DOCUMENT RESUME

ED 422 823 HE 031 581

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TITLE	A Program Cost Study: Determining the Revenues and Expenditures Associated with Instruction, Research, and Service Programs. AIR 1998 Annual Forum Paper.
SPONS AGENCY	Indiana Univ.-Purdue Univ., Indianapolis.
PUB DATE	1998-05-00
NOTE	26p.; Paper presented at the Annual Forum of the Association for Institutional Research (38th, Minneapolis, MN, May 17-20, 1998).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Accounting; Administration; Budgeting; Costs; Educational Finance; Expenditure Per Student; Expenditures; *Higher Education; Institutional Administration; *Program Budgeting; *Resource Allocation
IDENTIFIERS	*AIR Forum; *Responsibility Center Budgeting; Responsibility Center Budgeting

ABSTRACT

A program cost study was conducted at a large midwestern university to determine department-level expenses and revenues associated with the mission-critical activities of instruction, research, and service. The study (or program) is based on a model for allocating costs, called responsibility centered management, that has been used for nearly a decade to allocate campus revenues and expenses to academic units, and an instructional effort report/capacity model used to examine total faculty workloads. The study/program was conducted at a large, midwestern, urban public university and provides campus, school, and department-level cost information for teaching, research, and service activities. The study also allocates all levels of overhead (departmental, school, and central administration) to the foregoing activities within each academic unit. Direct and overhead costs can be evaluated separately or together to formulate plans and budgets. The information generated by this model is used with indicators of program quality and accessibility as an integral part of the campus planning and budgeting process. (Contains 26 references.) (CH)

Running Head: PROGRAM COST STUDY

A Program Cost Study: Determining the Revenues and Expenditures Associated with Instruction, Research, and Service Programs

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The authors would like to thank Robyn Crossen and Lisa Whitecotton for research assistance with this project. We would also like to thank Chancellor Gerald Bepko and Executive Vice Chancellor William Plater for funding this project. Any views expressed in this paper are those of the authors only and do not necessarily reflect those of IUPUI or Indiana University.

for Management Research, Policy Analysis, and Planning

This paper was presented at the Thirty-Eighth Annual Forum of the Association for Institutional Research held in Minneapolis, Minnesota, May 17-20, 1998.
This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of AIR Forum Papers.

Dolores Vura
Editor
AIR Forum Publications

A Program Cost Study: Determining the Revenues and Expenditures Associated with Instruction, Research, and Service Programs

Abstract

A program cost study was conducted at a large midwestern university to determine department level expenses and revenues associated with the mission-critical activities of instruction, research, and service. The analysis is patterned after a controversial study conducted at the University of Rhode Island (Swonger and Mead, 1996; Cordes, 1996, Roush, 1996) but includes significant improvements based on the availability of well-developed models for allocating costs (Responsibility-Centered Management, or RCM) and attributing faculty effort to these mission-critical activities (Instructional Effort Report/Capacity Model). RCM has been used for nearly a decade to allocate all campus revenues and expenses to academic units. The IER/Capacity Model has developed over the course of ten years from a system for illustrating faculty teaching loads to one concerned with total faculty workloads. The results of the cost study were promulgated through a series of reports and meetings with university administrators. The results provide to them a wealth of cost information to supplement existing evaluation mechanisms assessing program process and quality and were incorporated into the annual planning and budget processes across all campus units.

A Program Cost Study: Determining the Revenues and Expenditures Associated with Instruction, Research, and Service Programs

Introduction

The cost of attending a college or university has risen dramatically over the last 30 years when compared to other public and private expenditures. A recent study by the National Commission on the Cost of Higher Education (1997, 1998) places these increases in the comparative context of other economic indicators. Between 1981 and 1995, tuition at public four-year colleges increased at a rate two to three times higher than the consumer price index, the traditional measure of price inflation. College tuition has also increased faster than commonly accepted measures of income. From 1987 to 1996, disposable per-capita income rose 52 percent. The price of public higher education during the same period rose from 95 percent for four-year institutions to 169 percent for two-year institutions.

