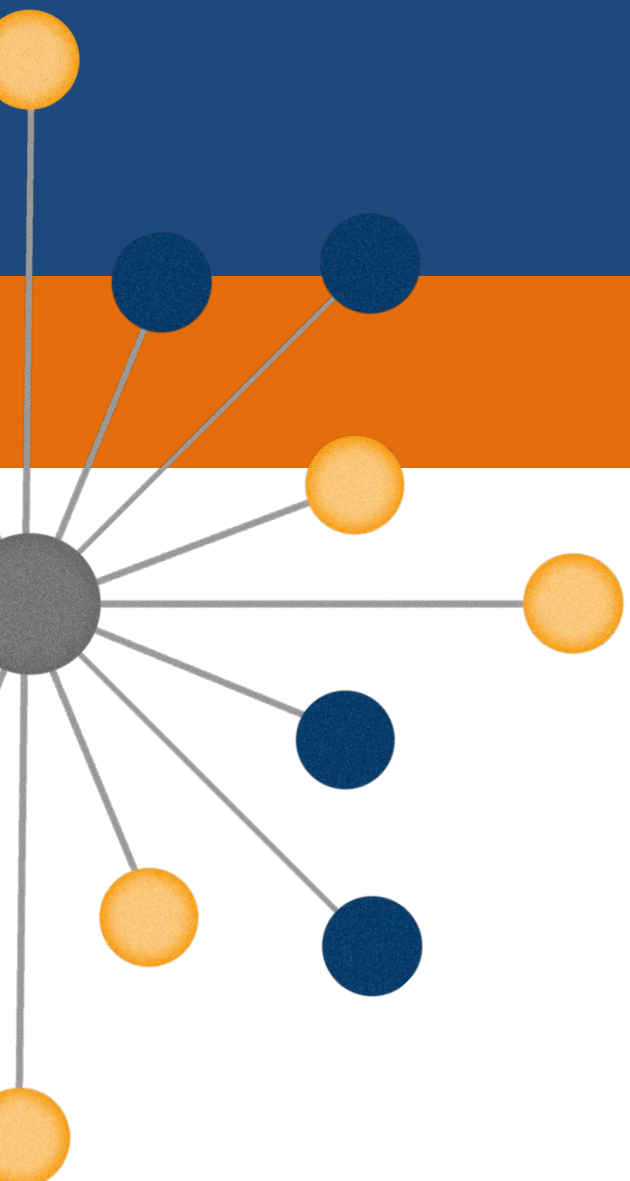
Measuring the Value of Higher Education

Individual Benefits, Societal Gains



Educational and Economic Focus

The University of Texas System

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Executive Summary

In response to increasing pressure to demonstrate the value-added of a college degree, this report outlines direct and indirect measures of such value. It explores this value added from two perspectives: the individual (micro level) and the societal (macro level). And it considers the impacts within four domains: educational, economic, social and research.

Table: Summary of Areas of Value Added

Individual	Societal
Education Domain	
Knowledge and skills	The shared body of knowledge, resources
Economic Domain	
Employment and personal income	Revenues, return on investment, job creation
Social Domain	
Quality of life, civic and charitable participation	Health and wellness, arts and culture
Research Domain	
Problem solving skills, know-how	Health, jobs, knowledge, productivity

The truth is, however, that the individual benefit drives the societal impact—and the better society is as a whole, the better for the individual. The domains are also not truly exclusive of one another. For example, research into cell behavior adds to the body of knowledge (educational) and may result in a life-saving cure (social) or in the creation of a start-up company (economic). Impact in one domain often ripples through the others.

Appendix A and B provide a brief overview of the value added and the recommended direct and indirect metrics for demonstrating that value.

Introduction

In our society, a major paradigm shift has occurred in higher education. In the past, most students who graduated from high school had aspirations to attend college and receive a degree. Recent decades have seen aspiration evolve into expectation, and the trend seems to be continuing towards necessity: in a 2010 report, the Georgetown University Center on Education and the Workforce projected that by 2020 63 percent of jobs in the U.S. economy would require postsecondary education. Moreover, the Bureau of Labor Statistics (2010) indicates that by 2020 there will be a gap in the jobs needed with a degree and number of degrees produced. With this shift, there are much greater pressures for higher education institutions to provide accessible and affordable education while maintaining high quality.

