure indicates the proportion of variance in the dependent variables combined with the regression weights used.

For example, an R^2 of .8759 indicates that 87.59 per cent of the variance in variable Y is explained by the variation in the combined X's. The methodology which yields the highest R^2 is the best fit relationship between the independent variables. That is, it provides the best weighting of the variables for predictive ability.[27]

Beta weights were calculated for each variable. The beta weights are the constants in the regression equation and they provide a means of measuring the change in the dependent variable for a given change in an independent variable assuming the other independent variables are held constant. The coefficient of multiple determination (R^2) is the sum of the beta weights times their respective simple r.[28]

Shortcomings of regression analysis are recognized. In multiple regression analysis the value of any regression coefficient depends on the other variables included in the regression. Difficulty may arise because one can never be sure that there are not other X variables related to cost. Even if the regression coefficients are clearly meaningfully significant, it is not uncommon to find that the fraction of the variance of Y attributable to the regression is much less than 50 per cent. This indicates that in much of the research, most of the variation in Y is due to variables not included in the regression. To

further complicate the problem, one must recognize that the relationships may not be linear.

Even with all of the above mentioned problems, multiple regression analysis is among the best available statistical methodologies to meet the objectives of this aspect of the study.

Kendall Coefficient of Concordance[29]

The Kendall Coefficient of Concordance was used to assess the degree to which there was agreement in the rank ordering of variables across the several costing methodologies. A high agreement indicates that no one methodology gives a meaningfully different rank ordering of variables. The degree of agreement among the four costing methodologies, as to their rank ordering of the variables, was reflected by the degree of variance among the four independent variables. The coefficient of concordance is a function of that degree of variance. A high value of the Coefficient of Concordance may be interpreted as meaning that the costing methodologies apply essentially the same standard in ranking the four variables.

Summary

In this chapter the design of the study was presented. A summary of the rationale for the study, the purposes, and research objectives were discussed as were

the parameters of the data and the methods of collecting the data. The assumptions, limitations, and scope of the study were listed and a discussion on the instrument reliability and validity was presented. The dependent and independent variables were defined and discussed. Also included was a discussion on the profile development, the costing methodology, and the statistical approach.

NOTES--CHAPTER III

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CHAPTER IV

ANALYSIS OF RESULTS

Objectives of the Research

This study was intended to fill, in part, the need for research on costing methodology and faculty activity analysis. The basic objectives of this descriptive research consisted of two parts. The first was to examine the allocation of faculty time and salary costs among several activities and to consider the interrelationships of several instructional workload factors. The second objective was to compare four costing methodologies used to allocate costs to courses while considering the importance of selected variables of cost.

The analysis for the first objective was approached in two ways. A profile of faculty activity by department and rank was developed and the relationships of several workload factors were examined by employing the Pearson product moment correlation. The analysis for the second objective centered on answering four research questions which address the problem of comparing the four costing methodologies.

Activity Profile

Time and Cost Distribution

Tables 4 - 9 show the distribution of faculty time by rank for the total college and for each department. The distribution of the forty-four faculty members among the four ranks for the total college is shown on Table 4. The distribution was five instructors, thirteen assistant professors, nine associate professors, and seventeen professors with an average reported total hours per week for all ranks in the college of 63.5 hours. As discussed in Chapter III, there were no statistically significant differences in the college or by department from a similar survey done in 1970. The greatest differences between ranks for the college as reflected in this survey were between professors at 66.4 hours and instructors at 59.6 hours, a difference of 6.8 hours. Scheduled teaching accounted for 41.2 per cent of the time; and including other instructional related functions, the total teaching activities amounted to 55.3 per cent of the average week. Research consumed 21.2 per cent of the time, slightly more than half of the scheduled teaching time. Public service functions were only 3.5 per cent, but internal service and administrative and committee work together amounted to 20 per cent of the average week.

TABLE 4.--Time and cost distribution to activities by rank for total college

COLLEGE TOTALS	N=5 INSTRUCTOR				N=13 ASSISTANT PROFESSOR				N=9 ASSOCIATE PROFESSOR				N=17 PROFESSOR			
	HOURS		COSTS		HOURS		COSTS		HOURS		COSTS		HOURS		COSTS	
	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL
A.1	33.8	56.711	2095.30	10476.49	27.1	42.920	1807.14	23492.85	27.4	45.191	2636.67	23730.02	22.6	34.868	2174.12	36959.99
A.2	6.2	10.403	384.34	1921.72	3.0	4.724	198.91	2585.88	4.1	6.778	395.45	3559.02	4.0	5.976	381.37	6483.37
A.3	2.4	4.027	148.78	743.89	2.4	3.835	161.49	2099.36	2.8	4.588	267.19	2404.74	2.3	3.497	223.17	3793.97
A.4	2.0	3.356	123.98	619.91	2.2	3.470	146.11	1899.42	2.8	4.588	267.19	2404.74	2.6	3.896	248.60	4226.19
TOTAL A	44.4	74.497	2752.40	13762.81	34.7	54.949	2313.65	30077.51	37.1	61.128	3566.50	32098.53	31.5	47.437	3027.27	51463.52
B.1	0.0	0.000	0.00	0.00	.0	.061	2.56	33.32	0.0	0.000	0.00	0.00	.4	.620	39.55	672.35
B.2	1.6	2.685	99.19	495.93	6.6	10.471	440.89	5731.59	7.9	13.098	764.17	6877.57	7.6	11.510	734.50	12486.48
B.3	6.1	10.235	378.15	1890.73	6.1	9.643	406.03	5278.39	7.2	11.987	694.70	6252.34	6.9	10.359	661.05	11237.83
TOTAL B	7.7	12.919	477.33	2386.66	12.7	20.175	849.48	11043.30	15.2	25.805	1458.88	13129.90	14.9	22.488	1435.10	24396.67
C.1	.8	1.342	49.59	247.96	2.5	3.921	165.08	2146.01	1.2	2.052	119.70	1077.33	2.9	4.294	274.02	4658.42
C.2	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	.2	.266	16.95	288.15
TOTAL C	.8	1.342	49.59	247.96	2.5	3.921	165.08	2146.01	1.2	2.052	119.70	1077.33	3.0	4.568	290.97	4946.57
D.1	2.7	4.530	167.38	836.88	3.0	4.724	198.91	2585.88	2.3	3.847	224.44	2019.99	2.7	4.028	257.07	4370.27
D.2	.1	.168	6.20	31.00	1.1	1.741	73.31	953.04	.1	.183	10.69	96.19	.5	.708	45.20	768.40
D.3	1.5	2.517	92.99	464.93	1.8	2.788	117.40	1526.20	.4	.641	37.41	336.66	2.8	4.250	271.20	4610.39
TOTAL D	4.3	7.215	266.56	1332.81	5.8	9.254	389.62	5065.12	2.8	4.671	272.54	2452.84	6.0	8.986	573.47	9749.06
E.1	.6	1.007	37.19	185.97	2.3	3.714	156.36	2032.71	2.0	3.297	192.38	1731.42	7.8	11.731	748.62	12726.61
E.2	1.8	3.020	111.58	557.92	5.0	7.987	336.31	4372.00	2.3	3.847	224.44	2019.99	3.2	4.799	306.23	5205.90
TOTAL E	2.4	4.027	148.78	743.89	7.4	11.701	492.67	6404.72	4.3	7.144	416.82	3751.40	11.0	16.529	1054.85	17932.51
TOTAL	59.6	100.000	3694.67	18473.33	63.2	100.000	4210.51	54736.67	60.7	100.000	5834.44	52510.00	66.4	100.000	6381.67	108488.32

		N=44 ALL RANKS			
		HOURS		COSTS	
	ACTIVITY	AVERAGE PER WEEK	PER CENT OF TOTAL	AVERAGE SALARY	TOTAL SALARIES
A.1	SCHEDULED TEACHING	26.2	41.2	2151.35	94659.35
A.2	UNSCHEDULED TEACHING	4.0	6.3	330.68	14549.99
A.3	ACADEMIC PROGRAM ADVISING	2.4	3.8	205.50	9041.96
A.4	COURSE AND CURRICULUM RESEARCH AND DEVELOPMENT	2.5	3.9	207.96	9150.26
A	TOTAL TEACHING ACTIVITIES	35.1	55.3	2895.49	127401.57
B.1	INSTITUTE AND RESEARCH PROJECTS	.2	.3	16.04	705.67
B.2	SPECIFIC PROJECTS	6.7	10.6	581.63	25591.57
B.3	GENERAL SCHOLARSHIP AND PROFESSIONAL DEVELOPMENT	6.6	10.4	560.44	24659.24
B	TOTAL RESEARCH, SCHOLARSHIP, AND CREATIVE WORK ACTIVITIES	13.5	21.2	1158.10	50956.53
C.1	GENERAL PROFESSIONAL SERVICES/ADVICE DIRECTED OUTSIDE THE INSTITUTION	2.2	3.5	184.77	8129.72
C.2	EXTENSION SERVICE	0.1	0.2	6.55	288.15
C	TOTAL PUBLIC SERVICE ACTIVITIES	2.2	3.5	191.32	8417.87
D.1	STUDENT-ORIENTED SERVICE	2.7	4.2	223.02	9813.02
D.2	GENERAL PROFESSIONAL SERVICE/ADVICE DIRECTED TOWARD THE INSTITUTION	0.6	0.9	42.01	1848.63
D.3	SERVICE REPORTS AND RECORDS	1.9	3.0	157.69	6938.18
D	TOTAL INTERNAL SERVICE ACTIVITIES	5.1	8.0	422.72	18599.83
E.1	ADMINISTRATIVE DUTIES	4.2	6.6	379.27	16676.71
E.2	COMMITTEE PARTICIPATION	3.4	5.4	276.27	12155.81
E	TOTAL ADMINISTRATIVE AND COMMITTEE ACTIVITIES	7.6	12.0	655.26	28832.52
	TOTAL	63.5	100.0	5322.92	234206.32

TABLE 5.--Time and cost distribution to activities by rank for department 1

DEPARTMENT 1	N=0 INSTRUCTOR				N=3 ASSISTANT PROFESSOR				N=1 ASSOCIATE PROFESSOR				N=2 PROFESSOR			
	HOURS		COSTS		HOURS		COSTS		HOURS		COSTS		HOURS		COSTS	
	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL
A.1	0.0	0.000	0.00	0.00	34.0	55.921	2603.43	7810.30	41.0	68.333	3587.50	3587.50	24.0	37.209	2341.70	4683.41
A.2	0.0	0.000	0.00	0.00	2.7	4.386	204.19	612.57	0.0	0.000	0.00	0.00	7.0	10.853	683.00	1365.99
A.3	0.0	0.000	0.00	0.00	2.7	4.386	204.19	612.57	0.0	0.000	0.00	0.00	4.5	6.977	439.07	878.14
A.4	0.0	0.000	0.00	0.00	3.7	6.031	280.76	842.29	0.0	0.000	0.00	0.00	4.5	6.977	439.07	878.14
TOTAL A	0.0	0.000	0.00	0.00	43.0	70.724	3292.58	9877.74	41.0	68.333	3587.50	3587.50	40.0	62.016	3902.84	7805.68
B.1	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00
B.2	0.0	0.000	0.00	0.00	5.0	8.224	382.86	1148.57	2.0	3.333	175.00	175.00	2.3	3.488	219.53	439.07
B.3	0.0	0.000	0.00	0.00	5.9	9.704	451.77	1355.32	2.0	3.333	175.00	175.00	4.3	6.589	414.68	829.35
TOTAL B	0.0	0.000	0.00	0.00	10.9	17.928	834.63	2503.89	4.0	6.667	350.00	350.00	6.5	10.078	634.21	1268.42
C.1	0.0	0.000	0.00	0.00	.2	.384	17.87	53.60	1.0	1.667	87.50	87.50	1.3	1.938	121.96	243.93
C.2	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00
TOTAL C	0.0	0.000	0.00	0.00	.2	.384	17.87	53.60	1.0	1.667	87.50	87.50	1.3	1.938	121.96	243.93
D.1	0.0	0.000	0.00	0.00	3.0	4.934	229.71	689.14	5.0	8.333	437.50	437.50	4.5	6.977	439.07	878.14
D.2	0.0	0.000	0.00	0.00	.0	.055	2.55	7.66	1.0	1.667	87.50	87.50	.5	.775	48.79	97.57
D.3	0.0	0.000	0.00	0.00	1.1	1.864	86.78	260.34	2.0	3.333	175.00	175.00	3.5	5.426	341.50	683.00
TOTAL D	0.0	0.000	0.00	0.00	4.2	6.853	319.05	957.15	8.0	13.333	700.00	700.00	8.5	13.178	829.35	1658.71
E.1	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	2.0	3.333	175.00	175.00	5.5	8.527	536.64	1073.28
E.2	0.0	0.000	0.00	0.00	2.5	4.112	191.43	574.29	4.0	6.667	350.00	350.00	2.8	4.264	268.32	536.64
TOTAL E	0.0	0.000	0.00	0.00	2.5	4.112	191.43	574.29	6.0	10.000	525.00	525.00	8.3	12.791	804.96	1609.92
TOTAL	0.0	0.000	0.00	0.00	60.8	100.000	4655.55	13966.66	60.0	100.000	5250.00	5250.00	64.5	100.000	6293.33	12586.66

N=6 ALL RANKS

	ACTIVITY	HOURS: AVERAGE PER WEEK	HOURS: PER CENT OF TOTAL	COSTS: AVERAGE SALARY	COSTS: TOTAL SALARIES
A.1	SCHEDULED TEACHING	31.8	51.4	2680.20	16081.21
A.2	UNSCHEDULED TEACHING	3.7	6.0	329.20	1978.56
A.3	ACADEMIC PROGRAM ADVISING	2.8	4.5	248.45	1490.71
A.4	COURSE AND CURRICULUM RESEARCH AND DEVELOPMENT	3.4	5.5	286.74	1720.43
A	TOTAL TEACHING ACTIVITIES	41.7	67.4	3545.15	21270.92
B.1	INSTITUTE AND RESEARCH CENTERS	0.0	0.0	0.00	0.00
B.2	SPECIFIC PROJECTS	3.6	5.8	293.77	1762.64
B.3	GENERAL SCHOLARSHIP AND PROFESSIONAL DEVELOPMENT	4.7	7.6	393.78	2359.67
B	TOTAL RESEARCH, SCHOLARSHIP, AND CREATIVE WORK ACTIVITIES	8.3	13.4	687.05	4122.31
C.1	GENERAL PROFESSIONAL SERVICES/ADVICE DIRECTED OUTSIDE THE INSTITUTION	0.7	1.1	64.17	385.03
C.2	EXTENSION SERVICE	0.0	0.0	0.00	0.00
C	TOTAL PUBLIC SERVICE ACTIVITIES	0.7	1.1	64.17	385.03
D.1	STUDENT-ORIENTED SERVICE	3.8	6.1	334.13	2004.78
D.2	GENERAL PROFESSIONAL SERVICE/ADVICE DIRECTED TOWARD THE INSTITUTION	0.3	0.5	32.12	192.73
D.3	SERVICE REPORTS AND RECORDS	2.1	3.4	186.39	1118.34
D	TOTAL INTERNAL SERVICE ACTIVITIES	6.2	10.0	552.64	3315.86
E.1	ADMINISTRATIVE DUTIES	2.2	3.6	208.05	1248.28
E.2	COMMITTEE PARTICIPATION	2.8	4.5	243.38	1460.90
E	TOTAL ADMINISTRATIVE AND COMMITTEE ACTIVITIES	5.0	8.1	451.53	2709.20
	TOTAL	61.9	100.0	5300.55	31803.32