Rising costs at public universities have been attributed to a broad array of economic, political, and social forces. These include: the decline in state appropriations (Bepko and Rooney, 1997; National Center for Education Statistics, 1996); ever-advancing information and research technologies and their supporting infrastructural requirements (Attewell, 1996; Gilbert, 1996; Green and Gilbert, 1995; Huber, 1996; Massey and Zemsky, 1996); the necessity for expenditures on new and redesigned facilities prompted by enrollment growth and the special needs of newly served student populations (National Commission on the Cost of Higher Education, 1998); high levels of deferred maintenance (Association of Higher Education Facilities Officers, National Association of College and University Business Officers, and Sallie

Mae, 1997); and increasing expenditures on financial aid to attract and retain students (National Commission on the Cost of Higher Education, 1998).

More generally, Massey and Zemsky (1994), identify two phenomena contributing to increased costs to institutions. They coined the term "academic ratchet" to refer to the increasing focus of faculty roles on specialized research and scholarship rather than on the broader goals of the institution. The term "administrative lattice" was coined to describe how professional administrative structures continually grow more complex to support student life, faculty work, athletic enterprises, and public accountability requirements.

These developments have evoked demands for greater accountability and cost control from many state legislatures and governance boards. Additionally, increasing competition from entrepreneurial institutions, such as the University of Phoenix, has encouraged senior college administrators to support the development of more sophisticated tools to help assess and adjust the alignment of expenses and revenues to the institution's missions, goals, and values.

Higher education institutions have struggled with issues of representing costs for many years. The National Center for Higher Education Management System (NCHEMS) Resource Requirements Prediction Model (RRPM) of the late 1960s and early 1970s made the use of cost per student credit hour as a pivotal planning metric popular among higher education institutions and systems. The popularity of RRPM and several other computer-based resource allocation planning models declined in popularity due to the difficulty in recasting existing data systems and the prioritization of operational functions, such as payroll and registration, ahead of planning needs. (Mason, 1976). Simpson and Sperber (1984) described the kinds of cost information that a department-level administrator would find useful, based largely on distribution of faculty effort

over mission-critical activities. Because these and other efforts focused on department-level budgets, they missed the very significant central administrative overhead costs.

Middaugh (1996, 1997) developed a model and collected data nationally to represent instructional costs across a variety of disciplines. The several iterations of the "National Study of Instructional Costs and Productivity by Academic Discipline" provide useful indicators of instructional effort among full-time vs. part-time faculty and graduate assistants, but the usefulness of its cost information is limited. Like the studies already mentioned, the Middaugh model does not include campus, school and departmental overhead, thus missing the attribution of central administrative costs. Also, the model attributes all "education and general" expenses to the instruction function, thereby obscuring the degree to which faculty engage in research and service not specifically funded by sponsored contracts and grants.

This paper describes an institution-wide activity-based costing study conducted at a large, midwestern, public university located in an urban setting. This program cost study, as it is referred to, provides campus-, school- and, most importantly, department-level cost information for the full range of mission-critical activities: teaching, research and service. The study also includes the allocation of all levels of overhead—department, school, and central administration—to the mission-critical activities within each academic unit. Direct and overhead costs are made explicit in this cost model so they can be evaluated separately or together in formulating plans and budgets. The information generated by this model is used with indicators of program quality and accessibility as an integral part of the campus planning and budget processes.

Conceptual Background: Activity Based Costing

Activity-based costing (ABC) methods have become a centerpiece in the private sector's efforts to better ascertain costs and revenues associated with the mission-critical activities and product lines of an enterprise (Whalen, 1991). More recently, several colleges and universities have applied ABC methods to the analysis of costs and revenues in higher education (DeHayes and Lovrinic, 1994; Turk, 1992). Based on the fundamental principles of activity-based costing, Responsibility-Centered Management (RCM) has been adapted by a number of colleges and universities seeking to better manage the costs of higher education (Whalen, 1991; Stocum and Rooney, 1997; Robbins and Rooney, 1995).

Activity-based costing methods and RCM budgeting employ "cost drivers" to allocate the overhead costs of an enterprise to the primary productive units and their respective activities and products. These models have been cited as an effective way to assess the costs and contributions of the various activities necessary to the attainment of critical enterprise goals.

As a learning organization, a college or university faces special challenges for engaging in activity based costing. Firstly, the bottom line relates more directly to the creation, dissemination and application of knowledge rather than to monetary considerations. On the other hand, fiscal concerns directly influence an institution's ability to pursue its primary missions. Secondly, a large component of the cost of higher education is related to how the mission-critical workforce, the faculty, spend their time. Not only does faculty compensation represent a significant portion a college or university's costs, but the way a faculty uses its collective time in pursuing research, teaching and service activities determines the support costs required in each of those areas.

