

The Business of Engineering Education

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Abstract

The current recession is going to financially stress public universities in the Midwest; state funding will in all likelihood decline. High school graduation rates will be declining in all five states over the next few years, so enrollment and tuition revenues will also decline. It will be a difficult period for the universities financially, and faculty must think about the cost effectiveness of their contributions to the university. Faculty need to work with the administration to build a strong case for state funding, help with retention of current students, and recruiting of new students. This recession is going to force universities to look carefully at the cost effectiveness of their approaches to teaching and research.

Introduction

In the next few years, public universities in the Midwest are likely to face a period of declining state funding and declining undergraduate enrollment. A decline in enrollment, with the accompanying decline in tuition income, will cause a financial hardship on the universities. With the recession, state tax receipts are down, and it is likely that state funding for education will decrease. University administrators have become increasingly concerned about student retention and recruitment because they see the impact of enrollment on the university budget.

Faculty must think about the business side of the engineering education that we provide. The engineering graduates that we provide are very important in building and maintaining our manufacturing base, infrastructure and economy. The education that we provide is very important. In the next few years we are going to be asked to provide that education at a lower cost, and we are going to have to make some difficult decisions as to what is most important.

In the past, budget crises have come and gone with little impact on faculty. We have often had to tighten our belt for a few years, but have been able to stay focused on the academic issues of teaching and research. In the 2001 recession, state funding was reduced significantly and universities solved the budget problem by raising tuition sharply and by increasing enrollment. Sharp raises in tuition and increasing enrollment are not going to be options for this recession. Universities will need their faculty to begin thinking about the cost effectiveness of their teaching and research efforts.

University Budget

Like most large institutions, universities have two budgets. The larger budget is the total budget, which includes restricted funds. Restricted funds flow through the institution, but are designated for specific projects. The institution cannot use any portion of the restricted funds for other purposes. At a university, the restricted funds are typically for capital projects such as buildings or research projects.

The smaller budget is the operating budget, which excludes the restricted funds. Salaries, benefits, supplies, scholarships, energy costs and other day-to-day expenses are paid out of the operating budget. The university has control of the funds in this budget. A reduction in state or tuition funding will cause a decrease in the operation budget, which means cutting salary, benefits, supplies, scholarships, energy costs and other day-to-day expenses. Universities will have to become more cost efficient.

Historically, most of the funding for the operating budget has come from the state. This has made the operating budget very stable. Enrollment could increase or decrease without having a large impact on the operating budget. Universities have been able to “tighten their belts” a little and make it through a period of low enrollment.

In recent years, tuition funding has exceeded state funding at many state universities. Universities compute the total tuition funds and then subtract the scholarships that are paid out of the operating budget to calculate the net tuition income. At the Missouri University of Science and Technology, the total tuition income in FY08 (\$64.1M) was greater than the state funding (\$48.3M). The net tuition income (\$38.5M) was less than the state funding¹. The trend in recent years is that the net tuition income is getting closer to being equal to the state funding. The result is that funding for the operating budget is becoming more and more dependant on tuition revenue. This is going to change how state universities look at enrollment. Enrollment is going to become more important.

Enrollment Details

Enrollment tends to be proportional to the number of high school graduates. University enrollment lags high school graduation trends a few years because it takes several years for the students to work their way through college. The charts below show the expected number of high school graduates in Arkansas, Kansas, Missouri, Oklahoma and Nebraska.