TABLE 6.--Time and cost distribution to activities by rank for department 2

DEPARTMENT 2	N=2 INSTRUCTOR				N=4 ASSISTANT PROFESSOR				N=1 ASSOCIATE PROFESSOR				N=3 PROFESSOR			
	HOURS		COSTS		HOURS		COSTS		HOURS		COSTS		HOURS		COSTS	
	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL
A.1	46.0	80.702	2464.09	4928.18	20.6	33.013	1268.81	5075.23	28.0	73.684	3843.86	3843.86	24.3	38.021	2318.21	6954.64
A.2	.5	.877	26.78	53.57	4.2	6.723	258.38	1033.50	0.0	0.000	0.00	0.00	4.0	6.250	381.08	1143.23
A.3	0.0	0.000	0.00	0.00	3.3	5.202	199.93	799.73	0.0	0.000	0.00	0.00	1.7	2.604	158.78	476.35
A.4	0.0	0.000	0.00	0.00	1.0	1.601	61.52	246.07	4.0	10.526	549.12	549.12	2.3	3.646	222.29	666.88
TOTAL A	46.5	81.579	2490.87	4981.75	29.1	46.539	1788.63	7154.54	32.0	84.211	4392.99	4392.99	32.3	50.521	3080.37	9241.10
B.1	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00
B.2	2.5	4.386	133.92	267.84	2.8	4.402	169.17	676.70	1.0	2.632	137.28	137.28	6.7	10.417	635.13	1905.38
B.3	3.8	6.579	200.88	401.75	5.1	8.203	315.28	1261.12	2.0	5.263	274.56	274.56	6.3	9.896	603.37	1810.11
TOTAL B	6.3	10.965	334.79	669.59	7.9	12.605	484.45	1937.82	3.0	7.895	411.84	411.84	13.0	20.313	1238.50	3715.49
C.1	0.0	0.000	0.00	0.00	6.6	10.604	407.56	1630.23	1.0	2.632	137.28	137.28	4.7	7.292	444.59	1333.77
C.2	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00
TOTAL C	0.0	0.000	0.00	0.00	6.6	10.604	407.56	1630.23	1.0	2.632	137.28	137.28	4.7	7.292	444.59	1333.77
D.1	1.3	2.193	66.96	133.92	2.2	3.521	135.34	541.36	2.0	5.263	274.56	274.56	1.3	2.083	127.03	381.08
D.2	.3	.439	13.39	26.78	3.3	5.282	203.01	812.04	0.0	0.000	0.00	0.00	.3	.521	31.76	95.27
D.3	2.3	3.947	120.53	241.05	2.4	3.802	146.11	584.42	0.0	0.000	0.00	0.00	2.7	4.167	254.05	762.15
TOTAL D	3.8	6.579	200.88	401.75	7.9	12.605	484.45	1937.82	2.0	5.263	274.56	274.56	4.3	6.771	412.83	1238.50
E.1	0.0	0.000	0.00	0.00	4.9	7.803	299.90	1199.60	0.0	0.000	0.00	0.00	6.7	10.417	635.13	1905.38
E.2	.5	.877	26.78	53.57	6.1	9.844	378.34	1513.34	0.0	0.000	0.00	0.00	3.0	4.688	285.81	857.42
TOTAL E	.5	.877	26.78	53.57	11.0	17.647	678.24	2712.94	0.0	0.000	0.00	0.00	9.7	15.104	920.93	2762.80
TOTAL	57.0	100.000	3053.33	6106.66	62.5	100.000	3843.33	15373.34	38.0	100.000	5215.67	5216.67	64.0	100.000	6097.22	18291.66

N=10
ALL RANKS

	ACTIVITY	HOURS: AVERAGE PER WEEK	HOURS: PER CENT OF TOTAL	COSTS: AVERAGE SALARY	COSTS: TOTAL SALARIES
A.1	SCHEDULED TEACHING	27.5	46.3	2080.19	20801.91
A.2	UNSCHEDULED TEACHING	3.0	5.1	223.03	2230.30
A.3	ACADEMIC PROGRAM ADVISING	1.8	3.0	127.61	1276.08
A.4	COURSE AND CURRICULUM RESEARCH AND DEVELOPMENT	1.5	2.5	146.21	1462.07
A	TOTAL TEACHING ACTIVITIES	33.8	56.9	2577.04	25770.37
B.1	INSTITUTE AND RESEARCH CENTERS	0.0	0.0	0.00	0.00
B.2	SPECIFIC PROJECTS	3.7	6.2	298.72	2987.20
B.3	GENERAL SCHOLARSHIP AND PROFESSIONAL DEVELOPMENT	4.9	8.2	374.75	3747.54
B	TOTAL RESEARCH, SCHOLARSHIP, AND CREATIVE WORK ACTIVITIES	8.6	14.5	673.47	6734.74
C.1	GENERAL PROFESSIONAL SERVICES/ADVICE DIRECTED OUTSIDE THE INSTITUTION	4.2	7.1	310.13	3101.28
C.2	EXTENSION SERVICE	0.0	0.0	0.00	0.00
C	TOTAL PUBLIC SERVICE ACTIVITIES	4.2	7.1	310.13	3101.28
D.1	STUDENT-ORIENTED SERVICE	1.7	2.9	133.09	1330.92
D.2	GENERAL PROFESSIONAL SERVICE/ADVICE DIRECTED TOWARD THE INSTITUTION	1.5	2.5	93.41	934.09
D.3	SERVICE REPORTS AND RECORDS	2.2	3.7	158.76	1587.62
D	TOTAL INTERNAL SERVICE ACTIVITIES	5.4	9.1	385.26	3852.63
E.1	ADMINISTRATIVE DUTIES	4.0	6.7	310.50	3104.98
E.2	COMMITTEE PARTICIPATION	3.4	5.7	242.43	2424.33
E	TOTAL ADMINISTRATIVE AND COMMITTEE ACTIVITIES	7.4	12.4	552.93	5529.31
	TOTAL	59.4	100.0	4498.83	44988.33

TABLE 7.--Time and cost distribution to activities by rank for department 3

DEPARTMENT 3	N=0 INSTRUCTOR				N=2 ASSISTANT PROFESSOR				N=3 ASSOCIATE PROFESSOR				N=8 PROFESSOR			
	HOURS		COSTS		HOURS		COSTS		HOURS		COSTS		HOURS		COSTS	
	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL
A.1	0.0	0.000	0.00	0.00	20.5	30.037	1346.64	2693.29	19.1	27.447	1659.95	4979.84	23.3	33.179	2204.36	17634.85
A.2	0.0	0.000	0.00	0.00	3.5	5.128	229.91	459.83	7.7	11.036	667.46	2002.38	4.6	6.483	430.72	3445.78
A.3	0.0	0.000	0.00	0.00	2.5	3.663	164.22	328.45	4.3	6.238	377.26	1131.78	2.0	2.842	188.81	1510.48
A.4	0.0	0.000	0.00	0.00	1.0	1.465	65.69	131.38	2.5	3.599	217.65	652.95	2.3	3.197	212.41	1699.29
TOTAL A	0.0	0.000	0.00	0.00	27.5	40.293	1806.47	3612.94	33.6	48.321	2922.32	8766.95	32.2	45.702	3036.30	24290.40
B.1	0.0	0.000	0.00	0.00	.3	.366	16.42	32.84	0.0	0.000	0.00	0.00	.9	1.243	82.60	660.83
B.2	0.0	0.000	0.00	0.00	13.5	19.780	886.81	1773.63	16.3	23.512	1421.98	4265.95	11.6	16.430	1091.56	8732.46
B.3	0.0	0.000	0.00	0.00	6.5	9.524	426.98	853.97	9.2	13.196	798.05	2394.15	8.9	12.700	843.74	6749.96
TOTAL B	0.0	0.000	0.00	0.00	20.2	29.670	1330.22	2660.44	25.5	36.708	2220.03	6660.10	21.4	30.373	2017.91	16143.25
C.1	0.0	0.000	0.00	0.00	.5	.733	32.84	65.69	2.9	4.175	252.47	757.42	3.2	4.529	300.92	2407.33
C.2	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	.4	.533	35.40	283.21
TOTAL C	0.0	0.000	0.00	0.00	.5	.733	32.84	65.69	2.9	4.175	252.47	757.42	3.6	5.062	336.32	2690.54
D.1	0.0	0.000	0.00	0.00	6.5	9.524	426.98	853.97	1.8	2.639	159.61	478.83	3.1	4.440	295.02	2360.12
D.2	0.0	0.000	0.00	0.00	.5	.733	32.84	65.69	0.0	0.000	0.00	0.00	.6	.888	59.00	472.02
D.3	0.0	0.000	0.00	0.00	2.0	2.930	131.38	262.76	0.0	0.000	0.00	0.00	2.8	3.908	259.61	2076.91
TOTAL D	0.0	0.000	0.00	0.00	9.0	13.187	591.21	1182.42	1.8	2.639	159.61	478.83	6.5	9.236	613.63	4909.06
E.1	0.0	0.000	0.00	0.00	3.0	4.396	197.07	394.14	3.3	4.798	290.20	870.60	3.3	4.707	312.72	2501.73
E.2	0.0	0.000	0.00	0.00	8.0	11.722	525.52	1051.04	2.3	3.359	203.14	609.42	3.5	4.920	326.88	2615.02
TOTAL E	0.0	0.000	0.00	0.00	11.0	16.117	722.59	1445.18	5.7	8.157	493.34	1480.02	6.8	9.627	639.59	5116.75
TOTAL	0.0	0.000	0.00	0.00	68.2	100.000	4483.33	8966.67	69.5	100.000	6047.78	18143.33	70.4	100.000	6643.75	53150.00

	ACTIVITY	N=13 ALL RANKS HOURS AVERAGE PER WEEK	HOURS PER CENT OF TOTAL	COSTS AVERAGE SALARY	COSTS TOTAL SALARIES
A.1	SCHEDULED TEACHING	21.9	31.3	1946.77	25307.98
A.2	UNSCHEDULED TEACHING	5.1	7.4	454.46	5907.99
A.3	ACADEMIC PROGRAM ADVISING	2.6	3.7	228.52	2970.71
A.4	COURSE AND CURRICULUM RESEARCH AND DEVELOPMENT	2.1	3.1	191.05	2483.62
A	TOTAL TEACHING ACTIVITIES	31.8	45.5	2820.79	36670.29
B.1	INSTITUTE AND RESEARCH CENTERS	0.6	0.9	53.36	693.67
B.2	SPECIFIC PROJECTS	13.0	18.6	1136.31	14772.04
B.3	GENERAL SCHOLARSHIP AND PROFESSIONAL DEVELOPMENT	8.6	12.3	769.08	9998.08
B	TOTAL RESEARCH, SCHOLARSHIP, AND CREATIVE WORK ACTIVITIES	22.2	31.7	1958.75	25463.79
C.1	GENERAL PROFESSIONAL SERVICES/ADVICE DIRECTED OUTSIDE THE INSTITUTION	2.7	3.9	248.50	3230.44
C.2	EXTENSION SERVICE	0.2	0.4	21.79	283.21
C	TOTAL PUBLIC SERVICE ACTIVITIES	3.0	4.2	270.28	3513.65
D.1	STUDENT-ORIENTED SERVICE	3.3	4.8	284.07	3692.92
D.2	GENERAL PROFESSIONAL SERVICE/ADVICE DIRECTED TOWARD THE INSTITUTION	0.4	0.6	41.36	537.71
D.3	SERVICE REPORTS AND RECORDS	2.0	2.9	179.97	2339.67
D	TOTAL INTERNAL SERVICE ACTIVITIES	5.8	8.3	505.41	6570.31
E.1	ADMINISTRATIVE DUTIES	3.3	4.7	289.73	3766.47
E.2	COMMITTEE PARTICIPATION	3.9	5.6	328.88	4275.48
E	TOTAL ADMINISTRATIVE AND COMMITTEE ACTIVITIES	7.2	10.3	618.61	8041.95
	TOTAL	69.9	100.0	6173.85	80260.00