The Organizational Context

The campus at which this study was conducted has over 27,000 students, 1,500 full-time faculty, 3,500 full-time staff and a budget of approximately $660 million, including $125 million of externally funded research. It has 18 academic schools with over 180 degree programs, ranging from the associate through doctoral levels, as well as several of the country's largest first professional programs in medicine, dentistry and law. Its internal complexity is compounded by the fact that its academic programs are tied directly to both of the state's large research universities, although it is administratively affiliated with only one of them. Like many public universities, the state appropriation represents a declining portion of the total funding, whereas tuition and fees, research funds, and other private sources of support represent an increasing proportion.

Method

The sophistication and success of an activity-based costing study rests largely on the validity, reliability, and availability of the cost drivers used to allocate overhead expenses to the "product line" of an organization. Like the University of Rhode Island (URI) cost study, the current analysis starts with a relatively simple articulation of the mission-critical activities of the university and proceeds to the more complex task of attributing expenditures and revenues to these activities. While the URI study relied almost entirely on student credit hours to attribute revenues and expenses to academic programs and activities, the present study uses a more sophisticated system for allocating costs based on extensions to the existing RCM budgeting and faculty activity accountability systems.

Defining Mission-Critical Activities

The final target of all revenues and expenditures is the full array of degree programs and department-based service instruction, research and outreach/public service. More specifically, these mission-critical activities are defined as follows:

- Undergraduate Service Instruction--instruction and curriculum development associated with courses intended for students not enrolled in the school or department's undergraduate degree programs. This includes all credit hour enrollments by non-department major students in undergraduate courses.
- Undergraduate Majors--instruction, advising, and curriculum development related to maintaining undergraduate degree programs and the students who enroll in them.
- Graduate Majors--instruction, program management, and student/curriculum development associated with graduate degree programs, graduate courses and the students who enroll in them, whether they are enrolled in the school's or department's graduate program or not. No graduate service category was maintained, as the vast majority of these courses would not be offered if there were no graduate degree program.
- Research and Scholarly Activity--research and scholarship among the faculty in general, and among staff specifically hired to support such activity through sponsored grants and contracts and other restricted sources of funds.
- Outreach and Public Service--outreach and public service activities among faculty in general and among staff specifically hired to support such activity via sponsored grants and contracts and other restricted sources of funds.

The present analysis diverges from the URI study with regard to activity specifications in three notable ways:

- Degree programs are identified only to the department and degree level. That is, the analysis distinguishes between undergraduate, graduate, and professional degrees, but does not further distinguish among multiple degree programs at each level (e.g., more than one baccalaureate degree program, or master's vs. doctoral programs). This organizational level of analysis was chosen to expedite the current study with the expectation that individual program costs could be the focus of a later effort.
- Expenditures are first distributed to administrative activities (i.e., explicit administrative roles and service to the university) in the same fashion as they are distributed to the mission-critical activities, as described below. The expenditures associated with administrative activity were then redistributed over the mission-critical activities and thereby treated as an element of "overhead" (e.g., department and school overhead).
- Fee income from undergraduate courses was allocated between "major" and "service" based on the major of each student enrolled in the section. This allowed differentiation between two students taking the same course for different purposes (majors vs. service instruction). Fee income from graduate courses was allocated solely to the "graduate majors" activity.

Attributing Expenditures and Revenues

The campus's RCM model uses a set of cost drivers (e.g., student credit hours, faculty and staff FTE, square footage, etc.) to allocate to each academic Responsibility Center (RC) those revenues received centrally (state appropriation) and the costs of central administration and support activities (assessments).[1] In addition, the RCM model and supporting accounting system

[1] For further details on these allocations, the reader can consult Whalen (1991), Robbins and Rooney (1995), and Stocum and Rooney (1997).

allow some revenues (e.g., tuition and fee income) to be attributed directly to academic RCs. Finally, for sponsored grants and contracts and certain other restricted accounts, both revenues and expenditures can be attributed directly to a specific activity (teaching, research, or service) within a school or department using a "higher education function code" that indicates whether the account involved supports research, service or instructional activities.

Two sets of additional cost drivers were developed for the program cost study. Organizational cost drivers attribute to departments (where necessary) those revenues and expenditures that originate or are initially attributed to school and administrative unit accounts. Activity cost drivers attribute to the mission-critical activities within schools and departments the non-restricted funds, which comprise the majority of the annual revenues and expenditures. Before describing these cost drivers in further detail, Figure 1 is provided as an overall summary of the revenue and expenditure allocation process.

