

Essays in Perspective

Improving University Performance Through Measurement and Management

by Elizabeth D. Capaldi





ACTA
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About the Author

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Through its *Essays in Perspective*, ACTA’s Institute for Effective Governance seeks to stimulate discussion of key issues in higher education. The opinions expressed are those of their authors.

Improving University Performance Through Measurement and Management

Universities and colleges are powerhouses of economic development and crucial to the competitiveness of our country. This paper reviews how trustees can maximize the economic and other impacts of their educational institutions by measuring and rewarding productivity and quality.

University work delivers no common bottom line, no clear stock price. Instead, major research universities compete in a complex marketplace for talent and ability and produce highly individualized products in the form of degreed students, research results, and useful services to their communities. Universities know that the management of cost and productivity will help deliver the resources needed to sustain quality, but the tools for managing their complex enterprises do not readily produce easily-measured indicators of success.

While all universities account for their various funds, the funds themselves do not always accurately reflect the cost of teaching and research, and it becomes difficult to connect the actual financial statements to the effective use of resources. Now with resources scarce and higher education responding to the continuing demand for quality, universities need to develop techniques for managing their money and investing effectively in productivity and quality.

Success depends as much on the ability to spend the money available effectively as it does on the ability to locate additional resources.

Measuring Teaching and Research Productivity and Quality

Quality and Productivity

Quality measures vary greatly by academic field. Throughout the country, the faculty in each field define the elements of quality. For research,

or the equivalent creative activities, faculty measure the quality of books, articles, paintings, compositions, or inventions. For teaching, faculty measure results on standardized examinations, pass rates on professional tests, employment, satisfaction surveys, portfolios of teaching performance, or peer and student evaluation of teaching.

To measure quality of an entire university or college, it is best to use output measures of education and research.

For research, these include:

- sponsored research (an output measure of quality because grants are awarded based on competition);
- citation indices (which indicate how influential the research is on other researchers); and
- quality of publication outlets.

For quality of teaching, these include:

- student evaluations;
- performance of students in subsequent classes based on teaching in previous classes; and
- results of output measures from instruments such as the Collegiate Learning Assessment which provide reliable assessments of writing and critical thinking skills.

Universities are comprised of many academic sub-units which reflect different areas of intellectual activity. Think of a university as composed of many separate businesses, each with its own cost structure and competitive context. Psychology departments compete nationally and internationally for the very best faculty and students, as do medical schools, law schools, etc. Some of the national competitions are formal, such as competing for grants from federal agencies. Winning these competitions, shown by having a large amount of grant money, is thus a measure of quality.

The most useful data from a university or university system includes data that is at the level of college or discipline. Teaching, research, and service all vary by discipline and the competition is by discipline. We

will discuss measures of teaching and research quality and productivity to make this clear.

Teaching

Teaching productivity is popularly conceived in terms of number of students taught. However, to capture that concept accurately, one needs to consider how many hours the faculty member meets with the students, namely, measured by the credit hour. A course that meets three hours a week generates three credit-hours, a course that meets four hours a week generates four credit-hours, etc. Most courses are three credit-hours, but some lab courses are four hours, and some specialty courses are one or two hours.

Obviously a faculty member who teaches a four-credit-hour course, which meets four hours a week, is working harder than one who teaches a three-credit course. Typically, 120 credit hours are required for a degree, so the number of credit hours taught also captures the contribution of a course to the student's total program of study. The second factor is how many students are in the class, measured by student credit hour (SCH). Student credit hours in a course are the number of students in the course multiplied by the number of credit hours. So a three-credit-hour course with 30 students produces 90 SCH, a three-credit-hour course with 10 students produces 30 SCH. As you can see, SCH is a fundamental measure of teaching productivity because it captures both numbers of students and hours of faculty contact with those students. Obviously, larger class sizes lead to a greater number of SCH per faculty. And there is no doubt that classes can be quite large and taught very effectively in some disciplines, particularly at the introductory level.