TABLE 8.--Time and cost distribution to activities by rank for department 4

DEPARTMENT 4	N=3 INSTRUCTOR				N=2 ASSISTANT PROFESSOR				N=2 ASSOCIATE PROFESSOR				N=1 PROFESSOR			
	HOURS		COSTS		HOURS		COSTS		HOURS		COSTS		HOURS		COSTS	
	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL
A.1	25.7	41.948	1725.06	5175.18	35.7	47.987	2063.42	4126.85	35.2	48.958	3068.05	6136.11	19.0	30.645	1879.57	1879.57
A.2	10.0	16.304	672.10	2016.30	1.8	2.349	101.01	202.01	3.8	5.286	326.39	652.78	0.0	0.000	0.00	0.00
A.3	4.0	6.522	268.84	806.52	.5	.671	28.86	57.72	2.5	3.472	217.59	435.19	2.0	3.226	197.85	197.85
A.4	3.3	5.435	224.01	672.10	4.3	5.705	245.30	490.60	4.3	5.903	369.91	739.81	1.0	1.613	98.92	98.92
TOTAL A	43.0	70.109	2890.04	8670.11	42.2	56.711	2438.59	4877.18	45.7	63.542	3981.94	7963.89	22.0	35.484	2176.34	2176.34
B.1	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00
B.2	1.0	1.630	67.21	201.63	8.5	11.409	490.60	981.21	6.0	8.333	522.22	1044.44	2.0	3.226	197.85	197.85
B.3	7.7	12.500	515.28	1545.83	9.3	12.416	533.89	1067.79	11.7	16.319	1022.68	2045.37	1.0	1.613	98.92	98.92
TOTAL B	8.7	14.130	582.49	1747.46	17.7	23.826	1024.50	2048.99	17.7	24.653	1544.91	3089.81	3.0	4.839	296.77	296.77
C.1	1.3	2.174	89.61	268.84	.8	1.007	43.29	86.58	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00
C.2	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00
TOTAL C	1.3	2.174	89.61	268.84	.8	1.007	43.29	86.58	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00
D.1	3.7	5.978	246.44	739.31	2.5	3.356	144.30	288.59	3.0	4.167	261.11	522.22	0.0	0.000	0.00	0.00
D.2	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00
D.3	1.0	1.630	67.21	201.63	2.5	3.356	144.30	288.59	.5	.694	43.52	87.04	5.0	8.065	494.62	494.62
TOTAL D	4.7	7.609	313.65	940.94	5.0	6.711	288.59	577.18	3.5	4.861	304.63	609.26	5.0	8.065	494.62	494.62
E.1	1.0	1.630	67.21	201.63	2.5	3.356	144.30	288.59	2.5	3.472	217.59	435.19	30.0	48.387	2967.74	2967.74
E.2	2.7	4.348	179.23	537.68	6.3	8.389	360.74	721.48	2.5	3.472	217.59	435.19	2.0	3.226	197.85	197.85
TOTAL E	3.7	5.978	246.44	739.31	8.8	11.745	505.03	1010.07	5.0	6.944	435.19	870.37	32.0	51.613	3165.59	3165.59
TOTAL	61.3	100.000	4122.22	12366.67	74.5	100.000	4300.00	8600.00	72.0	100.000	6266.66	12533.33	62.0	100.000	6133.33	6133.33

	ACTIVITY	N=8 ALL RANKS HOURS AVERAGE PER WEEK	HOURS PER CENT OF TOTAL	COSTS AVERAGE SALARY	COSTS TOTAL SALARIES
A.1	SCHEDULED TEACHING	29.7	44.1	2164.71	17317.71
A.2	UNCHEDULED TEACHING	5.2	7.7	358.89	2871.09
A.3	ACADEMIC PROGRAM ADVISING	2.5	3.7	187.16	1497.28
A.4	COURSE AND CURRICULUM RESEARCH AND DEVELOPMENT	3.5	5.2	250.18	2001.43
A	TOTAL TEACHING ACTIVITIES	40.8	60.5	2960.94	23687.52
B.1	INSTITUTE AND RESEARCH CENTERS	0.0	0.0	0.00	0.00
B.2	SPECIFIC PROJECTS	4.2	6.2	303.14	2425.14
B.3	GENERAL SCHOLARSHIP AND PROFESSIONAL DEVELOPMENT	8.3	12.3	594.74	4757.91
B	TOTAL RESEARCH, SCHOLARSHIP, AND CREATIVE WORK ACTIVITIES	12.5	18.5	897.88	7183.03
C.1	GENERAL PROFESSIONAL SERVICES/ADVICE DIRECTED OUTSIDE THE INSTITUTION	0.7	1.0	44.43	355.42
C.2	EXTENSION SERVICE	0.0	0.0	0.00	0.00
C	TOTAL PUBLIC SERVICE ACTIVITIES	0.7	1.0	44.43	355.42
D.1	STUDENT-ORIENTED SERVICE	2.8	4.2	193.76	1550.12
D.2	GENERAL PROFESSIONAL SERVICE/ADVICE DIRECTED TOWARD THE INSTITUTION	0.0	0.0	0.00	0.00
D.3	SERVICE REPORTS AND RECORDS	1.8	2.7	133.98	1071.88
D	TOTAL INTERNAL SERVICE ACTIVITIES	4.5	6.7	327.75	2622.00
E.1	ADMINISTRATIVE DUTIES	5.4	8.0	486.64	3893.15
E.2	COMMITTEE PARTICIPATION	3.5	5.2	236.52	1892.20
E	TOTAL ADMINISTRATIVE AND COMMITTEE ACTIVITIES	8.8	13.1	723.17	5785.34
	TOTAL	67.4	100.0	4954.17	39633.33

TABLE 9.--Time and cost distribution to activities by rank for department 5

DEPARTMENT 5	N=0 INSTRUCTOR				N=2 ASSISTANT PPOFESSOR				N=2 ASSOCIATE PROFESSOR				N=3 PROFESSOR			
	HOURS		COSTS		HOURS		COSTS		HOURS		COSTS		HOURS		COSTS	
	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL	AVG	PER CENT OF TOTAL	AVG FOR PROF	TOTAL
A.1	0.0	0.000	0.00	0.00	27.7	53.623	2099.35	4198.70	25.0	52.356	2975.57	5951.14	19.3	31.608	1930.88	5792.63
A.2	0.0	0.000	0.00	0.00	1.8	3.382	132.39	264.78	3.3	6.806	386.82	773.65	1.7	2.725	166.45	499.36
A.3	0.0	0.000	0.00	0.00	2.3	4.348	170.22	340.43	3.5	7.330	416.58	833.16	2.5	4.087	249.68	749.05
A.4	0.0	0.000	0.00	0.00	1.5	2.899	113.48	226.96	2.5	5.236	297.56	595.11	3.0	4.905	299.62	898.86
TOTAL A	0.0	0.000	0.00	0.00	33.2	64.251	2515.43	5030.87	34.2	71.728	4076.53	8153.06	26.5	43.324	2646.63	7939.89
B.1	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00
B.2	0.0	0.000	0.00	0.00	8.0	15.459	605.22	1210.43	3.9	7.853	446.34	892.67	3.7	5.995	366.20	1098.60
B.3	0.0	0.000	0.00	0.00	4.8	9.179	359.35	718.70	5.0	10.471	595.11	1190.23	5.7	9.264	565.95	1697.84
TOTAL B	0.0	0.000	0.00	0.00	12.7	24.638	964.57	1929.13	9.8	18.325	1041.45	2082.90	9.3	15.259	932.15	2796.44
C.1	0.0	0.000	0.00	0.00	1.3	2.415	94.57	189.13	.3	.524	29.76	59.51	2.2	3.542	216.39	649.17
C.2	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00
TOTAL C	0.0	0.000	0.00	0.00	1.3	2.415	94.57	189.13	.3	.524	29.76	59.51	2.2	3.542	216.39	649.17
D.1	0.0	0.000	0.00	0.00	1.5	2.899	113.48	226.96	1.3	2.618	148.78	297.56	2.5	4.087	249.68	749.05
D.2	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	.3	.545	33.29	99.87
D.3	0.0	0.000	0.00	0.00	.5	.966	37.83	75.65	.3	.524	29.76	59.51	2.0	3.270	199.75	599.24
TOTAL D	0.0	0.000	0.00	0.00	2.0	3.865	151.30	302.61	1.5	3.141	178.53	357.07	4.8	7.902	482.72	1448.16
E.1	0.0	0.000	0.00	0.00	0.0	0.000	0.00	0.00	.5	1.047	59.51	119.02	15.0	24.523	1498.09	4494.28
E.2	0.0	0.000	0.00	0.00	2.5	4.831	189.13	378.26	2.5	5.236	297.56	595.11	3.3	5.450	332.91	998.73
TOTAL E	0.0	0.000	0.00	0.00	2.5	4.831	189.13	378.26	3.0	6.283	357.07	714.14	18.3	29.973	1831.00	5493.01
TOTAL	0.0	0.000	0.00	0.00	51.7	100.000	3915.00	7830.00	47.7	100.000	5683.33	11366.67	61.2	100.000	6108.89	18326.67

	ACTIVITY	N=7 ALL RANKS HOURS AVERAGE PER WEEK	HOURS PER CENT OF TOTAL	COSTS AVERAGE SALARY	COSTS TOTAL SALARIES
A.1	SCHEDULED TEACHING	23.3	42.7	2277.50	15942.47
A.2	UNSCHEDULED TEACHING	2.2	4.0	219.63	1537.39
A.3	ACADEMIC PROGRAM ADVISING	2.7	4.9	274.66	1922.64
A.4	COURSE AND CURRICULUM RESEARCH AND DEVELOPMENT	2.4	4.4	245.85	1720.93
A	TOTAL TEACHING ACTIVITIES	30.6	56.0	3017.69	21123.82
B.1	INSTITUTE AND RESEARCH CENTERS	0.0	0.0	0.00	0.00
B.2	SPECIFIC PROJECTS	5.0	9.2	457.39	3201.70
B.3	GENERAL SCHOLARSHIP AND PROFESSIONAL DEVELOPMENT	5.2	9.5	515.25	3606.77
B	TOTAL RESEARCH, SCHOLARSHIP, AND CREATIVE WORK ACTIVITIES	10.1	18.5	972.64	6808.47
C.1	GENERAL PROFESSIONAL SERVICES/ADVICE DIRECTED OUTSIDE THE INSTITUTION	1.4	2.6	128.26	897.81
C.2	EXTENSION SERVICE	0.0	0.0	0.00	0.00
C	TOTAL PUBLIC SERVICE ACTIVITIES	1.4	2.6	128.26	897.81
D.1	STUDENT-ORIENTED SERVICE	1.9	3.5	181.94	1273.57
D.2	GENERAL PROFESSIONAL SERVICE/ADVICE DIRECTED TOWARD THE INSTITUTION	0.1	0.2	14.27	99.87
D.3	SERVICE REPORTS AND RECORDS	1.1	2.1	104.91	734.40
D	TOTAL INTERNAL SERVICE ACTIVITIES	3.1	5.7	301.12	2107.84
E.1	ADMINISTRATIVE DUTIES	6.6	12.1	659.04	4613.30
E.2	COMMITTEE PARTICIPATION	2.8	5.1	281.73	1972.10
E	TOTAL ADMINISTRATIVE AND COMMITTEE ACTIVITIES	9.4	17.2	940.77	6585.41
	TOTAL	54.6	100.0	5360.48	37523.34

Some interesting but not unexpected trends developed from instructor to professor as reflected in Table 4. After examining the percentage distributions, a general trend, with minor deviations, emerged showing that with an increase in rank there was a decline in the percentage of time spent in scheduled teaching and an increase in research, administrative duties, and committee work. Although the difference in research between associate professor and professor was meaningless, the difference in administrative duties and committee work was 6.7 hours.

Several questions could be raised in light of the distribution of salary costs among the activities. For example, research was consuming approximately $51,000, which was more than half of the scheduled teaching function; but can the output of this activity justify the cost? This question and similar questions cannot be answered by this research, but only through the judgment of the administration and faculty of this college.

Table 5 reflects a small department with limited activity in research (13.4%) but a major involvement in teaching (51.4%). The department represented in Table 6 was the most equipment-oriented and made the most use of the tutorial method of instruction. Its distribution of faculty time resembled the total college. Table 7

reflects the department with the greatest committment to research (31.7%). Scheduled teaching amounted to only 31.3 per cent. The teaching and research responsibility was quite evenly distributed over the three ranks in this department. This department also reported the highest number of hours per week (69.9 hours) which was also quite evenly spread over the ranks. The department represented by Table 8 required small classes with a large amount of faculty time spent in evaluating papers. This may have accounted for the fact that this department had the second highest allocation to scheduled teaching (29.7 hours). Other than a very low allocation to public service, this department generally paralleled the college. The final department, as reflected in Table 9, reported the lowest number of average hours per week (54.6 hours). Although a low public service allocation was reported, this department had the highest allocation in the college to administrative duties and committee work (17.2%).

This profile analysis of the faculty activities provided a focus for the rest of this research. The scheduled teaching section of the profile analysis for the total college as reflected in Table 4 was examined by correlating several variables of the instructional workload. These variables were factors related to the student, the faculty, and the course.

Student, Faculty, and Course Relationships

An application of the Pearson product moment correlation to the data included in the scheduled teaching section of the profile analysis revealed some meaningful relationships. Table 10 shows that there was little relationship between faculty rank and other variables such as total workweek (.139), total teaching hours per course (-.140), level of instruction (.029), and likelihood for graduate assistant help (.114). However, it did appear that rank was positively related to years of experience (.515). Also as the rank increased there was a slight tendency for the teacher to have taught his courses previously (.204). As his years of experience increased there was only a slight possibility that he would spend less time in preparation and administration for his courses (-.20).

It is noteworthy that there was very little correlation between the total workweek for a faculty member and the student credit hours per course (-.124), class size (-.118), contact hours per course (-.052), number of course sections taught (-.142), and total teaching hours per course (.144). It appeared that the total hours worked per week was a relatively fixed amount and as instructional workload measures decreased or increased other activities were forced to increase or decrease to absorb the time.