Exacerbating the effects of this paradigm shift is the nation's slow recovery from a severe economic recession. State funding for higher education is on the decline, and the level of student debt is increasing. All of the issues have placed higher education under an accountability and transparency microscope to assess the value of higher education.

The U.S. Department of Education has responded to these pressures by creating the College Affordability and Transparency Center. The center has developed affordability and value-added metrics within a series of dashboards (e.g., College Scorecard, College Navigator, Net Price Calculator Center, College Affordability and Transparency List, and State Spending Charts) to educate students and parents. The dashboards provide various metrics for specific universities on undergraduate enrollment, costs, graduation rates, loan default rates, and median debt.

It is critical for The University of Texas System (UT System) to respond to the ever growing pressures of demonstrating the value of higher education. The best way to do this is by providing various metrics needed to measure the value of higher education for students, communities, and society. The value of higher education is interwoven into the operating culture of the University of Texas System. The sole mission of UT System is to "provide high-quality education opportunities for the enhancement of the human resources of Texas, the nation, and the world through intellectual and personal growth."

Though this construct of "value" in higher education can seem like a rather abstract concept to measure, there are different ways we can capture these effects. In this paper, value will be deconstructed into four higher education domains:

- **Educational Domain:** growth in knowledge, competencies, and skills
- **Economic Domain:** expanded economic opportunities and impact on the labor market
- **Social Domain:** value added to understanding and participation in civic engagement
- **Research Domain:** value added as a result of research experiences and activities

This paper will highlight the importance of higher education activities taking place at UT System. The metrics presented will provide data that helps illustrate how UT System is striving toward the campuses' collective vision of having a "fundamental commitment to enhance the lives of individuals and to advance a free society."

Methodology

As one may expect, it can be difficult to identify and quantitatively capture value-added effects. Here methods will be presented for examining both the "micro-level" effect each domain has on students' lives and the "macro-level" effect each domain has on communities and society. Micro-level outcomes are outcomes that are associated with value added for individual students. Macro-level outcomes result in measuring how students and universities positively impact the community or society. Appendix A provides a diagram that represents four broad categories of "value-added" effects and an overview of the way higher education interacts with each.

There are two approaches to capturing value-added outcomes: direct measures and indirect measures. There are strengths and weakness to both direct and indirect measures. Direct measures are based on concrete data such as completed work, standardized tests, and wages. Data for direct measures can be more challenging to capture but are more objective in nature. Indirect measures include self-reported information about students' perceived learning. Indirect measures are easier to capture but tend to be more subjective and biased. Using both types of measures can lead to a more complete picture of how higher education adds value to students, communities, and society. Appendix B provides an overview of a list of the value-added outcomes that will be discussed.

Measuring the Value of Higher Education to a Student

The focus of this section is on the value of higher education to the student at the individual (or micro) level. Earning a bachelor's degree has significant benefits for the graduate: from gaining the knowledge and skills critical to finding a good job; to lowering rates of unemployment and raising lifetime earnings; from better health and living standards to increased civic participation. The impact of postsecondary institutions on students is discussed around outcomes organized into four broad categories: educational, economic, social, and research related outcomes. Even if growth is assessed by domain, students grow as an integrated whole and student growth in one dimension is related to and dependent on growth in the other dimensions.

Educational Domain

Educational college outcomes measure cognitive outcomes related to higher order intellectual processes, acquisition of knowledge and academic skills. There are many ways in which educational gains can be measured. For example, general knowledge can be measured by standardized tests of academic proficiency. Year-to-year retention and graduation rates are another way of measuring student progress and successful completion of the requirements of a degree.

Retention and Graduation. The ultimate goal for universities is to provide a high quality education in an environment where students persist and then graduate. Typically universities report first-year retention rates and four-, five-, and six-year graduation rates. It is very important to report these numbers, but they only provide a glimpse of how universities add value to students' academic success.

Students who are entering into universities bring with them a set of preexisting student and academic characteristics that are correlated with success. For example, research indicates that first generation students have a lower probability of graduation than non-first generation students (Tym, McMillion, & Barone, 2004). Using predictive modeling can help provide a broader view of how universities add value to a student's academic success. Examining entering student characteristics (e.g., first generation, family income/Pell grant eligibility, and college readiness) through logistic regression can be used to determine probabilities of success at different times during a student's academic career.