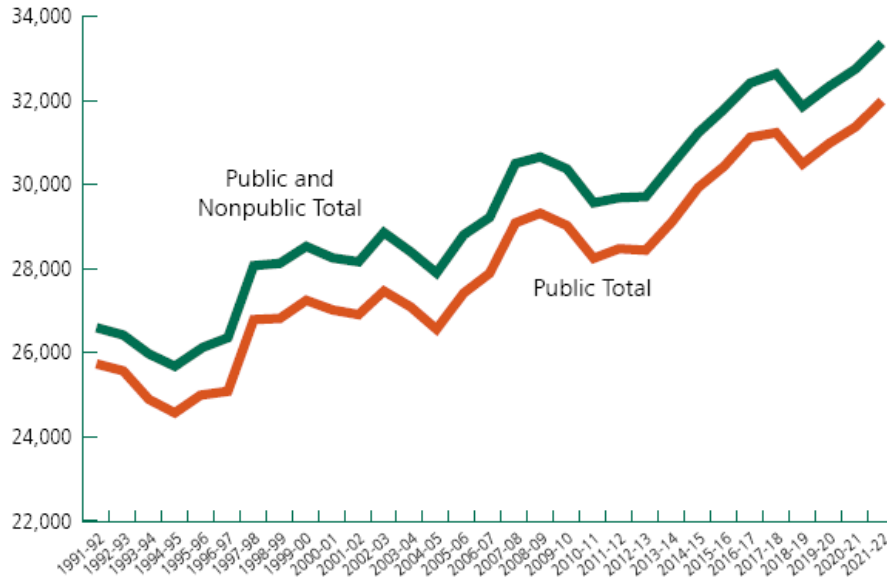


Figure 1. Arkansas High School Graduation Numbers 1991-92 to 2004-05 (actual), 2005-06 to 2021-22 (Projected).²

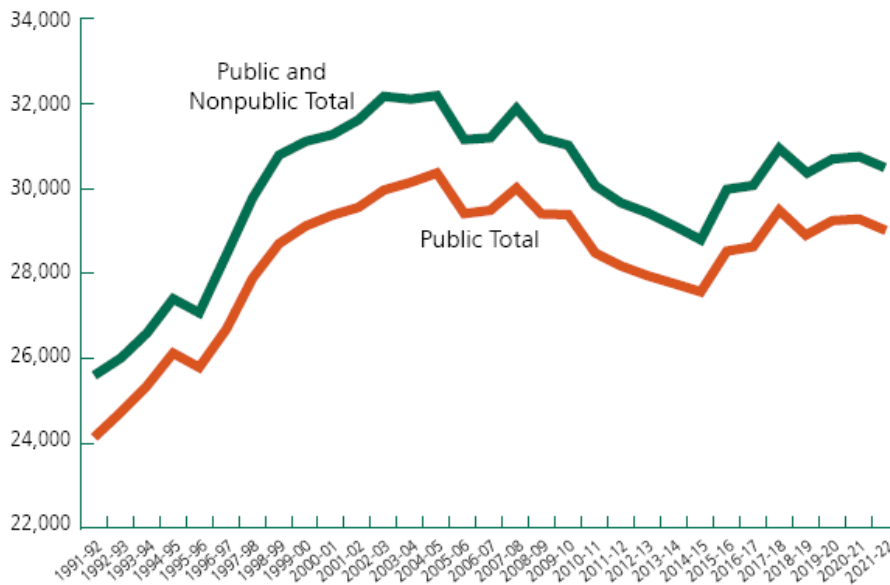


Figure 2. Kansas High School Graduation Numbers 1991-92 to 2004-05 (actual), 2005-06 to 2021-22 (Projected).³

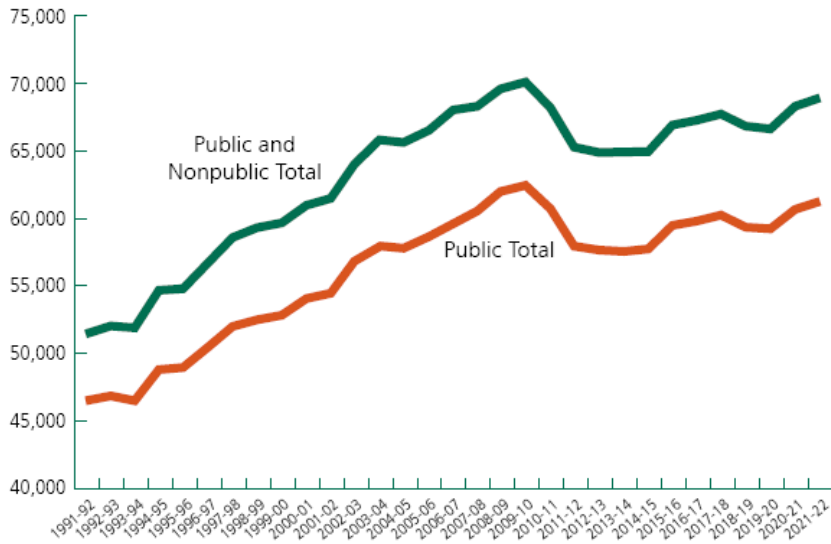


Figure 3. Missouri High School Graduation Numbers 1991-92 to 2004-05 (actual), 2005-06 to 2021-22 (Projected).⁴