TABLE 10.--Simple correlations of instructional workload characteristics *

	VAR NO.						
RANK	1	1.00000000					
EXPERIENCE	2	.51516045	1.00000000				
FIXED CRED	3	-.16020567	.10686174	1.00000000			
NO SECTION	4	-.19692198	.17260176	.24929875	1.00000000		
TOTAL HOUR	5	.13928623	-.03417134	-.19801114	-.14216551	1.00000000	
LEVEL	6	.02912891	-.11609236	-.05330509	.06419892	.06000241	1.00000000
FREQUENCY	7	.20415309	.48124534	-.15281213	.22727332	-.12300460	-.01646634
CLASS SIZE	8	.15296251	.08870426	.06348510	-.15934390	-.11778990	-.56142913
CRED HOURS	9	.19557726	.04470281	-.09494971	-.19078945	.06717433	.17906151
SCH	10	.17479749	.09140072	.05206417	-.18275005	-.12369540	-.53156068
CONTACT HR	11	-.17768833	-.12154577	-.07438563	-.34412540	-.05248249	-.11039796
OTHER HOUR	12	-.00274338	.00640244	-.22280293	-.25408560	.30357136	-.00598905
PREP ADM	13	-.09788201	-.19964965	.05216012	-.26396927	.13491393	-.15035025
TEACH TIME	14	-.13956733	-.15226155	-.08455157	-.40007987	.14414803	-.12978193
GRAD ASST	15	.11363037	-.20478144	-.05078298	-.05051946	.02803009	-.25131503
COST-TIME	16	.15050574	.06565516	-.03762960	-.36341445	-.09219004	-.26367466
COST-CONT	17	.12179164	.05834626	-.03182962	-.30245906	-.07679252	-.24394648
COST-SCH	18	.10787688	.05174465	-.02805987	-.26302078	-.06797641	-.45954911
COST-CRED	19	.20361764	.09213320	-.06474899	-.47551393	-.10224267	-.19030234
		1	2	3	4	5	6
		RANK	EXPERIENCE	FIXED CRED	NO SECTION	TOTAL HOUR	LEVEL
FREQUENCY	7	1.00000000					
CLASS SIZE	8	-.06649788	1.00000000				
CRED HOURS	9	.01272931	-.04961252	1.00000000			
SCH	10	-.07664434	.97505882	.10107974	1.00000000		
CONTACT HR	11	-.15339803	.09640173	-.17790849	.09504321	1.00000000	
OTHER HOUR	12	-.14323063	.01104438	.03656887	.01680357	.28405267	1.00000000
PREP ADM	13	-.19950818	.33100248	.18049163	.37781257	.39562574	.25296470
TEACH TIME	14	-.22372621	.21465553	.00411236	.23809034	.80328952	.61008615
GRAD ASST	15	-.17206693	.50012650	.12175935	.50679725	.03788133	.01500952
COST-TIME	16	-.11513679	.45993636	.11917081	.50664514	.60812237	.43141392
COST-CONT	17	-.12686007	.43080076	.13039438	.48259218	.60406293	.33252891
COST-SCH	18	-.05023129	.68109261	.21136141	.72029569	.23700236	.20360952
COST-CRED	19	-.03425566	.28456768	.47377196	.35476271	.13991024	.29501908
		7	8	9	10	11	12
		FREQUENCY	CLASS SIZE	CRED HOURS	SCH	CONTACT HR	OTHER HOUR
PREP ADM	13	1.00000000					
TEACH TIME	14	.77433855	1.00000000				
GRAD ASST	15	.34995338	.19497413	1.00000000			
COST-TIME	16	.72569712	.81452750	.45440201	1.00000000		
COST-CONT	17	.67379705	.75232386	.44996820	.93412256	1.00000000	
COST-SCH	18	.54605163	.45930303	.53200150	.73356386	.70129488	1.00000000
COST-CRED	19	.38802876	.36784325	.36265886	.62750606	.56329247	.65432201
		13	14	15	16	17	18
		PREP ADM	TEACH TIME	GRAD ASST	COST-TIME	COST-CONT	COST-SCH

*See page 124 for an unabbreviated listing of variables.

Unabbreviated Listing of Variables
Related to Table 10

	Abbreviated (as in Table 10)	
1.	Rank	Faculty
2.	Experience	Years of teaching experience of the faculty member
3.	Fixed Cred	Fixed credit courses as opposed to variable credits
4.	No Section	Number of sections and/or courses taught by the faculty member
5.	Total Hour	Total work week expressed in hours
6.	Level	Course level of instruction
7.	Frequency	Number of times the professor has taught the course
8.	Class Size	Number of students enrolled in the course
9.	Cred Hours	Course credit hours
10.	SCH	Student credit hours
11.	Contact Hr	Formal scheduled contact hours or class hours
12.	Other Hour	Informal contact outside the classroom
13.	Prep Adm	Preparation and administration for the course
14.	Teach Time	Total course time - time devoted to a course
15.	Grad Asst	Whether or not a graduate assistant is assigned to the course
16.	Cost-Time	Course costs allocated on actual time devoted to the course
17.	Cost-Cont	Course costs allocated on formal contact hours
18.	Cost-SCH	Course costs allocated on student credit hours
19.	Cost-Cred	Course costs allocated on course credit hours

There did appear to be some flexibility in the use of time. There was a slightly positive relationship between total time per course and class size (.215) as well as student credit hours (.239). Also, as enrollment increased the time spent in preparation and administration increased slightly (.331). There was also a greater possibility for graduate assistant help (.500). Therefore as the class size increased there may have been a slight increase in total time devoted to that class, but the total workweek was not likely to change. It also appears that if a faculty member taught more sections or courses he may have spent less time per course section. That is, the higher the number of sections taught, the fewer hours spent in formal contact (-.344), other contact (-.258), preparation and administration (-.264), and total teaching time (-.400) per section. This is meaningful in analyzing workloads.

As there was an increase in the number of times the professor taught the course (frequency), the total number of teaching hours related to that course decreased only slightly (-.224) and the total workweek changed little (-.123). As expected, preparation and administrative time devoted to the course decreased slightly (-.200) as did other contact hours (-.143) when frequency was increased. However, formal contact hours also decreased with an increase in frequency (-.153), a phenomena difficult to explain.

As the level of instruction increased there was a decrease in class size (-.561) and SCH (-.532). Yet there was little correlation between level and total teaching hours (-.130), contact hours (-.110), and other contact hours (-.006). That is, as the level of instruction increased the size of the classes got smaller while the total teaching hours worked per course and the contact hours per course may have changed very little. It is interesting that higher level courses did not have a higher amount of other contact hours reported since at the graduate level a premium is placed on informal contact with students.

Although total teaching hours per course increased when formal contact hours increased (.803) the total workweek changed little (.144). In addition, as formal contact hours increased there was a slight increase in other contact hours (.284) as well as preparation and administrative time (.400). Therefore, an increase in contact hours may increase the teaching activities but it will not necessarily increase the total workweek.

Cost Relationships

The interrelationships among the four costing methodologies are noteworthy. Table 10 shows that costs developed on formal contact hours correlated with costs developed on total course time at a ratio of .934. Costs based on time correlated with costs based on

student credit hours at .734 and with costs based on credit hours at .628. Costs based on contact hours and student credit hours correlated at .701, between contact hours and credit hours at .563, and between student credit hours and credits at .654. Costs developed on total course time reported by the faculty correlated higher than any other method with each of the others except credit hours, which correlated at .654 with student credit hours compared to .628 with time. However, because costs developed on formal contact hours correlated so very highly with the total course time as reported by the faculty (.934, see Table 10), one should weigh quite closely the advantages of faculty activity survey over simply costing on formal contact hours.

It was apparent from the information in Table 11 that the methodology selected for allocating costs to courses would to some extent determine that cost. Allocating costs based on total course time and on formal contact hours paralleled each other quite closely. Although costing on credit hours, to a limited extent, resembled total course time and contact hours, costing on student credit hours varied a great deal from the other three patterns. This might be expected since student credit hours are really a subset of course credit hours. That is, the other three methods focus

on the course, whereas this method considers both the class size and the course credit hours. In interpreting Table 11, it is imperative that caution be exercised. The base unit was the individual course, thus to compare between levels it would be preferable to reduce the average course cost to a common unit.

TABLE 11.--Course cost patterns by level of instruction for four costing methodologies (in dollars)

Average Course Section Cost by Course Level	N	Allocation Methodology			
		Course Time	Contact Hours	Student Credit Hour	Course Credit Hour
Lower Undergraduate	19	1365	1388	1849	1194
Upper Undergraduate	71	731	730	696	747
Graduate	34	772	750	562	841

Rather than reporting per course costs by level, in Table 12 the course costs were reduced to per hour of total course time, per contact hour, per student credit hour, and per course credit hour. For each allocation methodology the unit basis for that allocation could not be used as the unit of measurement in the per unit cost since there would be no differential in the cost by level. This accounts for the blank spaces in Table 12.

TABLE 12.--Course costs by level converted to unit cost per course credit hour, student credit hour, contact hour, and total course time*

Unit of Cost	N	Allocation Methodology				Average	
		Course Time	Contact Hours	Student Credit Hour	Course Credit Hour	Cost	Ratio
Course Time							
Lower Undergraduate	19	---	121	164	106	130	1.0
Upper Undergraduate	71	---	80	76	82	79	.6
Graduate	34	---	91	69	102	87	.7
Per Contact Hour							
Lower Undergraduate	19	446	---	604	390	480	1.0
Upper Undergraduate	71	216	---	206	220	214	.4
Graduate	34	368	---	269	402	346	.7
Per Student Credit Hr.							
Lower Undergraduate	19	5	5	---	5	5	1.0
Upper Undergraduate	71	11	11	---	11	11	2.2
Graduate	34	19	18	---	20	19	3.8
Per Course Credit Hour							
Lower Undergraduate	19	419	429	530	---	489	1.0
Upper Undergraduate	71	264	263	209	---	268	.5
Graduate	34	207	195	143	---	182	.4

*Because of the nature of the data, this table should not be separated from the discussion which follows.

Table 12 illustrates the fact that the methodology for allocating the cost to the course and the unit selected to reduce that course cost to a common base will, to some extent, determine the cost. In the literature a popular unit used as a common base is the student credit hour. Anderson reported a ratio of 1:2:4 for the three levels of instruction. As Table 12 shows this ratio would also be supported by this research. However, the major factor in determining this ratio was costing based on the number of students, for the other three methodologies reflected a reverse pattern with lower undergraduate being the most expensive. These other methodologies developed unit cost based on the course regardless of the number of students. Since tuition fees are determined on a per student credit hour basis, there is value to calculating cost on the student credit hour. Yet, if there is some flexibility so that class size can be increased or decreased moderately without damaging the quality of instruction,[2] then perhaps costing should be focused upon the faculty member's time or upon the course.

It was apparent from Table 12 that salary cost determined on total course time reported was greater for lower undergraduate instruction. The correlational study reported earlier in this chapter in Table 10 showed class size correlating only moderately with

cost, and this due mainly to the inclusion of graduate assistant cost since the correlation with faculty time was only .215. The cost relationships reported in Table 12 should provide a reference for discussion by the administration and faculty of the college as they set policies governing workload factors.

Costing Methodologies and Variables of Cost

The literature suggests several variables which are related to cost. In this research the relationships of five of these variables, with cost developed on four costing methodologies, were examined. The following four research questions which were used as a guide in the analysis provide a focus for reporting the results.

1. Is there a relationship between each independent variable and cost for each of the costing methodology?

To answer this question two approaches were used. The Pearson product moment correlations were calculated between each independent variable and cost except for method of instruction (see Table 13). Caution needs to be exercised in interpreting this data. The unit of study is the course and not the student. If these costs were converted to a per student basis different results would likely occur.

TABLE 13.--Selected correlations among variables and costing methodologies

Variables	Course Costs Based on Percentage Allocation of			
	Total Course Time	Contact Hours	SCH	Credit Hours
Graduate Assistant's Cost Included				
Faculty Rank	.151	.122	.108	.204
Course Level	-.264	-.244	-.460	-.190
Class Size	.460	.431	.681	.285
Number of Sections and/or Courses Taught	-.363	-.302	-.268	-.476
Graduate Assistants Cost Excluded				
Faculty Rank	.109	.090	.081	.145
Course Level	-.209	-.188	-.442	-.065
Class Size	.367	.347	.648	.111
Number of Sections and/or Courses Taught	-.362	-.298	-.269	-.481

Because method of instruction is on a nominal scale, the Pearson product moment correlation is inappropriate. Therefore a one-way analysis of variance was used for this method in answering this question.

a. Rank had only a slight correlation with costs regardless of the costing methodology employed. The highest correlation was with costs developed on credits (.204); the lowest, with costs based on student credit hours (.108); with contact hour costs at .122 and costs based on total course time at .151.

b. Level had a low negative correlation with course costs based on total course time (-.264) and contact hours (-.244). The definite but small relationship may be attributed to a slightly negative relationship between the course level and the teaching time (-.130) and contact hours (-.110), see Table 10. A moderate correlation existed between level and costs developed on student credit hours (-.460). This was due in part to the negative correlation between the level of instruction and class size (-.561), see Table 10. Because costs were allocated to the course based on student credit hours, the impact was such that the larger classes cost the most per class. Therefore, it follows that the level of instruction would have a negative relationship with course costs developed on student credit hours.

c. Class size correlated moderately with costs based on total course time (.460), contact hours (.431), and student credit hours (.681). It had a low correlation with costs based on credit hours (.285). The positive correlation with course costs based on student credit hours was not surprising since class size correlated at .975 with student credit hours, the basis of allocating the costs, see Table 10. However, the substantial relationship between class size and course costs based on total course time (.460) was higher than might be expected since the correlation between class size and the total time devoted to a course was .215, see Table 10. This discrepancy can be explained by the fact that class size and the possibility of graduate assistant help was correlated at .500. Graduate assistants tended to be used on larger classes increasing the costs for those classes by the proportional allocation of the graduate assistant's salary. As reflected in Table 13, graduate assistants only effected a meaningful difference in correlations dealing with class size. With the exception of costs based on student credit hours, the correlations with class size would be lowered approximately ten points if graduate assistants were excluded from cost.

d. Number of sections taught was split as a variable between fixed credit sections and total sections.

There was very little correlation between fixed credit sections and costs regardless of methodology employed. The ratio ranged from -.028 to -.065. However, there was a negative relationship between the total sections taught and costs developed on the basis of total course time (-.363), formal contact hours (-.302), SCH (-.268), and course credits (-.476). That is, as the total number of sections taught increased, there was a slight decrease in costs. It has already been reported that as the total number of sections taught increased, the total time devoted to a course section decreased (-.400) as did also the contact hours (-.344). Therefore, each course got a smaller percentage of the total contact hours and teaching hours which resulted in an allocation of costs over more courses. The same logic held for SCH's and course credits.

The four variables used to allocate costs to the courses were correlated with the course costs before and after allocating the graduate assistant's salary. The correlations are reported in Table 14. It was evident from this table that all of the correlations were higher when the graduate assistant costs were included. With the exception of the variable of total course time, the variables used for allocating the costs only correlated moderately with the course costs. Other factors such as the salary schedule must account for the difference.

TABLE 14.--Correlations among bases of allocating costs and course costs developed on four methodologies

Variables	Course Costs Based on Percentage Allocation of			
	Total Course Time	Contact Hours	SCH	Credit Hours
Graduate Assistant's Cost Included				
Total Time Devoted to Course	.815	.752	.459	.368
Contact Hours	.608	.604	.237	.140
SCH	.507	.483	.720	.355
Credit Hours	.119	.130	.211	.474
Graduate Assistant's Cost Excluded				
Total Time Devoted to Course	.736	.601	.221	.116
Contact Hours	.451	.426	.066	.023
SCH	.172	.161	.474	.033
Credit Hours	.008	.012	.042	.224

e. Method of instruction was analyzed next to determine whether or not it had a relationship with costs based on the four methodologies. For this analysis it was necessary to use the one-way analysis of variance technique for a correlation analysis would be inappropriate.