In the logistic regression, the model can control for the influence of student and contextual characteristics. Predictor variables to consider in a regression

equation of this type are gender, race, parental income, first generation, SAT equivalent, admittance to choice of school, and high school percentile.

Once these variables are controlled for, universities can highlight the increase in the probabilities of successful outcomes as demonstrated value-added, showing that efforts and activities taking place within students' universities are contributing to the academic success of students. Probabilities can be generated for first-year retention, as well as for four-, five-, and six-year graduation.

Student Learning Outcomes (SLO). Student learning outcomes within academic courses are an indirect measure of educational value added. When students declare a major they are given a degree plan, which consists of a series of courses that students must take to obtain that degree. Each course within a degree plan will contain a series of student learning outcomes, chosen by the department and faculty as they prepare the course.

Student learning outcomes focus on the following areas: content knowledge, critical thinking, writing, quantitative reasoning, and ethics and leadership. To assess the overall value added through SLOs, curriculum maps can be used as a tool to measure the content and skills that students will be exposed to in a course as well as the breadth and depth of the exposure to those skills.

A curriculum map is a rubric that categorizes courses by the SLO area and level of content knowledge that should be achieved by the end of the course. There are three levels of content knowledge: I: Introduced; R: Reinforce and opportunity to Practice; M: Mastery at the senior or exit level. Table 1 provides an abbreviated example of a curriculum map for courses within an electrical engineering degree plan. One can view a curriculum map as a "transformative learning portfolio" that is based on student learning outcomes within each course taken.

The power of a curriculum map is the ability to illustrate how students enhance their content expertise, competencies, and skills. For example, Table 1 provides an example of how students developed their knowledge of electrical engineering. A course sequence from Intro to Electrical Engineering through a Senior Design Project allows students to increase their understanding of electrical engineering over time. Students completed the EE302 course that introduced (I) the content, EE364D reinforced (R) the content, and EE365R course helped students master (M) the content.

From a reporting standpoint, administrators can use curriculum maps as data to illustrate how many students are increasing their competencies, knowledge, and skills while attending a university. Administrators can aggregate the data within students' curriculum maps to report the number of students who passed a course sequence that is related to either content knowledge, critical thinking skills, writing, quantitative reasoning, or ethics and leadership.

Table 1. Example of Electrical Engineering Curriculum Map

	Intended Student Learning Outcome Areas				
Courses	Content Knowledge	Critical Thinking	Writing	Quantitative Reasoning	Ethics and Leadership
RHE 306 English Composition		I	R		
M 408C Differential and Integral Calculus	I	R		I	
EE 302 Intro to Electrical Engineering	I	I		R	
PHY 103N Laboratory for Physics	R	R		R	
EE 364D Introduction to Engineering Design	R	R	R		I
EE 464R Senior Design Project	M	M	R		R
I – Introduced R – Reinforce/Practice M – Mastery					

Standardized Exams. Results from standardized exams are a direct measure that could provide insight into the educational value-added for students. One such type of standardized exam is the Collegiate Learning Assessment (CLA), which examines students' critical thinking, analytic reasoning, problem solving, and written communication skills. Over 500 universities have used the assessment tool either to compare a random sample of their freshmen and seniors (cross sectional design) or to follow students over time to examine performances at their freshman year and then senior year (longitudinal design).

All UT System academic campuses participate in CLA except UT Brownsville. The CLA is a powerful tool because comparisons can be done within a campus and there is the opportunity to benchmark students' scores with peer institutions.

Licensure exams are national or state tests which measure the knowledge, skills, and abilities individuals need to practice in a specific area. Most exams are required to ensure public protection, and students must obtain the license to be eligible to work. For example, students who receive a degree in nursing are expected to pass the National Council Licensure Examination for Registered Nurses (NCLEX-RN). Other examples include: architecture, teaching, nursing, social work, law, accounting, pharmacy, engineering, and medicine.

Students who pass licensure exams have been determined to have successfully obtained the knowledge, skills, and abilities to practice in their field. Moreover, universities can benchmark their percent of success on licensure exams with their peer institutions. This measure can be reviewed annually to ensure the university efforts are impacting the students' success rates on these types of exams.

Economic Domain

Economic measures of value added are related to the education value-added that the student received. Career advancement and earnings are linked to area of study and academic success. The gains made in the educational domain play out in the economic domain.