It is equally clear, however, that not all information can be learned well in a large class. For example, learning a musical instrument requires one-on-one instruction, clinical instruction in medicine or nursing permits only a small number of students to accompany an instructor on rounds, and scientific laboratories are best taught with a medium

number of students, rather than hundreds or more. A simple way to take this into account is to measure number of sections taught as well as SCH. A music instructor may have only a few students in a section, but productivity would be shown by either many sections of students, or many hours a week with each student.

Upper division courses (junior and senior year) are typically and necessarily smaller than lower division classes, one reason that community colleges appear to be more efficient than four-year colleges. In a four-year college, the more expensive upper division is included in the calculations. Thus, to compare community colleges to four-year colleges in terms of cost per student FTE, one must consider only the freshman and sophomore year data and not the junior and senior year.

A university, which also has a teaching mission, is not comparable in raw data to either a community college or a liberal arts college because the faculty are required to spend time doing research, which is an important mission for the states and the country.

A great deal of attention has been given to measuring effectiveness and efficiency in American education by measuring institutional graduation rates. All of the stakeholders in higher education, and in public higher education specifically, have strong interests in ensuring that once a student enters college he or she will graduate. Graduation rates, like measures of teaching productivity, indicate how productive an institution is in its teaching mission.

As a measure, graduation rates appear straightforward. Colleges know how many first-time, full-time students they enroll each year and then report on how many of those students graduate from their institution four, five, and six years later. Sometimes things aren't so simple though. Students who decide to transfer to another institution to be closer to home or pursue an academic program which their original institution didn't offer are counted as a failure even though they've earned a degree. The institution that takes in that transfer student doesn't get to count that student as a success.

As an indicator of overall success, graduation rates are thus a flawed measure at best. First, graduation rates are heavily influenced by the students a college enrolls. Higher SAT scores and high school averages are reliable predictors of whether a student is or is not likely to graduate. Second, graduation rates fail to measure all the students that institutions educate. For example, public four-year institutions admitted 812,848 first-time, full-time students in the fall of 2000. By the end of the 2006 academic year, 434,363 had graduated with a bachelor's degree from their initial institution, or about 53%. Yet, public four-year institutions granted some 963,425 bachelor's degrees in 2006. Although the numbers vary from year to year, graduation rates will typically measure only about 45% of the actual overall institutional output in any given year.

Alternative graduation efficiency measures take a look at all the credit hours taught by a college and the number of degrees they grant. Dividing the number of bachelor's degrees granted, by the number of full-time equivalent students, yields a good proxy for efficiency. A perfectly efficient university would have a ratio of 0.25. This method has been used by the State of Washington in their Graduation Efficiency Index (GEI).

Productivity in Research

Sponsored research serves as both a productivity and a quality measure. It indicates productivity, because the more sponsored research dollars acquired and spent, the more work the faculty, staff, and students perform.

At the same time, since most sponsored research results from a competitive process, universities that get a large amount of grant money have demonstrated quality by winning the competition for funds. Although the opportunities for sponsored research vary by field, all fields have competitions for some level of funds. In 2006, universities performed more than \$47 billion in academic research and development. For every \$1 million in academic research and development,

29 jobs are created. Thus, nearly 1.4 million jobs were produced by academic R&D in 2006. This accounted for more than 1 out of every 200 jobs in the nation.¹ With a multiplier effect of more than 7, the \$47 billion in research generated more than \$334 billion in economic activity in the nation.

Research can also generate income from licenses (royalties) on new technologies and inventions. However, this is a very difficult business and few universities make a lot of money at this. Of 156 universities who report income from licensing, 46 actually lost money on technology transfer after subtracting costs of patenting and legal expenses.

Of the universities that make money, most of the revenue is driven by “blockbusters.”² Many commercial industries are also driven by blockbusters, e.g., the music industry, pharmaceuticals, publishing, venture capital. In technology transfer, blockbusters are very rare. Of 22,465 active licenses at universities in the United States, only 111 generate more than \$1 million in revenue. Also, big winners take between four and 10 years between patenting and generation of significant revenue. To deal with the risk of investing, universities can take one of two approaches. First, they can maximize the long-term upside by investing liberally in patenting, seed funding, and marketing to maximize the chances of developing a blockbuster. Second, they may choose to invest only in sure bets and live with the chances of losing a blockbuster.