The one-way analysis of variance was testing the hypothesis that the mean course costs were equal for all of the six methods of instruction. If this hypothesis were true then method of instruction would not have a relationship with cost. However, if the mean costs of the methods are different then method of instruction may make a difference in cost. To determine where the differences were located another statistical test was necessary. Unit cost data are in the appendices.

Analysis of variance for method of instruction was conducted using course costs for each of the four costing methodologies with costs including and excluding graduate assistants. The analysis was also made using course costs, including graduate assistant cost, and converted to per credit cost for the three costing methodologies using total course time, formal contact hours, and SCH. The methodology employing credit hours was omitted since there would have been no difference because it was the base unit used on the other three methodologies. Therefore, the units of study were

both the course costs and the course cost per credit. The F statistic, F table value, and the level of significance for each of the analysis of variance tables are listed below. The complete analysis of variance tables for each test are included in the appendices.

As Table 15 highlights, the hypothesis of equal mean costs for the methods of instruction must be rejected. There were statistically significant differences in the mean costs of the methods for each of the four costing methodologies whether or not graduate assistant costs were included, or if the costs were based on per course credits instead of total course costs. In every case the level of significance was at the .0005 level except for course costs allocated on credit hours, but excluding graduate assistants. In this case the .008 level was still a very high level of significance.

This statistical test answered the research question by demonstrating that there was a relationship between method of instruction and costs under each of the four costing methodologies. However, where the differences were located has not yet been discussed. To identify the differences the Scheffé method of post hoc comparisons was utilized. Table 32 in the appendices shows that in only five contrasts were there significant differences, yet they reflect a grouping pattern.

TABLE 15.--Analysis of variance F statistic for method of instruction

Costing Methodology	F Statistic	F Table Value	Level of Sig.
Without Graduate Assistant Costs:			
Total Course Time	13.04	4.79	.0005
Formal Contact Hrs.	15.55	4.79	.0005
Student Credit Hrs.	17.23	4.79	.0005
Course Credit Hrs.	3.30	4.79	.008
With Graduate Assistant Costs:			
Total Course Time	15.47	4.79	.0005
Formal Contact Hrs.	17.36	4.79	.0005
Student Credit Hrs.	17.99	4.79	.0005
Course Credit Hrs.	5.90	4.79	.0005
Per Credit Costs:			
Total Course Time	7.37	4.79	.0005
Formal Contact Hrs.	9.29	4.79	.0005
Student Credit Hrs.	12.84	4.79	.0005

Inspection of this data suggested that costs of lecture and discussion were similar as were the costs of seminar and independent study. Laboratory and tutorial may form another group, Table 32. Upon reflection of the definitions of each of these methods of instruction and the tendency in the literature to group instruction into laboratory, nonlaboratory, and independent study,[3] it was decided to re-group instruction and test using Scheffé for similar mean costs. The three groups of instruction became (1) lecture and recitation/discussion, (2) laboratory and tutorial, and (3) seminar and independent study.

These three groups were contrasted against each other both on course costs and on course costs per credit. The complex contrasts were calculated by both weighting the contrasts with the number of units in the given method and without weighting the contrasts. Identical results were found with both the weighted and unweighted approaches. The results reported in Table 33 in the appendices demonstrate that lecture and discussion were definitely different in cost from seminar and independent study under all four costing methodologies whether determined on a per-course basis or on a per-credit basis. Laboratory and tutorial differ from the other two groups part of the time depending upon the costing methodology employed.

It was apparent that method of instruction did have a relationship as a variable of cost with each of the four costing methodologies. Furthermore, the methods seemed to group into the three categories as discussed in the literature,[4] from a methodological point of view as well as from a cost point of view as demonstrated in this research.

Because method of instruction is on a nominal scale it was not possible to include it as a variable in the remainder of the research. The statistical test performed on method of instruction demonstrated that it was certainly a major factor and highly related to

cost. The issue must remain unsettled as to whether or not class size determines the method of instruction. However, the evidence suggested a strong relationship between cost and method of instruction under all four of the costing methodologies.

2. What is the relative importance of the variables within each costing methodology?

This question was answered by utilizing multiple regression stepwise addition and deletion with course costs developed on the four methodologies as the dependent variable. The results of the multiple regression analysis are reported in Tables 17 - 20. The equations were calculated setting the significance level at .05 for both approaches in addition to in Tables 16 - 29. All variables were included to obtain a rank ordering, however, conclusions will be drawn only on those that are significant. The equations were calculated setting alpha at .05 for both approaches in addition to including all variables regardless of their level of significance. A complete set of data for the multiple regression equations including only those significant at the .05 level are included in the appendices. Identical results were obtained by the stepwise addition and deletion approaches.

TABLE 16.--Multiple regression results for costs allocated on total course time reported (four variables)

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	1107.60						
Class Size*	6.73	1.63	.39	.10	17.12	.0005	.211
No. of Sections Taught*	- 136.47	36.86	-.29	.08	13.71	.0005	.298
Faculty Rank	18.65	44.64	.03	.08	.17	.677	.299
Course Level	- 22.13	85.18	-.02	.09	.07	.795	.299

Multiple Correlation Coefficients

	R^2	R
All Variables	.30	.55
*Only Variables with at least .05 sig. when excluding other variables (see appendices for analysis)	.30	.55

TABLE 17.--Multiple regression results for costs allocated on formal contact hours (four variables)

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	1067.52						
Class Size*	7.70	2.00	.38	.10	14.85	.0005	.186
No. of Sections Taught*	- 130.94	45.33	-.24	.08	8.34	.005	.242
Faculty Rank	11.29	54.90	.02	.08	.04	.837	.242
Course Level	- 15.76	104.75	-.01	.10	.02	.881	.242

Multiple Correlation Coefficients

	R^2	R
All Variables	.24	.49
*Only Variables with at least .05 sig. when excluding other variables (see appendices for analysis)	.24	.49

TABLE 18.--Multiple regression results for costs allocated on student credit hours (four variables)

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	1156.99						
Class Size*	13.44	1.83	.59	.08	53.72	.0005	.464
No. of Sections Taught*	- 105.19	41.57	-.17	.07	6.40	.013	.490
Course Level	- 141.84	96.06	-.12	.08	2.18	.142	.500
Faculty Rank	- 9.19	50.34	-.01	.07	.03	.855	.500

Multiple Correlation Coefficients

	R^2	R
All Variables	.50	.71
*Only Variables with at least .05 sig. when excluding other variables (see appendices for analysis)	.49	.70

TABLE 19.--Multiple regression results for costs allocated on course credit hours (four variables)

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	1279.66						
No. of Sections Taught*	- 150.63	28.26	-.43	.08	28.41	.0005	.226
Class Size*	2.05	1.25	.16	.10	2.70	.103	.271
Faculty Rank	41.47	34.22	.10	.08	1.47	.228	.278
Course Level	- 52.85	65.30	-.08	.09	.65	.420	.282

Multiple Correlation Coefficients

	R^2	R
All Variables	.28	.53
*Only Variables with at least .05 sig. when excluding other variables (see appendices for analysis)	.27	.52

a. Total course time reported by the faculty was one methodology for allocating costs to courses. The results of applying the costs developed on this methodology as the dependent variable in a multiple regression analysis are reported in Table 16. The rank ordering of the relative importance of the variables can be determined by examining the contribution to the total R^2 made by each variable. The two variables, class size and number of sections taught by the faculty member, together accounted for almost all the R^2 in the equation. The other two variables made little additional contribution to the R^2.

b. Formal contact hours, as reported in the survey, was the basis for allocating costs to courses. Table 17 reflects the results of the multiple regression analysis. As with the methodology based on total course time, class size and number of sections taught are again the only two significant factors in contributing to the total R^2. This costing methodology not only had the lowest R^2 (.24) but it also had the lowest combined R^2 for class size and number of sections taught (.242).

c. Student credit hours, the third basis of allocating costs, had the highest contribution to R^2 (.49) for the two significant variables of class size and number of sections taught (see Table 18). Class size alone accounted for .464 of the variance in costs.

This undoubtly was a result of the very high correlation between class size and SCH (.975, Table 10). Because class size was the major component in calculating student credit hours, it was not surprising that there was a higher correlation in this methodology.

d. Course credit hours was the fourth methodology for allocating costs to courses and the results of applying these costs as the dependent variable in the multiple regression analysis are reported in Table 19. The two significant variables reported with the other three methodologies were also significant under this methodology, but in reverse order. The number of sections taught by the faculty member accounted for .226 of the total R^2. When class size was added the cumulative contribution was .271.

Only class size and the number of sections taught by the faculty member were significant variables in all four methodologies. In three out of the four methodologies class size was first in relative importance. Faculty rank and course level were not significant variables when combined with the other variables although the former appeared third in the ranking three out of four times.

3. Under which costing methodology do the variables explain the greatest amount of the variance in the costs?

Below is a summary of the multiple correlation coefficients reported in Tables 16-19. It was apparent that the four independent variables together explained the greatest amount of variance when costs were allocated on a student credit hour basis. However, this was due almost solely to the independent variable of class size.

TABLE 20.--Summary of multiple correlation coefficients

	R^2	R
Costs Allocated on Actual Time	.30	.55
Costs Allocated on Contact Hours	.24	.49
Costs Allocated on Student Credit Hours	.50	.71
Costs Allocated on Course Credit Hours	.28	.52

Research questions 2 and 3 were extended to include additional variables.

Because class size is so highly correlated with student credit hours, the results of this analysis may not reflect the true usefulness of the costing methodologies. Including class size as an independent variable had the effect of considering only one of the bases of allocating cost since student credit hours, one basis of allocating costs, correlates with class size at .975 (see Table 10). For this reason it was decided to add the four variables used in allocating costs to the four

independent variables discussed above. A multiple regression stepwise addition and deletion was calculated for the eight variables. A significance level of .05 was required for both the addition and deletion techniques. The multiple regression analysis was also figured regardless of the variable's level of significance. A complete set of data for the multiple regression equations for only those variables significant at the .05 level are included in the appendices. Identical results were found by the stepwise addition and deletion techniques except for costs allocated on course credit hours. Both approaches for credit hours are reported in the appendices.

In addition to the four variables of class size, number of sections taught by the faculty member, faculty rank, and course level, the four bases of allocating costs were included. These are: total course time reported by faculty, formal contact hours, student credit hours, and course credit hours. Reported below are the results of the multiple regression analysis on the eight variables for each of the four costing methodologies.

Table 21 reflects the results of the multiple regression analysis, for all eight variables, for costs allocated on the total course time devoted to the course reported by the faculty in the survey. Only three variables, total course time, student credit hours, and

TABLE 21.--Multiple regression results for costs allocated on total course time reported (eight variables)

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	-259.53						
Total Course Time*	64.99	6.02	.78	.07	116.58	.0005	.664
Student Credit Hours*	3.16	1.29	.61	.25	6.01	.016	.767
Faculty Rank*	123.00	24.34	.22	.04	25.53	.0005	.808
Class Size	- 6.03	4.21	-.35	.25	2.05	.155	.814
No. of Sections Taught	27.23	21.73	.06	.05	1.57	.213	.816
Course Level	44.33	44.87	-.05	.05	.98	.325	.816
Course Credit Hours	9.37	35.14	.02	.06	.07	.790	.818
Contact Hours	1.70	11.58	.01	.07	.02	.884	.818

Multiple Correlation Coefficients

	R^2	R
All Variables	.82	.90
*Only Variables with at least .05 sig. when excluding other variables (see appendices for analysis)	.81	.90

faculty rank, made significant contributions to the total explained variance in costs (R^2). Faculty rank was significant in this analysis whereas without including the bases of allocating costs it was not significant (see Table 16).

The highest multiple correlation coefficient of R^2 (.82) was achieved by this costing methodology. By adding the bases of allocating costs as variables in the multiple regression analysis, the costing methodologies were put on a more comparable basis. This was the case because the variable of class size had, in effect, the impact of one of the bases of allocating costs, namely student credit hours. However, the high R^2 is a result of adding the variable used in allocating the costs. Thus, caution needs to be exercised in interpreting the high R^2.

The multiple regression results for allocating costs on contact hours was reported in Table 22. A total R^2 of .72 resulted from the analysis, .70 of which was attributed to total course time, student credit hours, faculty rank, and class size. It was noteworthy that contact hours did not make a significant contribution to the total R^2, yet it was the basis of allocating the costs. When considered independently of the other variables, contact hours correlated at .604 with costs allocated on contact hours (see Table 10).

TABLE 22.--Multiple regression results for costs allocated on formal contact hours (eight variables)

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	-552.85						
Total Course Time*	59.53	8.83	.61	.09	45.42	.0005	.566
Student Credit Hours*	4.47	1.89	.73	.31	5.58	.020	.664
Faculty Rank*	126.68	35.72	.19	.05	12.57	.001	.691
Class Size*	- 9.18	6.18	-.46	.31	2.21	.140	.703
Contact Hours	31.76	17.00	.17	.09	3.49	.064	.710
No. of Sections Taught	59.80	31.89	.11	.06	3.52	.063	.717
Course Credit Hours	35.31	51.57	.05	.07	.50	.483	.718
Course Level	-40.24	65.84	-.04	.06	.37	.542	.719

Multiple Correlation Coefficients

	R^2	R
All Variables	.72	.85
*Only Variables with at least .05 sig. when excluding other variables (see appendices for analysis)	.70	.84

Student credit hours was the basis for allocating costs and used as the dependent variable in the multiple regression analysis reported in Table 23. Whereas this costing methodology had the highest R^2 when just the four variables were included (.50, see Table 18), it had next to the lowest with an R^2 of .65 in this analysis. Class size, which accounted for .46 of the R^2 reported in Table 18, contributed no significant addition to the total R^2 when all eight variables were considered. Student credit hours had a level of significance of .0005 in the equation that included only the four significant variables (see appendices). In the analysis reported in Table 23 it lost that level of significance when it was considered along with all eight variables. The difference was a result of a major shift in the standard error of the regression coefficient for the variable. Therefore, student credit hours made the major contribution to the explained variance as reflected in R^2, but its level of significance was altered by the inclusion of all eight variables.