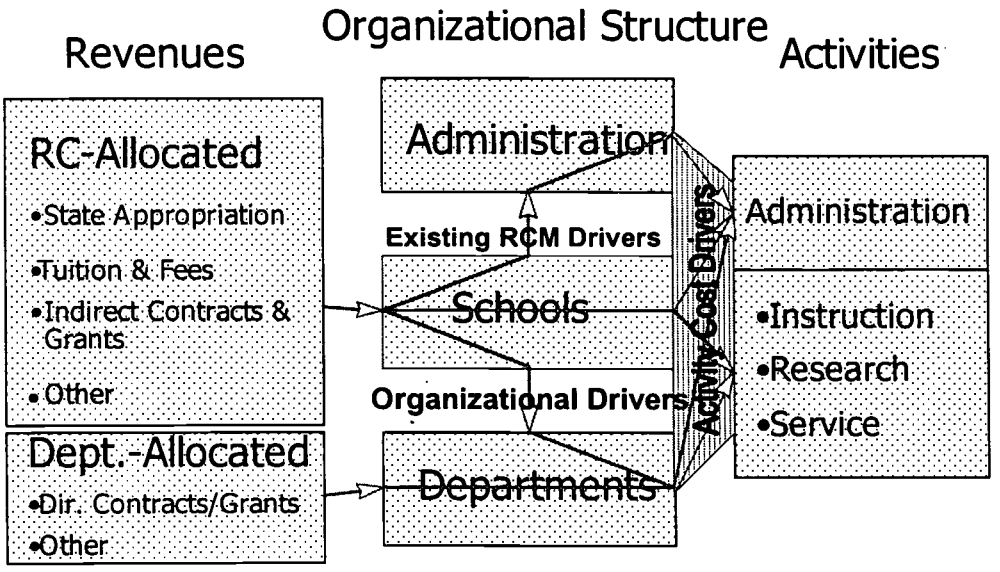

Figure 1. Allocating Revenues and Expenditures

Starting at the left side of the figure, most institutional revenues are attributed through the accounting system to the appropriate academic responsibility center. Some revenue sources,

such as sponsored grants and contracts, are attributed directly to departments and sometimes directly to specific activities within those departments. The top section of the middle column of Figure 1 represents the RCM assessments charged to academic RCs to fund administrative RCs. The bottom of the middle column illustrates the use of organizational cost drivers to devolve revenues to the departments. Finally, all revenues are associated with expenditures using the newly developed activity cost drivers, which supplement the known restricted expenditures.

Organizational Cost Drivers

Many expenditures (e.g., all RC assessments for campus administration expenses) and revenues (e.g., tuition and fees) originate at the campus level and are then attributed to the academic RC (i.e., school) level. For RCs that organize degree programs using a department structure (Five of the 14 RCs included in the study), it was necessary to drive these expenditures and revenues down to the department level. The drivers used in this analysis depend on the category of revenue or expenditure. Several possible cost drivers were modeled before settling on those producing the most consistent results across RCs.

The most common drivers are student credit hours (e.g., for tuition and fee revenues and assessments for undergraduate education support services) and proportion of unit full-time academic salaries paid from "Education and General" accounts. For example, the state appropriation is distributed according to the academic salaries driver. Each department receives credit for a portion of the appropriation equivalent to the proportion of total RC full-time academic salaries within that department. That is, if department A accounts for 17 percent of total RC academic salaries, it receives credit for 17 percent of the state appropriation within that school. Similarly, department A would receive a "debit" for 17 percent of the RC assessments, which are also driven by the full-time academic salaries driver. Figure 2 illustrates the use of

organizational cost drivers to allocate the two largest sources of revenues (tuition and fees and state appropriation) and the overhead expenses (assessments) used to fund central administrative units.