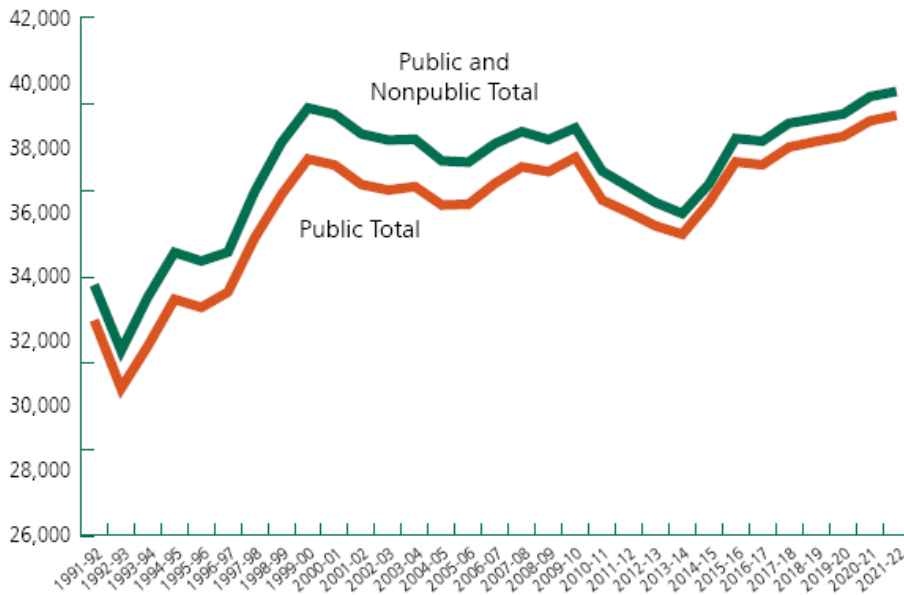


Figure 4. Oklahoma High School Graduation Numbers 1991-92 to 2004-05 (actual), 2005-06 to 2021-22 (Projected).⁵

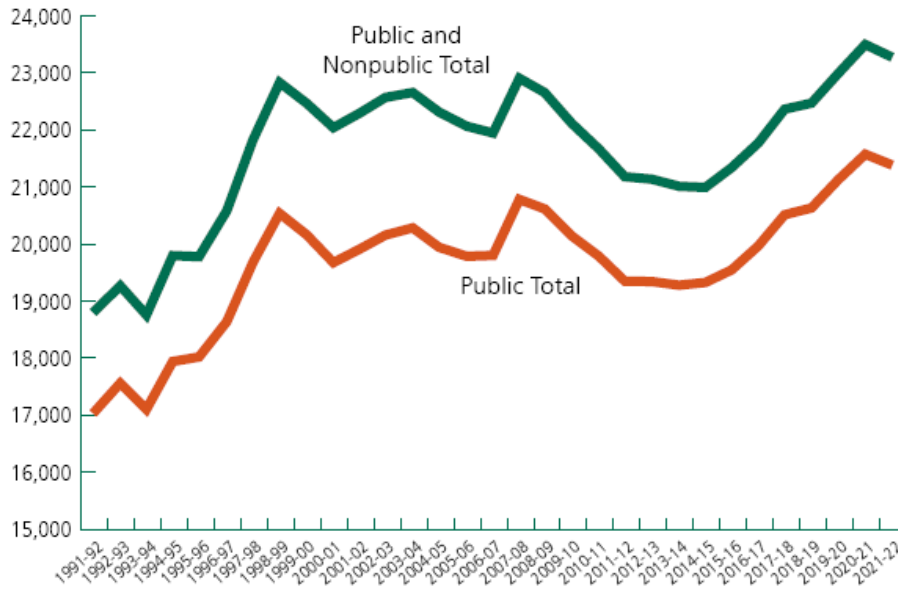


Figure 5. Nebraska High School Graduation Numbers 1991-92 to 2004-05 (actual), 2005-06 to 2021-22 (Projected).⁶