Table 24 reflects the results of the multiple regression analysis with costs allocated to courses based on course credit hours as the dependent variable. An R^2 of .51 resulted from the analysis, the lowest of the four costing methodologies. This was the one analysis where a different result was obtained from

TABLE 23.--Multiple regression results for costs allocated on student credit hours (eight variables)

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	94.52						
Student Credit Hours*	2.79	2.37	.40	.34	1.38	.241	.519
Total Course Time*	48.20	11.07	.44	.10	19.00	.0005	.607
Course Credits*	138.37	64.62	.17	.08	4.59	.034	.628
Course Level*	-207.35	82.50	-.17	.07	6.32	.013	.646
Contact Hours	- 31.69	21.30	-.15	.10	2.21	.140	.653
Faculty Rank	18.37	44.76	.02	.06	.16	.682	.654
Class Size	2.68	7.74	.12	.34	.12	.730	.654
No. of Sections Taught	- 1.93	39.96	-.00	.06	.00	.962	.654

Multiple Correlation Coefficients

	R^2	R
All Variables	.65	.81
*Only Variables with at least .05 sig. when excluding other variables (see appendices for analysis)	.65	.80

TABLE 24.--Multiple regression results for costs allocated on course credit hours (eight variables)

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	504.33						
No. of Sections Taught*	- 96.15	26.97	-.27	.08	12.71	.001	.226
Course Credit Hours*	182.71	43.61	.40	.10	17.55	.0005	.378
Student Credit Hours*	- .11	1.60	-.03	.41	.00	.945	.439
Total Course Time*	25.45	7.47	.41	.12	11.61	.001	.472
Course Level	-116.68	55.68	-.16	.08	4.39	.038	.488
Contact Hour	- 26.89	14.38	-.22	.12	3.50	.064	.505
Faculty Rank	34.24	30.21	.08	.07	1.28	.259	.510
Class Size	1.49	5.22	.12	.40	.08	.776	.511

Multiple Correlation Coefficients

	R^2	R
All Variables	.51	.71
*Only Variables with at least .05 sig. when excluding other variables (see appendices for analysis)	.47	.69

stepwise addition and deletion (see appendices). The variables denoted by an asterisk in Table 24 are the ones considered significant under stepwise addition. A phenomena similar to that reported in Table 23 regarding student credit hours also occurred with this analysis reported in Table 24. Under stepwise addition student credit hours had a significant level of .002 (see appendices), but when all the variables were included as reported in Table 24 the level of significance was excessively high (.945). This difference was also traced to the shift in the standard error of the regression coefficient. The variable, number of sections taught, made the greatest contribution to the total R^2, both when all eight variables were considered (Table 24), and when just the original four variables were considered (Table 19).

Total course time reported and the number of student credit hours were considered significant in all four costing methodologies. Of the original four variables, faculty rank was considered significant twice; and each of the other three variables, class size, course level, and number of sections taught, were each significant once. The variables considered significant with costs based on total course time were also considered significant with costs based on contact hours and in the same relative order of importance. This was

true for all eight variables as reported in Tables 21 and 22, and also with the four original variables as reported in Tables 16 and 17.

The question of the influence of graduate assistant costs that were included in the course costs was answered by the information in Table 25 which compared the multiple correlation coefficients, where the dependent variable excluded the graduate assistant costs, with those where graduate assistant costs were included. Identical results were obtained by the stepwise addition and deletion techniques where graduate assistant costs were excluded.

TABLE 25.--Comparison of multiple correlation coefficients including and excluding graduate assistants costs

Costing Methodology	R^2	R
Total Course Time:		
With Graduate Assistant Cost	.82	.90
Without Graduate Assistant Cost	.83	.91
Contact Hours:		
With Graduate Assistant Cost	.72	.85
Without Graduate Assistant Cost	.71	.85
Student Credit Hours:		
With Graduate Assistant Cost	.65	.81
Without Graduate Assistant Cost	.62	.79
Course Credit Hours:		
With Graduate Assistant Cost	.51	.71
Without Graduate Assistant Cost	.44	.66

Table 25 reflects the fact that graduate assistant costs made very little difference in the multiple correlation coefficients when costs were allocated on total course time and on contact hours. As might be expected, the biggest differences resulted in costs allocated on student credit hours and on course credit hours. The difference in R^2 for costs allocated on course credit hours was explained in part by the fact that student credit hours made a significant contribution to the R^2 when graduate assistant costs were included. Graduate assistant costs correlated highly with large classes, thus with student credit hours. The same principle held for costing on student credit hours.

4. To what extent is there agreement in the rank ordering of independent variables across the costing methodologies?

The Kendall Coefficient of Concordance was used to assess the degree to which there was agreement in the rank ordering of variables between the costing methodologies. This approach provided another way of comparing the costing methodologies. The formula for calculating the Kendall Coefficient of Concordance yielded a coefficient between 0 and 1 where 1 represented perfect agreement among categories.

The rank ordering of the four variables among the four costing methodologies yielded a coefficient of concordance of .85. This coefficient was tested for significance at alpha .05 and found to be significant. That is, the probability was that the result was not a function of chance. Details of the calculations are in the appendices.

The variables were ranked by their relative importance in contributing to the total R^2 in the following order: (1) class size, (2) number of sections taught by the faculty member, (3) faculty rank, and (4) course level. Each of the variables received its rank three out of four times.

Summary

The profile analysis reflected a large portion of faculty time (45%) devoted to noninstructional activities. The distribution of time over activities is consistent with the mission of the departments and representative of other similar studies. The relationships between workload factors provided some noteworthy correlations. It appeared that the total workweek was relatively fixed as instructional workload factors increased or decreased. The total time devoted to a particular course by the faculty member correlated highly with contact hours, but it lacked a high correlation with other factors such as class size, course

credit hours, student credit hours, or level of instruction. As the level of instruction increased, the size of the class tended to get smaller while the time devoted to the class changed very little. As formal contact hours increased the total teaching time increased, but the total workweek changed little.

The correlation between course costs allocated on total course time and course costs allocated on formal contact hours was .934. Cost developed on total course time correlated higher than any other method with each of the other costs except credit hours. By inspection of the data it was evident that course costs and per unit costs were highly similar for the two costing methodologies based on total course time and on contact hours. Allocations based on course credits only partially resembled these two, and as expected, allocations based on student credit hour deviated the most.

It was determined that the method of allocating the costs to the courses and the method of reducing that course cost to a common base would, to some extent, determine that cost. Although previous research suggested that graduate instruction was four times the cost of lower undergraduate instruction when determined on a per-student credit hour, this research, while supporting that conclusion for that one methodology,

found lower undergraduate instruction more costly under the other methodologies. However the other methodologies develop the cost based on some unit of the course, whereas allocating on student credit hours is calculating a cost based on the student. Student credit hour costs, as discussed earlier, are a subset of costs allocated to course credit hours.

Method of instruction was found to be a significant variable of costs. Differences in the mean costs for methods suggested a grouping of lecture and recitation/discussion, laboratory and tutorial, and seminar and independent study.

Class size and the number of sections taught by the faculty member correlated the highest with costs. When the four original variables were considered, class size and number of sections taught made the only significant contribution to the total explained variance in costs under all four costing methodologies. When only the four original variables were considered, costs allocated on student credit hours provided the highest R^2. This was due to the variable class size. When the four bases of allocating costs were included in the multiple regression analysis, which put the costing methodologies on a more comparable basis, the methodology which had the highest R^2 was costs allocated on the basis of the reported total course time. Therefore, the

equation which provided the best model for predicting costs was based on the total time devoted to the course as reported in the faculty activity survey. The rank ordering of relative importance of variables was: (1) class size, (2) number of sections taught by the faculty member, (3) faculty rank, and (4) course level. Although there was high agreement between costing methodologies in the rank ordering of these variables, considering both the original four variables and the four bases of allocating costs, the highest explained variance is achieved with costs allocated on total time devoted to the course as reported in the faculty activity survey.

NOTES--CHAPTER IV

[1]Waldo Keith Anderson, "Factors Associated with Instructional Costs in Kansas Public Higher Education" (unpublished Ph.D. dissertation, University of Minnesota, 1963), Dissertation Abstracts, Vol. 2507, p. 3908.

[2]Ruth E. Eckert, "College and University--Programs," in Encyclopedia of Educational Research, ed. by Chester W. Harris (New York: The MacMillan Company, 1960), p. 279; Stanley Ikenberry, "Instructional Cost and Quality," College and University, XXLVII, No. 3 (Spring, 1962), 50; Paul L. Dressel, "Measurement and Evaluation of Instructional Objectives," The 17th Yearbook, National Council on Measurements Used in Education (Ames, Iowa: National Council on Measurements Used in Education, 1960), p. 5.

[3]Anderson, op. cit., p. 3908; John M. Evans and John W. Hicks, An Approach to Higher Educational Costs Analysis, Studies in Higher Education (Lafayette, Indiana: Purdue University, 1961), p. 20.

[4]Ibid.

CHAPTER V

THE PROBLEM, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS FOR FUTURE RESEARCH

The Problem

Efficient resource projection and allocation requires a thorough analysis of the faculty activities and their related costs. Effective utilization of faculty is a major responsibility of college and university administrators. Even in light of this many institutions have little idea of how the faculty allocate their time or how this distribution effects costs. "One has only to raise the question as to what professors in a given department actually do, to learn that in most departments and most universities only the professor can provide an answer."[1] Few institutions have devised a meaningful method of gathering this information, analyzing the data, or costing out these activities. Only now is the concept of faculty activity analysis emerging with general interest and acceptance.

To manage the cost of instruction requires the identification of the major variables of costs. Yet research on costing methodology in higher education has lacked a thorough examination assessing what results when different costing methodologies are employed. To generate a cost figure is not sufficient when it is realized that the costing methodology will to a degree, determine that cost figure. A need for research which inquires into the nature of the costing methodology used for allocating costs to the individual units chosen was reflected in the literature.

Research Objectives

The objectives of this dissertation were divided into two parts. The first was to examine the inter-relationships of selected instructional workload factors through determining the distribution of faculty time among several activities and assigning costs to these activities based on the salaries of the faculty. The profile analysis was developed by department and by rank.

The second objective was to compare four costing methodologies used in allocating costs to courses. The bases of allocating costs were: (1) the total course time, (2) formal contact hours, (3) student credit hours, and (4) course credit hours. This comparison was not only based on the costs generated per course, but it also considered the differences in selected variables of

costs and the respective costing methodology. The five variables of costs which were examined were: (1) faculty rank, (2) course level, (3) class size, (4) number of course and/or sections taught by the faculty member, and (5) the method of instruction. The comparison of costing methodologies as related to these variables centered on answering four research questions which addressed the comparability of these methodologies.

Parameters of the Data

The population from which the data were drawn for this study were the faculty and course offerings of one college at Michigan State University. This college offers both undergraduate and doctoral level programs, and its five departments are diversified in both the nature of their activities and course offerings. The entire faculty were surveyed and a return rate of 94.1 per cent was realized. All but one faculty member not responding were contacted in a follow-up. The results of the follow-up were only used to determine their comparability with the rest of the college. All of the data, except salaries, were collected for the fall term of 1972 through a faculty activity survey instrument designed by the National Center for Higher Education Management Systems.

Findings

The findings must be interpreted in light of limitations of the study. The costs were developed from only the instructional portion of the faculty's time and from one college at one university.

1. A large portion of faculty time (45%) was devoted to noninstructional activities. The distribution of time spread over activities was consistent with the mission of the departments and representative of other similar studies.

2. It appeared that the total workweek was relatively fixed as instructional workload factors increased or decreased. The total time devoted to a particular course correlated highly with formal contact hours, but not with other factors such as class size, course credit hours, student credit hours, or level of instruction.

3. As the level of instruction increased, the size of the classes tended to get smaller, while the total time devoted to the class changed little.

4. As faculty rank increased there was a slight decrease in total course time, formal contact hours, and the number of sections taught.

5. A very high correlation of .934 was realized in comparing costs allocated on total course time

and costs allocated on faculty reported formal contact hours. Costs developed on total course time correlated higher than any other method with each of the other costs except those developed on credits.

6. Costs developed on the methods, total course time, and faculty reported formal contact hours were highly similar in relation to the level of instruction.

7. It was determined that the method of allocating the costs to the courses and the method of reducing the course costs to a common base did, to some extent, determine that cost. Although previous research suggested that graduate instruction was four times the cost of lower-division undergraduate instruction when determined on a per-student credit hour, this research, while supporting that conclusion for that one methodology, found lower-division undergraduate instruction more costly under the other methodologies. However, these other methodologies were costing on the basis of a unit related to the course, whereas the student credit hour is really a subset of course credit hours. This finding supports the contention that the costing methodology will to some extent determine the cost.

8. Class size, the number of sections taught by the faculty member, and method of instruction were found to be significant variables of course costs.

9. The dependent variable used in the multiple regression analysis which explained the greatest amount of variance in costs was the method for which costs were developed on total course time as reported in the faculty activity survey.

Conclusions

The value of a faculty activity survey has been demonstrated in this research. When such a large portion of faculty time is devoted to noninstructional activities, it is important that the faculty time be utilized efficiently and effectively. Work assignments for faculty should be individualized to take advantage of the strengths of each faculty member. A perusal of the individual survey instruments suggests that workload needs to be more evenly distributed, for some faculty carry an excessively heavy load. Teaching assignments should never be based solely on student credit hours, and certainly consideration should be given to contact hours. To achieve maximum utilization of faculty, a program of self-renewal through a faculty development program may increase their productivity.

Faculty should be given tangible incentives for assisting in finding new methods for reducing costs

without reducing the quality of instruction. Since a large portion of faculty time is not under the influence of administration, it may be desirable, as suggested by others[2] to define a teaching load which represents the full-time involvement of faculty and adjust that load when the faculty member is involved in research, service, or other activity.

Although there appears to be some rationale for allowing a small increase in contact hours, the major areas where economy can be achieved would be in reducing the number of courses and increasing the class size. These decisions need to be made in light of the instructional strategies and purposes. A variety of classes and class sizes might be desirable and possible if a thorough analysis were made of existing courses. Further research would be indicated; however, the areas of noninstructional activity may provide an additional area where economy can be achieved.

As demonstrated in this research, method of instruction is definitely related to course costs regardless of the costing methodology employed. However, its importance, as noted by others, is likely to be related to its influence on class size and teaching load.[3]

The true cost of instruction is related to the salary paid the professor and how he allocates his time to instruction. A faculty activity survey is the only

acceptable method for allocating costs to courses of the four considered in this research, because time does not correlate very highly with the bases of allocating costs under the other methodologies with the possible exception of contact hours. To develop a costing methodology on the presumption that a relationship exists between time and some other basis of allocation would be erroneous. Only formal contact hours had a high correlation with time. Because a large portion of instruction is based on variable credit courses and the formal contact hours for these courses are not listed in the schedule of courses, it may be necessary to survey the individual faculty members for this information.