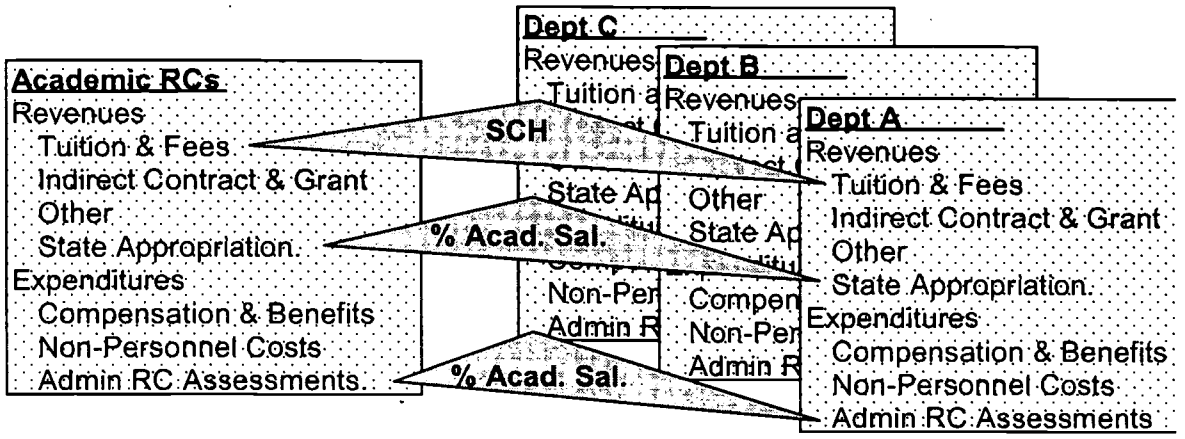

Figure 2. **Organizational Cost Drivers**

The full-time academic salaries driver was chosen over various modeled combinations of student credit hours, faculty full-time equivalency (FTE) and staff FTE. The academic salaries driver produced the most stable and consistent empirical results. It is also intuitively appealing in that the academic payroll is the primary "fiscal fuel" for engaging in the mission-critical activities of teaching, research and service. In addition, state appropriation, faculty salaries, and campus assessments tend to be fairly stable; hence, they are all "quasi-fixed."

Activity Cost Drivers

Once all financial information has been driven to the appropriate unit level, the next step is to move these amounts across the mission-critical activities using the activity cost drivers. As mentioned earlier, certain expenditures and revenues, such as those associated with sponsored grants and contracts, can be attributed directly to activities. In addition to its organizational driver function of attributing tuition and fee revenues to departments, the student credit hours

driver was used as the activity cost driver to distribute tuition and fee revenues to the three components of instructional activity (undergraduate service, undergraduate majors, and graduate majors).

For expenditures and revenues that cannot be distributed to activities on the basis of either account attributes (the higher education function code), or student credit hours, this analysis employs faculty workload drivers as derived from the Instructional Effort Report (IER)/Capacity Model.

IER/capacity model-based drivers. The mission-critical activities to which this analysis targets all expenditures and revenues are directly related to the efforts of full-time faculty. Therefore, the distribution of full-time faculty workload over these activities was chosen as the primary cost driver to distribute a large portion of the annual revenues and expenditures. All academic RCs except the Medical School contributed to the IER/Capacity Model data collection. The School of Medicine had its own even longer-standing system for collecting annual faculty effort distribution data that was entirely compatible for the purposes of this study.

The IER/Capacity Model system has evolved over the last several years from a simple description of faculty teaching assignments (the IER) to a more well rounded, but still fairly simplistic, description of faculty effort across the mission-critical activities considered in this study (IER/Capacity Model). The most recent iteration of this model was undertaken specifically to generate the activity-based drivers for this analysis. Specifically, school deans and, in some cases, department chairs were asked to review the instructional workload data for the 1995-96 fiscal year, and to supplement it in two specific ways:

1. Supplement the scheduled instruction workload information by indicating how each faculty member's remaining workload was distributed across the mission-critical activities plus administration (i.e., service to the university).
2. Devise a set of "rules" to generate workload parameters for scheduled instruction to replace the existing self-report method.

Because of the relative immaturity of the rule-based system, the self-reports as reviewed by the dean or chair, for both scheduled instruction and other activities were used in the current analysis. Using the self-reports, each full-time faculty represents 1.00 FTE, regardless of his or her relative workload or productivity, per se.

In reviewing and revising the Instructional Effort Reports, deans and chairs were instructed to consider "Research and Scholarly Activity" as a default category for all otherwise non-assigned effort. The data collection forms that were distributed and on which faculty effort was reported showed all non-instructional effort in this default category. Those filling out the forms then noted specific instructional, outreach/service, and administrative roles, with the still remaining FTE left in the research and scholarship category. This category was further described in the accompanying instruction as being related to such activities as "unfunded" research,"keeping up with one's discipline", and participating in the routine management activities of the academic unit (e.g., completing annual review forms, etc.). The non-grant specific FTE reported in this category was later distributed (by the authors) 40%-40%-20% among the final research, instruction, and administration/management categories, respectively. This convention was chosen to represent common "rules of thumb" used throughout university departments when defining faculty activity.

