

A NEW BUDGET MODEL FOR UNIVERSITY ACADEMIC AFFAIRS

*Mahyar A. Amouzegar, College of Engineering, California State Polytechnic University,
Pomona, CA 91768, 909-869-2472, mahyar@cpp.edu*

*Khosrow Moshirvaziri, Information Systems Dept., California State University, Long Beach,
Long Beach, CA 90840, 562-985-7965, moshir@csulb.edu*

ABSTRACT

We present an optimization-based model to facilitate and improve the division of academic affairs budget allocation process. The model attempts to incorporate not only traditional criteria such as the number of full-time equivalent students (FTES) and student faculty ratio (SFR), but also utilizes other relevant measures such research and scholarly activities.

BACKGROUND

Historically, the CSU campuses are funded directly by the number of full-time equivalent students (FTES)¹ and as such budget planning at the campus level is tightly coupled with the FTES-based budgeting model. The impact of this model is evident at all levels of the campus operation— including the number of full-time equivalent faculty (FTEF), which in turn is strongly effected by student enrollment numbers. An FTES-based budgeting model is a relatively efficient approach that is simple to implement, and has certain flexibility due to a lack of emphasis on analysis and integrated planning. It would be an appropriate model in a homogeneous educational environment, where the focus is on classroom teaching only and there are no major variations in the mode and delivery of curriculum.

However, in comprehensive and diverse universities such as many of the CSU campuses that offer wide range of teaching and training environments, this approach circumvents meaningful analysis, and indeed oftentimes obstructs the achievement of strategic objectives of the campus. In short, the weaknesses of the FTES-based budget process tend to outweigh its strengths, especially in an environment of change. This is particularly true in regional public universities, in general, and CSUs, specifically, since as the public financial support has declined over the last several years, and as the campuses have moved towards a so called “teacher-scholar model”² of higher education with more emphasis on scholarly and creative activities, the budgeting framework must be reassessed to provide the proper type of incentives with an appropriate set of metrics. This new framework must take into account not just the basic parameters such as FTES and student faculty ratio (SFR) but also encourage research and scholarly activities, alternative

¹ Prior to 1993-94, funding for the California State University (CSU) was calculated utilizing a complex set of funding formulas (Orange Book) predicated upon FTES, SFR and other factors. In 1994, this model was eliminated. In its place, the CSU adopted a simplified approach that is influenced by student-faculty ratio, size of physical plant and related programmatic considerations. Under this model, the State provided \$7,885 per FTEs in 1998-99 fiscal year compared with \$6,330 in 2011-12.

² This and some variation of this term is used by many regional campuses that are focused on teaching and applied research in that order.

modes of education and training, and other quantitative and qualitative factors that make up the education system that is already in place in these universities.

INTRODUCTION

To meet the new challenges and move away from a purely FTES-based budgeting model, we should keep our focus on certain principles that help inform the decision makers and provide positive incentives that support the vision and mission of our respective institutions. Therefore any new funding model should provide enticements that advance the vision of excellence and should contain many elements of the following attributes:

- Commitment to excellence in teaching
- Advance and encourage exiting strengths and priorities, such as interdisciplinary scholarship and internationalization, as well as, boost economic development through grants and contracts and other activities
- Balance local autonomy with a strong sense of unity of vision and values
- Provide incentives for graduate studies and research
- Encourage creativity and responsible risk taking while providing for reasonable oversight by the leadership
- Provide mechanisms for investments of fresh ideas at all levels
- Reward entrepreneurial efforts (provide favorable view and reward proposals that aim to increase revenues)
- Ensure that resource decisions recognize critical circumstances that will require investment
- Incentives or rewards for creative approaches that reduce expenses (for example being able to keep dollars saved when expenses are reduced)
-

METHODOLOGY

CSU's Current Budget Model - The funding mechanism at the academic affairs divisions of the CSUs are mainly based on FTES and SFR with some minor variations at each of the 23 campuses. At one campus, for example, academic affairs division combines FTES growth (based on a previous year) and a divisional SFR (same rate across the colleges) to compute the budget and to derive the number of faculty positions needed to support the enrollment growth. Operations and maintenance (O&M) budget is set by a fixed rate for the whole division. In another campus, the SFR and O&M rates are college-specific and are based on historical data.