If a faculty activity survey is reasonably reliable and valid, as a growing body of research seems to indicate, then it can be used as an effective and efficient methodology for allocating costs to courses. If the data cannot be considered reasonably reliable and valid then costs developed on one of the alternative costing methodologies still will not provide a true reflection of how resources are really being allocated.

It is imperative that costs be understood in relationship to the purposes for which they are to be used. The limitations of cost analysis should be kept clearly in mind when a cost study is being planned.

Recommendations for Future Research

Several recommendations emerge from this research. The issue of the reliability and validity of faculty activity surveys needs additional study. Some method for assessing the high number of hours worked per week, as reported through faculty surveys, would make a significant contribution to existing research.

This study was conducted for one term in one college. It would be desirable to have this study duplicated using an entire year and crossing several colleges within the university. To extend the research to a larger sample with several institutions participating would strengthen the argument for the use of faculty activity surveys.

There is still a need for more research on comparing different costing methodologies. Not only is there need for examining the results of several methods of allocating costs to courses and methods of converting those course costs to unit costs, but also for conducting this kind of comparative study over a wider range of institutions which will have different emphases.

Definitive research is needed to assess the impact of an increase in class size and an increase in the number of sections taught by the faculty on the quality of instruction. It appears that the greatest

opportunity for economy is in class size, yet little is known about its impact on the quality of learning.

Since such a large portion of faculty time is spent in noninstructional functions, research to explore the cost-benefit of such activities could make a major contribution to workload studies. As higher education continues to adopt management information systems, it is important that cost-benefit be researched. The problems in defining outcomes are many, yet without more research in this area, the value of management information systems is limited.

NOTES--CHAPTER V

[1]Paul L. Dressel, F. Craig Johnson, and Philip M. Marcus, The Confidence Crisis (San Francisco: Jossey-Bass, 1970), p. 186.

[2]Reeves, et al., op. cit., p. 277; Floyd W. Reeves, Nelson B. Henry, and John Dale Russell, Class Size and University Costs (Chicago: University of Chicago Press, 1933), p. 149; Paul L. Dressel, private discussions on this research (East Lansing: Michigan State University, July, 1973).

[3]California and Western Conference Cost and Statistical Study for the Year 1954-55 (Berkeley: University of California, n.d.), pp. 30-31; Beardsley Ruml and Donald H. Morrison, Memo to a College Trustee (New York: McGraw-Hill, 1959), pp. 19-22.

APPENDICES

APPENDIX A

UNIT COSTS FOR METHOD OF INSTRUCTION BY COURSE COSTS, COURSE CREDIT HOUR, AND STUDENT CREDIT HOUR

TABLE 26.--Course cost by method of instruction (in dollars)

Method of Instruction	N	Costs Allocated By			
		Total Course Time	Formal Contact Hours	Student Credit Hours	Course Credit Hours
Lecture	41	1181	1200	1400	1018
Laboratory	13	836	914	760	735
Recitation and Discussion	28	1043	1154	1029	993
Seminal	10	375	328	177	499
Independent Study	27	274	108	132	597
Tutorial	5	890	866	449	821

TABLE 27.--Costs by method on instruction course cost allocated by three methods and converted to per course credit hour

Method of Instruction	N	Per Course Credit Hour Cost Allocated By		
		Total Course Time	Formal Contact Hours	Student Credit Hours
Lecture	41	334	342	392
Laboratory	13	329	361	194
Recitation and Discussion	28	294	319	278
Seminar	10	153	123	72
Independent Study	27	92	38	40
Tutorial	5	709	709	307

TABLE 28.--Costs by method of instruction course costs allocated on total course time and converted to per student credit hour cost

Method of Instruction	N	Per Student Credit Hour
Lecture	41	6.75
Laboratory	13	24.70
Recitation and Discussion	28	11.04
Seminar	10	17.01
Independent Study	27	20.96
Tutorial	5	75.42

APPENDIX B

ANALYSIS OF VARIANCE FOR METHOD OF INSTRUCTION

TABLE 29.--Analysis of variance for method of instruction (including graduate assistant costs)

1. Dependent variable: Course cost based on total course time

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Level of Sig
Between methods	16,759,866.09	5	3,351,973.22	15.47	.0005
Within methods	25,571,452.90	118	216,707.23		
Total	42,331,318.99	123			

2. Dependent variable: Course cost based on contact hours

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Level of Sig
Between methods	25,087,057.60	5	5,017,411.52	17.36	.0005
Within methods	34,103,341.24	118	289,011.37		
Total	59,190,398.84	123			

3. Dependent variable: Course cost based on student credit hours

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Level of Sig
Between methods	32,629,443.55	5	6,525,888.71	17.99	.0005
Within methods	42,796,592.39	118	362,682.99		
Total	75,426,035.94	123			

4. Dependent variable: Course cost based on course credits

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Level of Sig
Between methods	4,855,540.69	5	971,108.14	5.90	.0005
Within methods	19,434,527.86	118	164,699.39		
Total	24,290,068.55	123			

TABLE 30.--Analysis of variance for method of instruction (excluding graduate assistant cost)

1. Dependent variable: Course cost based on total course time

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Level of Sig
Between methods	11,982,073.08	5	2,396,414.62	13.04	.0005
Within methods	21,680,949.40	118	183,736,86		
Total	33,663,022.48	123			

2. Dependent variable: Course cost based on contact hours

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Level of Sig
Between methods	19,685,760.13	5	3,937,152.03	15.55	.0005
Within methods	29,873,763.89	118	253,167.49		
Total	49,559,524.02	123			

3. Dependent variable: Course cost based on student credit hours

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Level of Sig
Between methods	25,594,643.84	5	5,118,928.77	17.23	.0005
Within methods	35,058,557.15	118	297,106.42		
Total	60,653,200.99	123			

4. Dependent variable: Course cost based on course credits

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Level of Sig
Between methods	2,331,842.39	5	466,368.48	3.30	.008
Within methods	16,699,162.74	118	141,518.33		
Total	19,031,005.12	123			

TABLE 31.--Analysis of variance for method of instruction (per credit cost including graduate assistant cost)

1. Dependent variable: Per credit cost based on

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Level of Sig.
Between methods	2,185,472.33	5	437,094.47	7.37	.0005
Within methods	6,996,511.35	118	59,292.47		
Total	9,181,983.68	123			

2. Dependent variable: Per credit cost based on contact hours

Source of Variance	Sum of Squares	Degree of Freedom	Mean Square	F Value	Level of Sig.
Between methods	3,028,961.95	5	605,792.39	9.29	.0005
Within methods	7,693,642.78	118	65,200.36		
Total	10,722,604.73	123			

3. Dependent variable: Per credit cost based on student credit hours

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Level of Sig.
Between methods	2,408,316.23	5	481,663.25	12.84	.0005
Within methods	4,426,600.48	118	37,513.56		
Ttoal	6,834,916.71	123			

APPENDIX C

SCHEFFÉ CONTRASTS ON METHOD OF INSTRUCTION

TABLE 32.--Scheffé simple contrasts (six methods - course costs)

Where mean cost for method of instruction is noted by:

U_1 = lecture
U_2 = laboratory
U_3 = discussion
U_4 = seminar
U_5 = independent study
U_6 = tutorial

Where:

Y = yes, the comparison can be rejected
N = no, the comparison cannot be rejected
Alpha level = .05

Comparison	Basis of Costing Methodology: Time	Contact Hours	SCH	Credit Hours	Consensus
1. $U_1=U_2$	N	N	N	N	Cannot reject
2. $U_1=U_3$	N	N	N	N	Cannot reject
3. $U_1=U_4$	Y	Y	Y	Y[2]	Can reject
4. $U_1=U_5$	Y	Y	Y	Y[2]	Can reject
5. $U_1=U_6$	N	N	N	N	Cannot reject
6. $U_2=U_3$	N	N	N	N	Cannot reject
7. $U_2=U_4$	N	N	N	N	Cannot reject
8. $U_2=U_5$	Y	Y	N[1]	N	Can reject
9. $U_2=U_6$	N	N	N	N	Cannot reject
10. $U_3=U_4$	Y	Y	Y	N	Can reject
11. $U_3=U_5$	Y	Y	Y	Y	Can reject
12. $U_3=U_6$	N	N	N	N	Cannot reject
13. $U_4=U_5$	N	N	N	N	Cannot reject
14. $U_4=U_6$	N	N	N	N	Cannot reject
15. $U_5=U_6$	N	N	N	N	Cannot reject

[1]When graduate assistant costs are excluded this becomes a yes.
[2]When graduate assistant costs are excluded this becomes a no.

TABLE 33.--Scheffé complex contrasts (three methods - course and credit costs)

Where mean cost for method of instruction is noted by:

U_1 = lecture and recitation/discussion
U_2 = laboratory and tutorial
U_3 = seminar and independent study

Where:

Y = yes, the comparison can be rejected
N = no, the comparison cannot be rejected
Alpha level = .05

Costing Methodology	Unweighted			Weighted		
	U_1-U_3	U_1-U_2	U_2-U_3	U_1-U_3	U_1-U_2	U_2-U_3
Cost per course:						
Total Course Time	Y	N	Y	Y	N	Y
Formal Contact Hours	Y	N	Y	Y	N	Y
Student Credit Hours	Y	Y	N	Y	Y	N
Course Credit Hours	Y	N	N	Y	N	N
Cost per credit:						
Total Course Time	Y	N	Y	Y	N	Y
Formal Contact Hours	Y	N	Y	Y	N	Y
Student Credit Hours	Y	N	N	Y	N	N

APPENDIX D

MULTIPLE REGRESSION RESULTS FOR ADDITION AND DELETION ANALYSIS WITH A MINIMUM OF .05 LEVEL OF SIGNIFICANCE (CONSIDERING FOUR VARIABLES)

TABLE 34.--Multiple regression results for costs allocated on total course time reported (considering four variables)

Addition and Deletion Analysis for Variables with a Minimum of .05 Level of Significance

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	1113.66						
Class Size	7.03	1.32	.41	.08	28.58	.0005	.21
No. of Sections Taught	- 138.93	36.01	-.30	.08	14.88	.0005	.30

Multiple Correlation Coefficients

R^2	R
.30	.55

TABLE 35.--Multiple regression results for costs allocated on contact hours (considering four variables)

Addition and Deletion Analysis for Variance with a Minimum of .05 Level of Significance

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	1065.43						
Class Size	7.91	1.62	.39	.08	23.97	.0005	.186
No. of Sections Taught	- 132.39	44.25	-.24	.08	8.95	.003	.242

Multiple Correlation Coefficients

R^2	R
.242	.49

TABLE 36.--Multiple regression results for costs allocated on student credit hours (considering four variables)

Addition and Deletion Analysis for Variance with a Minimum of .05 Level of Significance

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	780.65						
Class Size	14.90	1.50	.66	.07	99.21	.0005	.464
No. of Sections Taught	-101.95	40.97	-.16	.07	- 2.49	.014	.490

Multiple Correlation Coefficients

R^2	R
.49	.70

TABLE 37.--Multiple regression results for costs allocated on course credit hours (considering four variables)

Addition and Deletion Analysis for Variance with a Minimum of .05 Level of Significance

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	1284.27						
No. of Sections Taught	-156.04	27.80	-.44	.08	31.51	.0005	.226
Class Size	2.77	1.02	.21	.08	2.72	.007	.271

Multiple Correlation Coefficients

R^2	R
.27	.52

APPENDIX E

MULTIPLE REGRESSION RESULTS FOR ADDITION AND DELETION ANALYSIS WITH A MINIMUM OF .05 LEVEL OF SIGNIFICANCE WITHOUT GRADUATE ASSISTANT COSTS (CONSIDERING EIGHT VARIABLES)

TABLE 38.--Multiple regression results for costs allocated on total course time without graduate assistant costs

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	-166.09						
Total Course Time	60.10	5.15	.81	.07	136.15	.0005	.633
Faculty Rank	105.35	20.84	.21	.04	25.58	.0005	.795
Student Credit Hours	3.21	1.10	.69	.24	8.45	.004	.820
Class Size	- 8.05	3.60	-.53	.24	5.00	.027	.825
No. of Sections Taught	26.58	18.59	.06	.04	2.04	.156	.829
Contact Hours	7.86	9.91	.05	.07	.63	.429	.831
Course Level	- 26.38	38.39	-.03	.05	.47	.493	.831
Course Credit Hours	- 12.79	30.07	-.02	.06	.18	.671	.831

Multiple Correlation Coefficients

R^2	R
.83	.91

TABLE 39.--Multiple regression results for costs allocated on formal contact hours without graduate assistant costs

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	-471.51						
Total Course Time	53.87	8.15	.60	.09	43.68	.0005	.602
Student Credit Hours	4.57	1.75	.81	.31	6.85	.010	.651
Faculty Rank	111.52	32.96	.18	.05	11.45	.001	.675
Class Size	- 11.32	5.70	-.61	.31	3.95	.049	.691
Contact Hours	39.29	15.68	.23	.09	6.28	.014	.705
No. of Sections Taught	56.65	29.42	.11	.06	3.71	.057	.714
Course Credit Hours	14.24	47.58	.02	.07	.09	.765	.714
Course Level	- 14.09	60.75	-.01	.06	.05	.817	.714

Multiple Correlation Coefficients

R^2	R
.71	.85

TABLE 40.--Multiple regression results for costs allocated on student credit hours without graduate assistant costs

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	175.78						
Student Credit Hours	2.90	2.24	.47	.36	1.67	.198	.474
Total Course Time	42.54	10.45	.43	.11	16.58	.0005	.574
Course Credit Hours	116.30	60.98	.16	.09	3.64	.059	.594
Course Level	-181.24	77.86	-.17	.07	5.42	.022	.612
Contact Hours	- 24.15	20.10	-.13	.10	1.44	.232	.617
No. of Sections Taught	- 5.02	37.71	-.01	.07	.02	.894	.617
Faculty Rank	3.20	42.45	.00	.06	.01	.940	.617
Class Size	.54	7.30	.03	.36	.01	.942	.617

Multiple Correlation Coefficients

R^2	R
.62	.79

TABLE 41.--Multiple regression results for costs allocated on course credit hours without graduate assistant costs

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	542.40						
No. of Sections Taught	- 99.27	25.53	-.32	.08	15.12	.0005	.232
Course Credit Hours	164.68	41.29	.41	.10	15.91	.0005	.382
Total Course Time	19.74	7.07	.36	.13	7.80	.006	.420
Contact Hours	- 18.70	13.61	-.17	.13	1.89	.172	.430
Course Level	- 72.71	52.72	-.12	.09	1.90	.170	.438
Student Credit Hours	.46	1.52	-.13	.43	.09	.764	.439
Faculty Rank	13.49	28.60	.04	.07	.22	.638	.440
Class Size	.87	4.94	.08	.43	.03	.860	.440