The economic domain measures short- and long-term career and labor market outcomes for students with bachelor's degrees. Colleges prepare students to meet workforce requirements and provides a lifetime of economic and employment advantages for students. The value-added of higher education can be quantified by metrics such as gainful employment rates, wage levels, and debt-to-income ratio.

The Federal Higher Education Opportunity Act of 2008 (HEOA) requires that universities receiving federal aid disclose to current and prospective students information on employment and job placement rates for graduates. The HEOA has gone through several iterations over the past few years. However, universities should expect in the near future that they will be required to report such numbers. This will provide the opportunity for some benchmarking of these measures of post-graduate success and the value added of higher education in the economic domain.

Economic impact may also be measured by students who enroll in graduate programs to specialize or subspecialize in their field of study. People with advanced degrees earn two to three times as much over a lifetime as high school graduates, so looking at students who go on to enroll in graduate school is an indicator of future financial benefit.

Employment Rates. One of the most important micro-level economic value-added outcomes for students is employment. Attending a university provides students with opportunities to learn specific content areas and enhance the skills and competencies needed to be successful in obtaining employment. Moreover, universities provide more doors of opportunity for students after graduation; some of these opportunities are the results of students networking and building relationships that benefit them later. Examining employment rates and whether (or not) field of study is translating into a career within a related industry can help demonstrate economic value-added at the individual level.

The UT System has recently entered into a partnership with the Texas Workforce Commission (TWC). Using TWC's state employment and wage data, UT System will be able to identify the percent of students who are employed within Texas and outside of Texas. The data for graduates working out of Texas will be provided using WRIS 2 (Wage Record Interchange System), a voluntary data sharing agreement among states (currently limited to 24 states based on data restrictions). Using this system, TWC will be able to obtain wage data in aggregate form for individuals living in Texas (to attend school) but are now living and employed in another state. A similar data sharing agreement (the original WRIS) is strictly for sharing wage records for state and federal reporting for programs funded by the U.S. Department of Labor.

For those graduates who are employed within Texas, we will also be able to link degree field to industry of employment. Even with limitations, these data should provide evidence on whether students are learning the skills they need to obtain employment.

Wage. Related to employment, a student's post-graduation earnings is another critical measure of the value of higher education. Carnevale, Rose, and Cheah (2011) conducted a wage analysis study and determined that at each educational milestone (high school diploma, bachelor's degree, master's degree, and Ph.D.) there is an increase in expected lifetime earnings.

There are two different approaches to measuring the economic value-added based on wage: 1) use descriptive statistics to examine the first five years of wage data for a graduating cohort or 2) use linear regression to determine the marginal effects for each predictor variable associated with wage. The UT System will be using both of these approaches.

In addition to employment rates and industry, UT System will be using descriptive statistics to examine Texas Workforce Commission wage data for cohorts of post-graduates. This examination will focus on the first five years of employment because it is more likely that success in the first five years of an individual's career could be attributed to the education they received rather than work experience.

Performing a linear regression on the combined student and TWC data will allow analysts to determine the wage differentials that exist when taking into account predictor variables such as gender, degree level, degree major, occupation type, years of experience, UT System institution, graduating cohort year, and time to degree. For example, we will begin to quantify wage differences that exist between students who receive a degree in English versus a degree in chemistry.

Ratio of Debt to Potential Lifetime Earnings. Given the focus on the costs of higher education, a potential direct value-added measurement is students' debt-to-earnings ratio. This measure would examine the ratio between the total debt a student takes out to pay for college and the estimated lifetime earnings of that student after graduation. (This excludes parental payments and loans.)

To capture the ratio, analysts must first account for the total debt a student incurred during her academic career. The lifetime earnings can be estimated by using current wage data and forecasting total earnings over a career of 30 years with an annual increase in salary of 2.5 percent. (Keep in mind that the estimate would not take into account breaks in service or career changes.) Once all data are accounted for the ratio can be calculated. For example, if a student's estimated lifetime earnings was $1 million (the average for people with a bachelor's degree) and she graduated with $20,000 in student debt, the ratio would be $50 dollars of earnings for every $1 of debt incurred by the student.

To help students minimize costs and reduce time to degree, UT institutions are working hard to find a tool to provide a similar portrait of an individual student's debt to earnings ratio that dynamically reflects decisions such as major changes or increased loan amounts. However, at the aggregate level, median earnings could be reported by debt level. Ratios could be calculated at the university, college, and degree major levels.