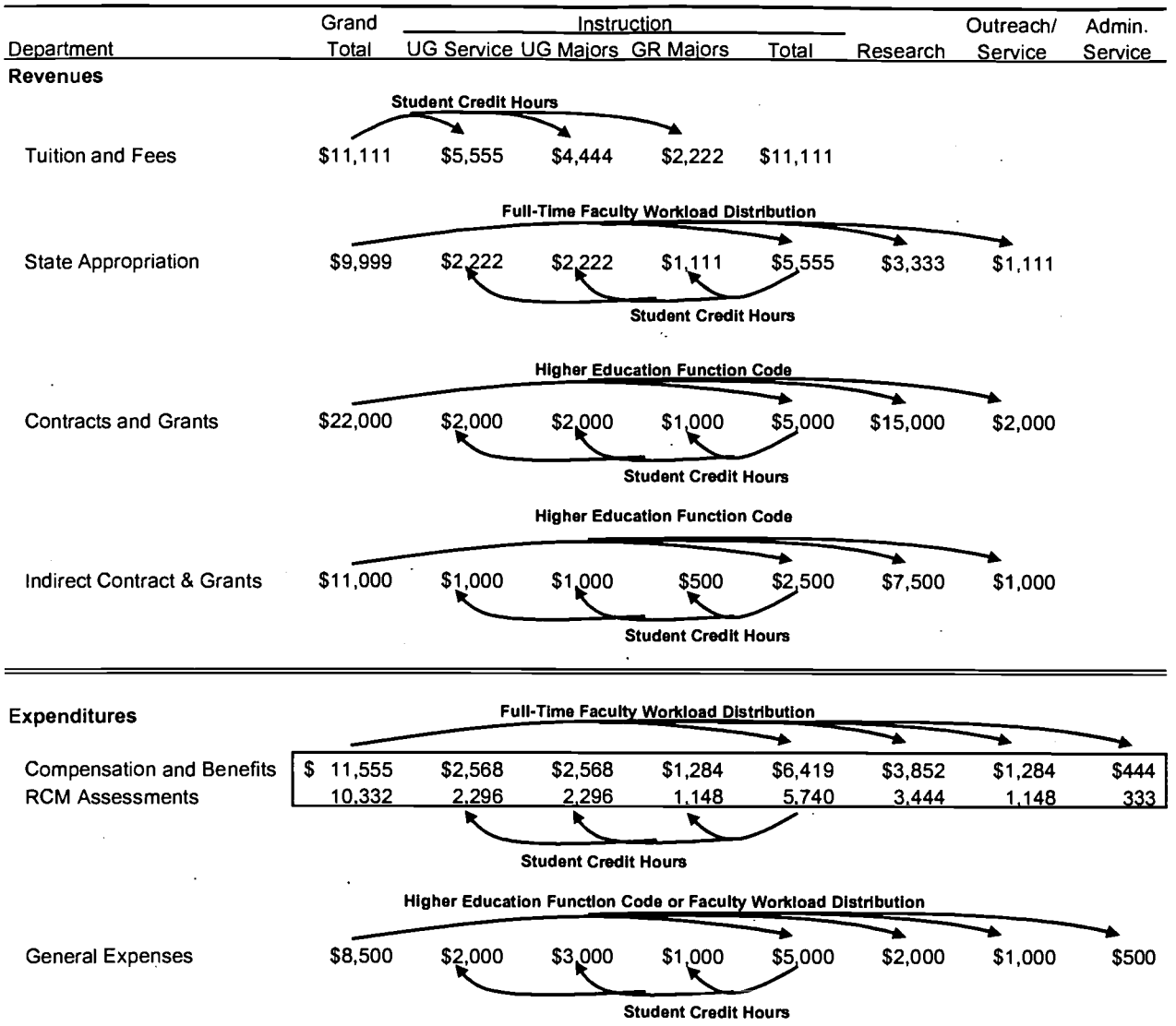

Figure 3. **Activity Cost Drivers**

Figure 3 illustrates the use of activity cost drivers for the major expenditure and revenue categories. Student credit hours were used to allocate tuition and fee revenues to their target activity. The faculty effort data from the IER/Capacity Model data was used to calculate unit-wide distribution drivers. That is, the proportion of effort devoted to the activities, as defined above, were determined across all full-time faculty in a particular unit. These proportions were used to allocate state appropriation across the total instruction, research, service and administration activities. Student credit hours were then used to "back-fill" appropriations from

total instruction into the three categories of instructional activity considered here: undergraduate service, undergraduate majors, and graduate majors.