Multiple Correlation Coefficients

R^2	R
.44	.66

APPENDIX F

MULTIPLE REGRESSION RESULTS FOR ADDITION AND DELETION ANALYSIS WITH A MINIMUM OF .05 LEVEL OF SIGNIFICANCE (CONSIDERING EIGHT VARIABLES)

TABLE 42.--Multiple regression results for costs allocated on total course time reported (considering eight variables)

Addition and Deletion Analysis for Variables with a Minimum of .05 Level of Significance

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	-214.07						
Total Course Time	64.25	3.48	.78	.04	341.85	.0005	.664
Student Credit hours	1.48	.22	.29	.04	45.77	.0005	.767
Faculty Rank	117.06	23.19	.21	.04	25.47	.0005	.808

Multiple Correlation Coefficients

R^2	R
.81	.90

TABLE 43.--Multiple regression results for costs allocated on formal contact hours (considering eight variables)

Addition and Deletion Analysis for Variables with a Minimum of .05 Level of Significance

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	-246.42						
Total Course Time	68.27	5.15	.70	.05	175.49	.0005	.566
Student Credit Hours	4.79	1.41	.78	.23	11.53	.001	.664
Faculty Rank	105.93	34.40	.15	.05	9.48	.003	.691
Class Size	- 10.13	4.57	-.50	.23	4.91	.029	.703

Multiple Correlation Coefficients

R^2	R
.70	.84

TABLE 44.--Multiple regression results for costs allocated on student credit hours (considering eight variables)

Addition and Deletion Analysis for Variables with a Minimum of .05 Level of Significance

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	117.37						
Student Credit Hours	3.75	.47	.54	.07	63.78	.0005	.519
Total Course Time	34.10	6.21	.30	.06	30.15	.0005	.607
Course Credit Hours	147.51	45.46	.19	.06	10.53	.002	.628
Course Level	-200.96	81.34	-.17	.07	6.10	.015	.646

Multiple Correlation Coefficients

R^2	R
.65	.80

TABLE 45.--Multiple regression results for costs allocated on course credit hours (considering eight variables)

Addition Analysis for Variables with a Minimum of .05 Level of Significance

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	363.11						
No. of Sections Taught	- 98.59	26.33	-.28	.07	14.02	.0005	.226
Course Credit Hours	179.95	30.88	.40	.07	33.95	.0005	.378
Student Credit Hours	.85	.27	.22	.07	9.68	.002	.439
Total Course Time	12.76	4.66	.20	.07	7.51	.002	.472

Multiple Correlation Coefficients

R^2	R
.47	.69

TABLE 46.--Multiple regression results for costs allocated on course credit hours (considering eight variables)

Deletion Analysis for Variables with a Minimum of .05 Level of Significance

Independent Variable	Regression Coefficients	Std. Errors of Coefficient	Beta Weights	Standard Error of Betas	F Values	Sig. Level	Cumulative Contribution to Total R^2
Constant	734.28						
Course Credit Hours	184.55	32.44	.41	.07	32.36	.0005	.425
No. of Sections Taught	-107.01	25.93	-.30	.07	17.04	.0005	.441
Total Course Time	26.37	7.24	.42	.12	13.28	.0005	.453
Course Level	-149.74	46.22	-.22	.07	10.50	.002	.478
Contact Hours	- 30.88	14.13	-.25	.12	4.77	.031	.498

Multiple Correlation Coefficients

R^2	R
.50	.71

APPENDIX G

FACULTY ACTIVITY AND OUTCOME

SURVEY INSTRUMENT

FACULTY ACTIVITY AND OUTCOME SURVEY

Name_____ Date_____ Academic Term_____

Please address any questions to_____ Phone_____

Upon completion, please detach the form and send it to_____

Purpose of Survey

This survey instrument has been designed by the National Center for Higher Education Management Systems (NCHEMS) for use in this as well as many other institutions. You are now participating in a pilot test that is being conducted to investigate the practicality of using faculty-generated activity data for costing, budgeting, planning, and reviewing academic programs.

If you wish to comment, we encourage you to do so on the last page of this booklet.

PLEASE READ THE INSTRUCTIONS ON PAGES 2 AND 5 BEFORE YOU COMPLETE THE FORM.

A sample form is included on pages 6 and 7.

General Instructions

This survey asks you to estimate the hours you spend during an "average week" of this term engaged in different types of activity. It then asks you to estimate the percentage contribution of these hours to the outcomes of the institution. Please read the activity definitions and examples for each activity as you complete the survey.

SECTION A: TEACHING ACTIVITIES

A.1. Scheduled Teaching: All activities related to courses (degree and nondegree, credit and noncredit, day or evening) given in the current term. These activities would include:

Meeting informally with course participants	Supervising teaching assistants	Giving remedial help to course participants	Contacting guest lecturers
Supervising these courses	Tutoring	Supervising laboratories	Preparing lectures
Meeting scheduled classes	Supervising independent study	Evaluating students	Preparing media

Instructions for Columns (a) through (i)

(a) Enter departments, colleges, or other unit designation under which the course is taught

(b) Enter number or other designation of course

(c) Enter section designation, number of students enrolled, and check (✓) if course material is remedial (below college level) or if it is extension (principally directed toward nonmatriculated students)

(d) Enter credit hours given for course

(e) Enter method of instruction as coded below

(f) Enter scheduled contact hours/week

(g) Enter hours/average week of unscheduled contact with students in course

(h) Enter hours/average week spent in preparing and arranging the activities of the current course

(i) Enter the total hours/average week (sum of columns (f), (g), and (h) in Section A.1)

Method of Instruction Column (e)

Code	Method	Definition
A	Lecture	Formal presentation - primarily one-way communication
B	Laboratory	Instructing, preparing, and supervising student investigations
C	Recitation/Discussion	Two-way communication of course materials
D	Seminar	Students carry the major responsibility for preparation
E	Independent Study	Students work independently with only minimal faculty direction
F	Tutorial	Students work one-to-one with the instructor
G	Programmed Instruction	Course contents presented through programmed materials

A.2 UNSCHEDULED TEACHING: Teaching not associated with the specific courses listed in A.1. For example:

Thesis committee participation	Guest lecturing in another faculty member's course
Discussions with colleagues about teaching	Giving seminars within the institution

A.3 ACADEMIC PROGRAM ADVISING: Giving advice to students concerning course scheduling and academic programs. Not to be confused with counseling that is included in D. 1

A.4 COURSE AND CURRICULUM RESEARCH AND DEVELOPMENT: Developing and preparing for future courses. For example:

Preparing course outlines	Devising new instructional materials	Developing department curriculum requirements
Developing book lists	Revising existing materials	Evaluating teaching effectiveness and planning changes

Level Codes Column (p)

Code	Description	Code	Description
A	Preparatory	E	Upper division and graduate
B	Lower division	F	Graduate
C	Upper division	G	Professional
D	Undergraduate	H	Other

NAME _____ I. D. OR SOCIAL SECURITY NO. _____

DEPARTMENT _____ RANK _____

FOR INSTITUTIONAL USE

SECTION A: TEACHING ACTIVITIES												PERCENTAGE DISTRIBUTION TO INSTITUTIONAL OUTCOMES						
A.1 SCHEDULED TEACHING												(j) STUDENT GROWTH AND DEVELOPMENT %	(k) CREATION OF NEW KNOWLEDGE AND ART FORMS %	(l) INSEPARABLE COMBINATION OF (j) + (k) %	(m) COMMUNITY SERVICE AND DEVELOPMENT %	(n) GENERAL INSTITUTIONAL SERVICES %	(o) PERSONAL PROFESSIONAL GROWTH %	DO NOT WRITE IN THIS COLUMN
								(f) + (g) + (h) = (i)			(i) HOURS PER AVERAGE WEEK							
(a) DEPT.	(b) COURSE	(c) SECTION Number	Enrollment	(√) if Remedial	(√) if Extension	(d) CREDIT HOURS	(e) METHOD OF INSTRUCTION	(f) FORMAL CONTACT HOURS	(g) OTHER CONTACT HOURS	(h) PREPARATION & ADMINISTRATION								
						SUBTOTAL												

	(p) LEVEL	(q) ACTIVITY DESCRIPTION								
A.2 UNSCHEDULED TEACHING										
A.3 ACADEMIC PROGRAM ADVISING										
A.4 COURSE AND CURRICULUM RES. & DEVELOP.										

OUTCOME DEFINITIONS

This section of the form allows you to indicate what outcomes your activities principally benefit. Please try to make a rough estimate of the percentage distribution for each of your activities to the following outcomes:

(j) Student Growth and Development: Results and benefits of activities that contribute to enhancing personal, social, academic, and/or career aspects of students who are registered in the institution.

(k) Development of New Knowledge and Art Forms: Results and benefits of activities that contribute to the development, storage, utilization, and/or appreciation of knowledge and art.

(l) Inseparable Combination of (j) and (k): Results and benefits of activities that contribute to both student growth and development and creation of new knowledge and art forms and cannot be separated. (It is preferable to separate these if possible.)

(m) Community Development and Service: Results and benefits of activities that contribute to educational growth in and provide short- or long-term utility to the community.

(n) General Institutional Support: Results and benefits of activities that contribute to maintaining the institution.

(o) Personal Professional Growth: Results and benefits of activities that contribute principally to your professional growth.

ACTIVITY		(q) ACTIVITY DESCRIPTION	(i) HOURS PER AVERAGE WEEK	PERCENTAGE DISTRIBUTION TO INSTITUTIONAL OUTCOMES						
				(j) STUDENT GROWTH AND DEVELOPMENT %	(k) CREATION OF NEW KNOWLEDGE AND ART FORMS %	(l) INSEPERABLE COMBINATION OF (j) + (k) %	(m) COMMUNITY SERVICE AND DEVELOPMENT %	(n) GENERAL INSTITUTIONAL SERVICES %	(o) PERSONAL PROFESSIONAL GROWTH %	DO NOT WRITE IN THIS COLUMN
SECTION B: RESEARCH, SCHOLARSHIP & CREATIVE WORK ACTIVITIES	B.1 INSTITUTES & RESEARCH CENTERS									
	B.2 SPECIFIC PROJECTS									
	B.3 GENERAL SCHOLARSHIP AND PROFESSIONAL DEVELOPMENT									
SECTION C: PUBLIC SERVICE ACTIVITIES	C.1 GENERAL PROFESSIONAL SERVICE ADVICE DIRECTED OUTSIDE THE INSTITUTION									
	C.2 EXTENSION SERVICE (NON INSTRUCTIONAL)									
SECTION D: INTERNAL SERVICE ACTIVITIES	D.1 STUDENT-ORIENTED SERVICE									
	D.2 GENERAL PROFESSIONAL SERVICE ADVICE DIRECTED TOWARD THE INSTITUTION									
	D.3 SERVICE REPORTS AND RECORDS									
SECTION E: ADMINISTRATIVE & COMMITTEE ACTIVITIES	E.1 ADMINISTRATIVE DUTIES	CODE LEVEL AS INDICATED BELOW (LEVEL)								
	E.2 COMMITTEE PARTICIPATION									

LEVEL OF ADMINISTRATIVE AND COMMITTEE ACTIVITIES

Code	Level
1	Department / Unit
2	College / School / Division
3	Campuswide
4	Systemwide

PLEASE READ THE INSTRUCTIONS ON THIS PAGE AS YOU COMPLETE THE FORM TO THE LEFT

SECTION B: RESEARCH, SCHOLARSHIP, AND CREATIVE WORK ACTIVITIES

B.1 Institutes and Research Centers: Research, scholarship, and creative work activity that is carried on for an institute or research center. (Includes all activities listed in B.2 that are done for an institute or research center.)

B.2 Specific Projects: Research, scholarship, and creative work activity related to a specific project. For example:

Departmental Research	Writing or Developing Research Proposals	Writing Articles
Sponsored Research	Administering Research Grants	Writing Books
Performing Your Professional Skill	Giving Recitals	Writing Reviews
		Creating New Art Forms
		Exhibitions

B.3 General Scholarship and Professional Development: All research, scholarship, and creative work activities related to keeping current in a professional field. For example:

Reading Articles and Books Related to Your Profession	Maintaining an Artistic Skill	Reviewing a Colleague's Research Work
	Attending Professional Meetings	Research-Related Discussion with Colleagues

SECTION C: PUBLIC SERVICE ACTIVITIES

This section includes activities that are directed outside the institution [except for those associated with community education (extension instruction) which should be included in A.1.]

C.1 General Professional Services/Advice Directed Outside the Institution: Activities that would not be considered Extension C.2 meant to benefit the community outside the institution. For example:

Consulting	Community Training Grants	Lectures or Seminars for the Public
Advising	Patient Care	

C.2 Extension Service: Activities that are directed toward the community outside the institution where fiscal control is shared by the institution and government agencies. For example:

Agricultural Extension Urban Extension

SECTION D: INTERNAL SERVICE ACTIVITIES

This section includes activities related to general contact with students, to professional responsibilities within other organizational units within the institution, and to fulfilling institutional requests. For example:

D.1 Student-Oriented Service:

Personal, Career, and Financial Counseling	Sponsoring Student Organizations
Preparing Recommendations	Meeting with Parents
Participation in Social Interaction	Coaching Athletics

D.2 General Professional Service/Advice Directed Toward the Institution: All nonadministrative activities related to performance of assignments in or consultation to such units as the library, counseling center, health clinic, campus architect's office, office of the president. Also included are:

Interviewing Candidates for Positions	Escorting Visitors

D.3 Service Reports and Records: Fulfilling institutional information requests such as:

Faculty Service Reports and Questionnaires	Preparing Minutes
Keeping Records	Writing and Answering Memoranda

SECTION E: ADMINISTRATIVE AND COMMITTEE ACTIVITIES

E.1 Administrative Duties. For example:

Performing the duties of a Department Chairman, Dean, Vice-President or Any Other Administrative Position	Assigning Faculty Course Load
	Preparing Budgets
Administering Personnel Policies	Gathering Data
	Helping During Registration

E.2 Committee Participation. For example:

Admission Committees	Faculty Senate
Candidate Selection Committees	Planning Committees
	Budget Committees

Code the level of these activities as described at the foot of the form.

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