Graduate Education. Some students decide to delay their employment opportunities and attend graduate or professional school. And the research shows that this decision can pay dividends financially: individuals with advanced degrees can earn two to three times more than high school graduates. There are three sources of data following students into graduate or professional school.

1. Institutional data. For students who attend graduate school at the same institution—or within the system of institutions—those students can be tracked from undergraduate and on to graduate school.
2. Voluntary System of Accountability (VSA). Universities that submit information to this national system provide student responses to survey questions that include their future educational aspirations. This data could be used as an indirect measure to account for continuing education rates.
3. National Student Clearinghouse (NSC). Perhaps the best source of data that would be a direct measure of students who continued their education is the National Student Clearinghouse which maintains enrollment and degree activities for 94% of all colleges and universities in the United States.

UT System will be using institutional data and data from NSC to follow graduating students from UT institutions to determine if they are attending graduate or professional school at a UT System campus or elsewhere. The percent of students continuing on to graduate or professional school can be used as a direct value-added measure of the contributions of higher education to the success of UT System students. It is also an indirect indicator of likely future success. The NSC education data combined with the TWC employment data should provide a robust picture of post-graduation outcomes for students.

Social Domain

Changes in students' social domain include attitudes and values, principled moral reasoning and civic involvement. Attending college moves students toward a heightened awareness of social justices and increases civic participation. It is well documented that educational attainment promotes community and civic involvement.

Volunteer Hours. Higher education adds value to a student's perspective on civic and community involvement (Pascarella & Terenzini, 2005). One way to

measure civic engagement is through accounting for the hours that students volunteer for organizations and services within the state of Texas and across the world.

These hours can be indirectly measured through the National Survey of Student Engagement (NSSE) and Student Experiences at Research Universities (SERU) surveys. All UT campuses complete the NSSE survey except UT Austin. UT Austin participates in the SERU survey. Both surveys ask students whether or not they participate in volunteer work and number of hours respondents spent doing community service or volunteer work.

Another indirect measure to determine civic engagement is to account for the number of service-based organizations within UT System campuses that perform in service-based activities. When looking at all UT campuses, there are thousands of students participating in thousands of these service organizations.

Service-Based Academic Courses. Universities across the country provide students the opportunity to enroll in service-based academic courses. Service-based courses emphasize a mixture of theory (core civic engagement methods and concepts) and hands-on training in the field. For example, students might be expected to attend lectures and perform 25 hours of service outside the classroom setting.

UT System campuses offer a number of service-based courses each year. A direct measure of social value-added is to identify the number of these courses and the number of students who enroll in them on an annual basis. An indirect measure for capturing data on civic engagement might be to survey the faculty of these courses to determine the level of impact the courses have on the surrounding communities (volunteer hours, activities performed).

Civic Engagement Competencies. The impacts of volunteerism on student development are well documented in the literature (Astin & Sax, 1998; Vogelgesang & Astin, 2000). Students who participate in service learning gain a heightened sense of personal efficacy, personal identity, spiritual growth and moral development (Astin & Sax, 1998). The SERU survey asks students to self-reflect and rate their civic engagement competencies (Appreciate Diversity, Social Responsibility, Self-awareness and Understanding) when they first started college and their current rating. The

increase in competencies provides an indirect measure for higher education social value from students' perspectives.

Giving Back to the Community. Various studies indicated that educational attainment in general, and a bachelor's degree in particular, appear to promote significantly higher levels of community and civic involvement even after graduation (Pascarella & Terenzini, 2005; Bureau of Labor Statistics, 2012). An outcome associated with social value of higher education is the number of alumni that either lead/create service-based organizations or participate (time and or money) in service-based organizations. The number of organizations, number of volunteer hours, and pledges could be measured by surveying UT alumni and asking them about their community involvement.

Research Domain

Another impact of college on students can be expressed in terms of research experiences of undergraduate students. Students exposed to research during their undergraduate education have more interaction with faculty and more involvement in their own learning; they learn to apply theory and skills in solving real problems. It has been also correlated with increased rates of persistence, graduation, graduate school enrollment, and higher degree aspirations. Engaging students in research can be made possible through research funding acquired by faculty from all available sources.