Contract and grant revenues were allocated across activities based on the higher education function code assigned to the specific accounts receiving the income. Indirect contract and grant revenue followed the contract and grant attribution proportionately. Expenditures for compensation and benefits, as well as the RC assessments, were allocated using the same faculty effort/student credit hour drivers used to allocate state appropriation. Finally, general expenses (e.g., supplies, travel, equipments, etc.) were allocated according to either the higher education function code (for restricted accounts) or the faculty workload/student credit hour combination (for unrestricted accounts). A more complete listing of the organizational and activity cost drivers used to allocate all revenues and expenditures is available by request from the authors.

Converting Administrative Activities to Overhead

As discussed above, administrative overhead was initially included in the model as an activity, but was then reallocated across the other activities because it is not considered mission-critical. As shown in Figure 3 above, administrative service activities were included as a target of expenditures, although not of revenues. That is, the effort attributed through the IER/Capacity Model to these activities was removed from both the numerator and denominator in determining the faculty workload drivers for revenue distributions but were included for expenditure distributions. It was reasoned that the campus does not receive revenues for the express purpose of administrative management, but that management is an overhead cost that should be recognized as consuming resources. Figure 4 illustrates the subsequent process by which administrative service-related expenditures were then re-allocated to the mission-critical

activities using the faculty workload/student credit hour drivers. These costs thus end up appearing as an overhead expense attributed proportionately to the mission-critical activities.

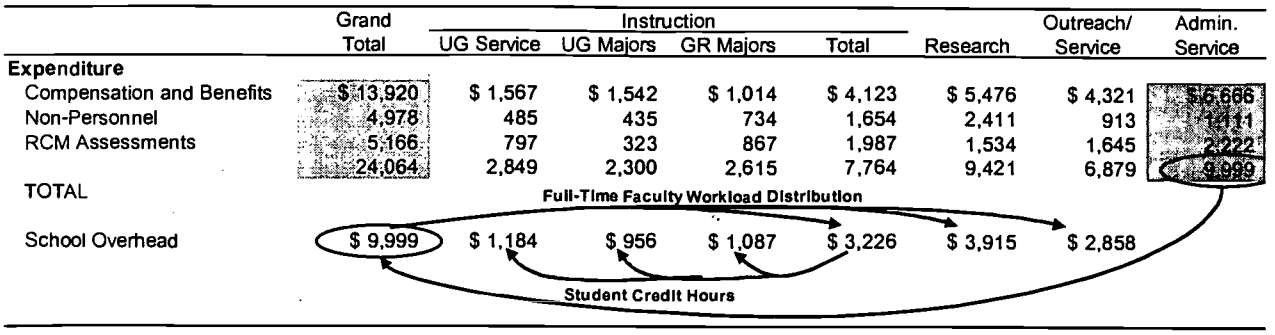

Figure 4. **Re-allocation of Administrative Service Activities as an Overhead Cost**

Generating Measures and Indicators

Having all the drivers necessary to distribute revenues and expenditures to the mission-critical activities, a set of reports and indicators was constructed to communicate the results of the analysis. The primary report consisted of two sections. The first section displayed the revenues and expenditures at the activity level within the unit (school and department, where applicable). The second section outlined a series of measures and indicators derived from the basic table.

The measures and indicators included in the second section of the primary report were chosen to represent several dimensions of program costs in both absolute and relative terms. Specifically, the indicators included:

- Direct and Net Contribution—revenues minus expenditures for each activity, first for directly attributable revenues and expenditures, and then with department-, school- and campus-level overheads considered.
- Revenues and Expenditures per Degree Conferred—a separate accounting of the revenues and expenditures associated with undergraduate and graduate degree programs (combined).

This measure was standardized using a three-year average of annual degrees conferred to dampen the annual volatility in the number of degrees granted in some departments and schools[2].

- Revenues and Expenditures per Major—Instructional costs standardized according to number of majors in degree program.
- Revenues and Expenditures per Student Credit Hour (SCH)—Instructional costs standardized according to total credit hours taught[3].