Quality

Quality depends on productivity and revenue. Trustees should reward those colleges that successfully explore entrepreneurial opportunities, move intellectual property to the marketplace, and compete effectively

¹ Data from the National Science Foundation Academic R&D Survey and the US Bureau of Labor Statistics.

² Some examples of blockbusters are the chemotherapy drug Taxol (Florida State) which has generated over \$200M in the past decade, the \$525M royalty stream from the drug Emtriva (Emory), the \$344M made by Stanford when Google went public, and the popular sports drink Gatorade from the University of Florida.

for grants, contracts, foundation funds, private gifts, and other dollars that can support the quality of the college.

Income generation itself is not the university's mission. It is, however, a means to the end of investment in increased quality. More importantly, trustees should reward the teaching and research productivity and quality that are the university's main purpose. Summarizing the following measures would be a basis for evaluating productivity and quality:

- Credit Hours and Sections Taught per Faculty
- Graduation Efficiency
- Sponsored Research per Faculty
- Patent and Royalty Income
- Fundraising
- Other Income

Productivity measures should be expressed in terms of faculty FTE because the faculty drive the university's quality and productivity. Colleges and departments have many staff people and others who support the teaching and research of the university, but these expenses become part of the cost of the faculty, for they support the work of the faculty. When productivity is expressed in terms of faculty FTE, this also ensures that a university's improvement is the result of a real change in faculty productivity and not the result of a change in faculty size. If a university acquires more faculty but produces the same teaching or research, for example, the productivity per faculty FTE will decline. Similarly, if a college loses faculty members, but its productivity stays the same, then the productivity of the college increases because the remaining faculty deliver the same result with fewer faculty members.

Faculty FTE should be separated into tenured/tenure track FTE and other faculty FTE (clinical, research, lecturers and other non-tenured teaching faculty). Faculty can be hired with a single function—lecturers who only teach, research faculty who only do research. Not all

faculty need to do both and the tenured faculty may differ in terms of relative effort allocated to teaching and research. The best method of evaluation is to separate these functions in measurement and determine if the money invested is producing enough productivity and quality in both teaching and research.

Management

Measures mean nothing if they are not used for management. Trustees should feel free to ask how quality and productivity measures are used to allocate budget, and to reward individual faculty members who excel.

Teaching excellence and research excellence are two different things. Institutions should budget for each, reward each, and determine what the outputs are for each. Typically, department chairs assign teaching and research. Chairs should assign based on the faculty member's relative strengths in each area. Some faculty are excellent teachers as measured by the evaluations of their teaching and the success of their students, but not successful researchers as measured by their publications and ability to compete for funds. These faculty members should have heavier teaching loads. On the other end of the spectrum, some faculty are not talented teachers, but instead excel in the laboratory. These faculty should be expected to be heavy grant getters, and indeed in many universities such people are expected to bring in some large percentage of their salaries from grants and thereby have less teaching responsibility. Universities can and should have a wide variety of assignments for faculty based on their talents and performance. While the typical tenured faculty member is expected to teach and have scholarly activity, the proportion of the assignment of teaching and scholarly expectations can and should vary.

Trustees should not micromanage, but can certainly ask for reports of outputs of teaching and research as a function of faculty FTE. These measures in essence show the results of money invested in teaching

and research, because the largest part of the university budget goes to salaries.

Differentiating the Market

Not all schools should have all missions.

Stated another way: Each state needs research universities as engines of economic development. But not all schools need to do research.

The higher education market is rightly becoming more diversified with for-profits offering highly profitable degrees (like business) taught by faculty who are paid relatively low wages and have no responsibility for residence life.

There is a market for the delivery of educational content. But there is also a market for context, the campus experience, as shown by the high demand for high-priced private liberal arts colleges. Much learning occurs outside the classroom and residential students—even when they take some courses online—learn valuable leadership and other skills by living on campus and interacting with peers and professors.

State systems can provide what the market needs by being aware of the separable products, costs and markets involved in content of instruction, context of instruction, and research.

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