The current budgeting system does not necessarily align with the institutional priorities and leaves little local autonomy. For example, the current model does not directly reward scholarly activities and does not distinguish between the differences in the delivery of the education (e.g., online) or type of classes (lab versus seminars or large lecture sections versus smaller ones). The weakness of the current model is in its attempt in "equalizing" the system by, for example, adjusting the SFR and the marginal rate for the cost of operations.

The overall budget of each college is the sum of the cost of full-time permanent faculty and staff, and cost lecturers (who fill the gap needed to meet FTES target) and O&M, calculated based on FTES and SFR. This has led to a mix of allocation, where some small colleges have operating budget disproportional to their size. The calculation for the college specific SFR is slightly more

problematic, as it depends on a faculty and staff base salary, which may impact hiring decision. This phenomenon has in turn led to an interesting variation in FTES to faculty ratio (see Figure 1). At a glance, one might come to the conclusion that a good policy would be to hire more faculty in colleges with higher FTES to faculty ratio (and they may fully deserve it) but this would not take into account modes of delivery (i.e., large lecture classes for service colleges), or class type.

Review of other Models and Methodologies

- UC, Davis is working on a so-called incentive based budgeting that allocates resources to the colleges directly.³ UC Davis’ model puts less focus on maintaining control of the number of positions at the college level. “Deans will create or eliminate faculty positions based on priorities, workload and available resources. Deans will have more responsibility for funding faculty salaries, benefits and start-up packages, but will retain a greater share of the salaries and benefits of faculty who retire or resign.” UC, Davis’ budget model was an attempt to move away from a linear 18.7 student per full-time faculty to a negotiated need-based recruitment. [1]
- Youngstown State University used the traditional incremental (or decremental) budget model with annual uniform percentage increases (or decreases).⁴ In their revision of the budget model, the focus was shifted towards aligning resources to the institutional priority and local autonomy amongst other objectives. Unfortunately, the end result was not a formula for an alternative budget model but rather changes in the process of budgeting such as transparency, accountability, etc.[2]
- The Delaware Study of Instructional Costs and Productivity⁵ is not a template for developing alternative budget models but rather a comprehensive survey of how universities allocate resources. It is not surprising to note that there are differences amongst the various disciplines and whether the institution in questions is a teaching or research campus.[3]

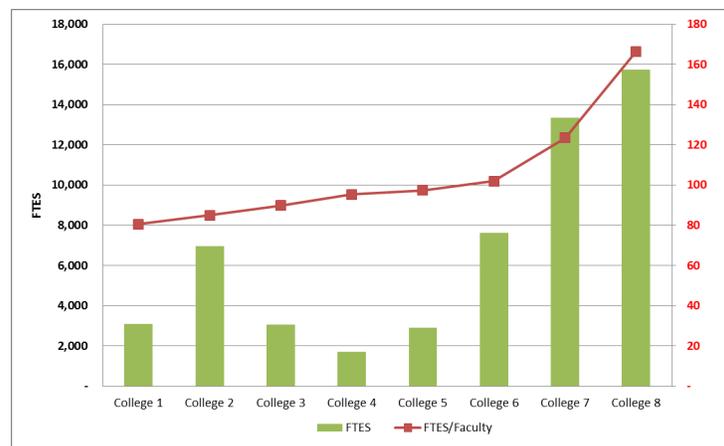


Figure 1: FTES-Faculty Ratio and FTES

³ UC Davis Budget and Institutional Analysis, February 2013

⁴ Youngstown State University 2020: A New Approach to University Budgeting, May 14, 2012

⁵ A Study of Higher Education Instructional Expenditures: The Delaware Study of Instructional Costs and Productivity, National Center for Educational Statistics, June 2003

New Budget Model

We have developed a new tool that allows the Provost (or an equivalent campus authority) to build a budget with relative ease, while incorporating additional measures such as number of majors (headcount in addition to FTES generated), number of research active faculty (known as Academically Qualified faculty in business colleges) demographical data (forecasting retirements), number of full-time faculty, as well as traditional factors like FTES and SFR (see Table 1).

In this model, courses are divided into categories (e.g., graduate lecture versus undergraduate activity) with associated SFRs, which is a user (i.e., Provost) defined parameter (see Table 2). We have also collected distribution of types of courses across the colleges, which with the course specific SFRs allow us to compute college specific SFR. Furthermore, O&M is computed based on various factors with different weights. In our example model, O&M is a function of FTES (40% weight), Majors (40%) and lab/activity portion of the course offerings (20%).