In examining the charts, Kansas and Nebraska reached a peak in the number of high school graduates in the 2006-07 school year. Arkansas, Missouri and Oklahoma reached their peak in the 2008-09 school year. All five of the states are going to experience a decline in the number of high school graduates in the next few years, which will almost certainly result in a decrease in university enrollment. Arkansas should have only a few years of reduced enrollment, after which their enrollments should recover and then increase. Oklahoma should recover their enrollments after 5 or 6 years. The charts suggest that it will be many years before universities in Kansas, Missouri and Nebraska recover their enrollments. The data indicates that there will be a reduction in enrollment over the next few years of approximately 3% in Arkansas, 7% in Kansas, 4% in Missouri, 3% in Oklahoma and 5% in Nebraska.

What Can University Faculty Do to Help the Budget?

State Funding. Universities will need to lobby for their share of state funding. Engineering education is an important part of strengthening the state economy. Faculty should be willing to help administrators build a strong case for not cutting state funding for engineering education. If state tax revenues are down, it is likely that higher education will face cuts in state funding. If we make a strong case as to why higher education is important, then perhaps we can decrease the size of the cuts we receive.

Enrollment-Retention. In order to improve enrollment, universities can put programs in place to try to improve retention. Historically, universities have tried many things to improve retention, with only marginal success. The National

Center for Educational Statistics published a comprehensive study in 2001 giving some of the reasons that cause students to leave the university before graduating.⁸

Statistically, PhD granting institutions and other prestigious institutions tend to have higher retention, and community colleges and other lower ranked institutions tend to have lower retention.⁸ The difference can probably be explained by the “average quality” of the students attracted to the institutions. Faculty efforts will have little impact in this area.

Students tend to want to stay at a university when they feel that they “fit in”. Social factors, such as finding a support group or a group of peers where the student feels comfortable, are important factors in retaining students. The cost of attending the university and financial aid are also important factors in retaining students. Some students are lost because they feel they cannot afford to continue attending the university.⁸ There are administrative offices on campus that work on the social factors of improving retention and on financial aid issues. Academic factors also affect retention. This is where faculty can have the largest impact on retention. Positive faculty-student interaction, quality advising, tutoring and help sessions all contribute to improving retention. Students also need to feel that the university has adequate facilities such as the library, computers and other laboratories, and that the university is offering the courses required for graduation.⁸

In order to help with retention, faculty may be asked to have more personal interaction with students, to provide office hour help and to spend time talking with the students when doing academic advising. Personal interaction helps with retention, but faculty often feel that they get mixed signals from the administration as to whether it is important to get involved with retention. It is hard for the administration to allocate resources or place a value on these types of activities. It is much easier to quantify the credit hours taught, number of advisees, research funding, publications etc. Personal interaction is very difficult to quantify, so even though it may be important to the university, faculty should not expect a tangible reward.

Enrollment-Recruiting. Faculty will also be asked to become more involved in recruiting new students to the university. Faculty can call prospective students and encourage them to come to the university. They can meet with prospective students and their parents when they visit the campus. The personal interaction will help in student recruitment and increasing enrollment. The typical engineering student will stay for about five years and spend \$40k to \$50k in tuition and fees at the university. If having a faculty member spend an hour talking with a prospective student and his or her parents makes the difference between the student coming to the university or not, then that is an hour of faculty time that was well invested. However, just like working on retention, recruiting efforts are difficult to quantify, and faculty should probably not expect to see a tangible reward for their work on recruiting.

Recruiting targeted at a specific group of students is often termed “Enrollment Management”. Private universities pioneered the effort of recruiting students who are able and willing to pay the full tuition⁹. Faculty often see this as a shady business, but we need to understand the economic impact of recruiting students who can afford to pay full tuition. As tuition revenue becomes a significant part of the operating budget, public universities will need to be more strategic in the offering of financial aid.