Results

In addition to preparing unit-level reports, the authors prepared a series of summative tables and charts that were disseminated in the broader context of presenting the study for use in the campus planning and evaluation processes. Given the unique nature and large budget associated with the Medical School, this unit was excluded from the campus-wide summary tables. Although the use and potential usefulness of the cost study is greatest within the academic units, the overall summary tables are helpful in setting an overall context against which unit summaries can be compared.

Table 1 illustrates the overall distribution of revenues, by source, across the mission-critical activities of the campus. As restricted by the model, all tuition and fee revenues are

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[2] The cost per degree indicator in this study is a cross-sectional cost, not a cumulative or longitudinal measure of the cost to confer a degree. That is, the per degree rate is used to compare annual major instruction costs across departments of varying size and not to determine how much it costs to confer a degree over the length of a student career.

[3] In assessing the cost per credit hour, our model was not able to differentiate between undergraduate and graduate credit hours. This is a feature we expect to incorporate in future years as we improve upon the IER/Capacity Model.

allocated to instructional activities. Three-quarters of the sponsored grant and contract revenue support research activities on the campus with most of the remaining one-quarter used in support of outreach and service activities and only a minor portion of the grant funding going toward instructional activities. The majority of "other income" supports outreach and service activities, which is not surprising for a campus having large health related programs such as Dentistry, which offers fee-based clinical services to the public. Most significantly, the state appropriation was shown to be used primarily for instructional activities (84%) and in only very modest proportions to support the research and public service activities of faculty.

Table 1. Distribution of Revenues across Mission-Critical Activities

Source of Revenue	Instruction	Research	Service	Total
Tuition and Fees	100%	0%	0%	100%
Contracts and Grants	5%	73%	22%	100%
Other Income	30%	9%	61%	100%
State Appropriation	84%	14%	2%	100%
Total Revenues	**73%**	**18%**	**9%**	**100%**

Table 2 displays the net contribution (total revenues minus total expenditures) across the mission-critical activities. The results support what most academics have always believed: undergraduate service courses are the most profitable. What may be somewhat surprising is the fact that in our model, graduate and first professional degree programs (Law and Dentistry, but not Medicine) also yielded a modest net contribution. It should be noted that the campus as a whole (excluding Medicine) produced nearly a $10 million surplus for this particular academic year.

Table 2. Net Contribution of Mission Critical Activities

Activity	Net Contribution
Undergraduate Service	$ 4,143,988
Undergraduate Degree Programs	$ 1,367,533
Graduate / Professional Degree Programs	$ 3,228,748
Research and Scholarship	$ 171,406
Outreach / Public Service	$ 1,087,026

After its initial distribution and the attendant discussions, several deans started using the cost study model in their annual planning and budgeting processes. New reports and analysis were developed centrally and in the schools to support these processes. One dean, who believed that prevailing myths held that there was a large overhead associated with her school's operations, analyzed her school compared to other school and campus overhead levels. She found her school had only modest overhead costs relative to other schools on campus.

The program cost study results were immediately incorporated into a broader planning and evaluation context. For the annual planning and budgeting process, school deans are provided with a variety of performance measures that relate to the quantities and qualities of students, academic programs, and goal-related activities. The program cost study data were woven into this process as another source of planning and evaluation support information. Taken together these information sources provide a rich context for evaluating the important issues of program access, quality and cost.

Conclusions

In an effort to improve both planning efforts and accountability to our heterogeneous constituencies, the authors conducted a systematic program cost study sponsored by the

campus's executive administrators. This study replicated the URI model in its approach, but has made significant refinements in the methodology, and, presumably, the quality of its results.

While our results are preliminary, they have led to some voluntary internal changes already. For example, one school has been considering forming stand-alone departments. The conclusion of the dean and his senior staff following this study was that they should proceed with this change. Another school is now contemplating raising its tuition for its master's degree program. The graduates of this program can readily realize a large salary upon graduation and the costs for this program far outpace its tuition revenues as demonstrated by the program cost study.

It is expected that these results will be useful to deans and the campus administration in making decisions to increase or decrease investments in existing programs and whether or not to initiate new academic programs. While these decisions should not be based solely on an economic cost-benefit analysis, the economic data should help improve the quality of decisions, especially when augmented with qualitative analyses from program reviews performed by internal and external peers and constituents.

In addition to the possible refinements to our study that we have already discussed, we believe that we can further enhance the model by testing it against alternative specifications in future years. As we review assumptions and alternatives and test the model against new assumptions, we will be able to examine the robustness of our current results.

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