Table 1: Academic Affairs Data

	College 1	College 2	College 3	College 4	College 5	College 6	College 7	College 8
FTES	3,085	7,970	2,950	7,190	2,920	1,790	15,750	13,750
FTEF	25.1	72.9	34.9	85.4	38.3	18.5	96.3	103.3
Research Faculty	10	18	5	30	10	2	28	37
Senior Faculty	17.2	43.4	20.5	61.8	19.3	5.5	66.2	65.6
Other Faculty	0.0	11.5	9.4	0.0	9.0	11.0	2.1	0.6
Headcount (Majors)	1,738	4,488	1,149	5,066	1,461	1,091	3,171	3,903

We adjusted the course specific SFRs and O&M percentages to have a budget result that is similar to the budget derived using the current FTES based model. This was done to establish a baseline as a starting point. In our example model, using the FTES base system, the average SFR for academic affairs was 24.1 with a budget of \$78.9M. Our baseline computed results allowed for an average SFR of 23.7 and a budget of \$79.0M. In the baseline model, 57% of courses were taught by tenured and tenure-track faculty and 88% of faculty's time was devoted to teaching. The remaining 12% was allocated to service, as research component is not explicitly defined in the base model (or the FTES based budgeting system).⁶

⁶ In CSU system faculty time is measured in weighted teaching unit (WTU) and generally each faculty member is assigned 12 WTUs for teaching and 3 WTUs for service each semester, for 30 WTUs each year. Faculty who do research may reduce their teaching component by "buying time".

Table 2: SFR by Course Type

Class Type	SFR
Graduate Activity	10
Undergraduate Activity	12
Graduate Lab	10
Undergraduate Lab	12
Graduate Lecture	12
Undergraduate Lecture	24
Graduate SUP/IND	3
Undergraduate SUP/IND	4

Next, we developed several optimization models that allow the user to meet various and possibly competing objectives. For example, a user may want to explicitly allocate time for research for a limited number of faculty members which would yield say, 90% teaching, 5% service and 5% research, across the division (some faculty teaching a full load and others getting time off from teaching). The model optimizes this across the colleges and identifies the minimum amount needed to meet the teaching demand while meeting the constraint and objective set by the user. In this example, the overall budget will increase by \$1.5M but the result would be 4 WTU reduction of teaching for all research active faculty members and an overall SFR of 22.1. We also developed a model that allows the user to “equitably” distribute allocation of new faculty hiring quota to each department, while increasing the research assignment at the lowest cost possible. In this model, the user will define relative weight of each important decision components such as the total number of research faculty members in a college, number of majors, and past research (or potential) research growth amongst others, to create relative weight for the objective function. For example, maximize number of new hires for a given budget while meeting the teaching requirement and increasing the research component. The result of this model is presented in Table 3. In this illustrative example, the division of academic affairs would hire 30 new faculty members and would provide 5 weighted teaching units of assigned time (i.e., teaching 7 units per semester) for 230 faculty members (out of 595) at an additional cost of \$4.5M, while meeting the teaching demand and providing a rationale for distribution of the new faculty lines (new hires) across the colleges. The overall SFR for the campus is reduced to 20 and as the result, 50% of teaching is performed by lecturers.

Table 3: Maximizing research while meeting demand

	College 1	College 2	College 3	College 4	College 5	College 6	College 7	College 8
FTEF	26.1	76.9	36.9	91.4	40.3	19.5	101.3	108.3
Research Faculty	11.0	22.0	7.0	36.0	12.0	3.0	33.0	42.0
New Faculty	1	4	2	6	2	1	5	5
Average SFR	18.4	23.4	22.1	18.8	16.4	23.2	22.8	18.4
Additional Cost (Research)	\$163K	\$338K	\$--	\$162K	\$132K	\$--	\$977K	\$917K
Cost (PT faculty)	\$1.3M	\$1.8M	\$425K	\$1.8M	\$950K	\$340K	\$6M	\$6M
O&M(\$)	\$350K	\$600K	\$250K	\$760K	\$420K	\$213K	\$711K	\$880K

CONCLUDING REMARKS

This paper presents a new approach to modeling the budget of the division of academic affairs in a regional teaching focused research driven university. The model provides a flexible tool for decision makers to develop resource allocation policies that meet the strategic goal of the campus.

REFERENCES

1. UC Davis Budget and Institutional Analysis, February 2013
2. Youngstown State University 2020: A New Approach to University Budgeting, 2012
3. A Study of Higher Education Instructional Expenditures: The Delaware Study of Instructional Costs and Productivity, National Center for Educational Statistics, 2003