Enrollment – Evening Classes. One way to increase enrollment is to offer evening classes. Classrooms and undergraduate labs are underutilized in the evenings, so this is an opportunity to increase enrollment without additional capital investment. Offering classes in the evening allows students who work full time during the day and would otherwise be unable to attend the university to take classes. It is usually possible to hire an adjunct faculty member to teach the evening classes for a few thousand dollars per class. When taught by adjunct faculty, enrollment of the evening classes can be relatively low and still be profitable. If the university is in a large enough metropolitan area to recruit a significant number of non-traditional students, then evening courses are a way to increase enrollment. Some of the traditional day students will end up in the evening sessions, and we need to be sure that we are not just pushing students from a day section to an evening section. There is no extra income in pushing students from one section to another. For some institutions, evening classes taught by adjunct faculty are a possible way to increase enrollment and tuition revenue.

Enrollment – Distance Education. University administrators often see an opportunity to increase enrollment by offering distance courses. With distance education, the university can enroll students from all over the world. Many universities are becoming distance education providers, and the competition for the distance students may be stiff. Universities are going to have to find a niche market to be profitable. Faculty can help make distance enrollment profitable by developing economical ways to include a few distance students into the regular courses they teach. If reduced teaching loads or additional faculty are needed to offer the distance courses, it is not an economical solution. Universities need to be careful in how their distance education programs are designed, or they can be a drain on resources.

As faculty get involved and develop distance education programs, they need to be sure that the programs meet the needs of the students and also that they are cost effective for the university. Financially, the large distance education providers (such as University of Phoenix and University of Maryland – College Park) have not been able to afford to use traditional faculty to teach the classes. It is not clear that charging regular state university tuition will generate enough tuition revenue to pay the cost of using traditional faculty to teach the distance classes. Faculty need to be involved to insure that the distance education programs developed do not end up being a drain on university resources.

Research. Most research funds come to the university as restricted funds, and cannot be used to help with the operating budget of the university. Faculty should be encouraged to find research funding that can be used to pay a portion of their academic year salary or portions of support staff salaries. Most funding agencies do not like to pay academic year support. These agencies feel that the university should provide faculty time and the necessary lab space and equipment as the university's contribution to the research project. The university will need to begin asking the funding agencies to pay a higher percentage of the cost of research. Faculty who can obtain research funding to pay a portion of their academic year salary will be rewarded for their efforts.

Gifts and Development. Faculty will be asked to help with making a case to prospective donors for gift funding. We will need to help development offices define the needs of the university and explain why the needs are critical to the success of the university. Many of the gifts will come as restricted funds and will not help the operating budget, but some gifts will go to the general fund. Sometimes scholarship gifts can be used to help with the operating budget by replacing scholarship funding that is currently paid from the operating budget. Scholarship gifts can also be helpful indirectly by helping increase enrollment and retention.

Summary and Conclusions

Universities in the Midwest are likely to face a reduction in state funding and a reduction in tuition income over the next few years. The data seems to indicate that Arkansas will be the least impacted and Kansas the most impacted, with Missouri, Oklahoma and Nebraska in between. In the recession of 2001, universities saw significant reductions in state funding, but enrollments and tuition revenues were increasing. This recession looks to be much worse.

Faculty need to begin to think about the cost effectiveness of their contributions to the university, and be more receptive to doing things that will help with the university budget. They need to be involved in helping make a strong case to the state legislatures that education is important, and that funding for higher education should be sustained. Faculty need to be involved with enrollment through efforts in retention of current students and recruiting of new students. Evening classes and distance education are other possible ways of increasing enrollment, and faculty need to be involved in developing the programs. Faculty have always emphasized the quality of education and research with only secondary concern about the cost. The cost effectiveness of our teaching and research is going to become more important in the next few years.

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Biographical Information

Dr. Douglas R. Carroll PhD PE is a Professor of Mechanical Engineering at the Missouri University of Science and Technology. He recently became the Director of the Cooperative Engineering Program, a cooperative program between Missouri S&T and Missouri State Universities.