Graduate Student Resources. An institution's research value to students can be directly measured using the monies brought in by research grants. Institutions could measure the number of graduate students who receive graduate research assistantships, which assist not only in recruiting the most competitive graduate students but also provides graduate students with the hands-on experiences they need in order to be competitive in the job market. Additionally, research grant dollars provide the funds needed to create ideal working environments (state-of-the-art labs, computer equipment, and travel monies) for graduate students to enhance their research experiences.

Undergraduate Research Initiatives. Research has indicated that undergraduate students who participate in university research are more likely to obtain degrees than their peers (Carroll, 2005). The NSSE and SERU surveys provide the opportunity for students to report whether they participate in university research. Using this direct measure, UT System

could examine how undergraduate research initiatives are influencing undergraduate student success.

Thus far, this paper has explored a number of ways to measure the very real impact that higher education has on its graduates. From higher wages to lower unemployment, from gains in knowledge and skills to an increased participation in the community, college graduates gain real value from their education. Equally as important, however, is how these individual returns role up and even multiply into an even larger societal gain. Universities must highlight these advantages through metrics as much as possible. University administrators must be able to demystify the "ivory tower." It is critical to create value-added metrics that resonate with communities and society.

Measuring the Impact of Higher Education on Society

In addition to gains to the individual student, postsecondary education provides benefit to our larger society in the same domains: educational, economic, social and research. Universities "render service to the public that produces economic, technical, social, cultural, and educational benefits through interactions with individuals and with local, state, national, and international organizations and communities."[1]

Society benefits at the macro level from the educational resources provided by postsecondary institutions. Economic gains include increased tax revenues, job growth in high-wage fields, improved employee productivity. These increases are compounded by lower health care costs and less need for government support programs and prisons. College graduates have a more knowledgeable participation in a democratic society, help students develop student understanding of complex society and social issues, and provide access to influential social networks (social capital). Society benefits from the research conducted at universities, from life-changing and life-saving technologies, from increased understanding of our bodies and our world to new insights into subatomic particles and the origins of the universe.

Educational Domain

Universities can provide a wide range of educational opportunities that are outside the classroom for individuals within our communities and society. These opportunities include free online classes, inexpensive informal classes, and arts and culture resources. And the ongoing study that occurs at universities enlarges the knowledge and understanding of topics ranging from art history to zoology.

> **Information Sharing Opportunities.** Institutions contribute to the education of the larger community by offering of free online courses. These courses are free and open to anyone with access to a computer, anywhere in the world. For example, UT System has joined Harvard, UC Berkeley, and MIT in offering free online education to anyone willing to participate through edX (www.edx.org). Starting in fall 2013, UT Austin will provide four online courses. The number of enrollees who participate and complete the online courses is an indirect measure of value added in this emerging arena.
>
> **Providing Educational Resources to the Public.** Most universities have numerous libraries and museums that are open to the public as an

[1] From the mission statement of The University of Texas System

educational resource, often free of charge. Tracking usage by those outside the university community would provide an indirect measure of the impact of these educational resources in the general public.

Most universities also sponsor public events that encourage learning or education in general, or specific subjects. One example of this kind of event is "Introduce A Girl to Engineering Day" held every February. This is a national event. At UT Austin, more than 1,800 young girls visit the campus and participate in activities. Activities like this, taking place on campuses across the nation, are integral to engaging the public in the educational domain.

Adding to the Academic Discourse. Related to the value added in the research domain, but not restricted to it, is the value universities contribute to society's larger educational domain through faculty and graduate students who add to the information and knowledge on a vast array of topics. Through books and publications of all kinds, university faculty expand our world and what we know and understand about it. Measuring the growth of knowledge is impossible, but by measuring the publications produced by faculty, within fields, we may indirectly measure an institution's value in this domain.

UT System has begun to use a third-party service, Academic Analytics, to collect information on the number of books and journal publications UT System faculty have produced for scholarly and public dissemination. Academic Analytics collects data on more than 270,000 faculty members from more than 385 universities in the U.S. and abroad, which allows for institutional views and national and peer comparisons. The data include, among other things, a count of faculty publications and citations to published journal articles. UT System will use these data to highlight faculty's contributions to society's knowledge base.

Whether it's through the relatively new free online courses (MOOCs) available to anyone, or through low-priced informal classes often taught by university faculty, or through libraries and museums that house special primary source material and resources not available elsewhere, universities add value to society in the educational domain. And the knowledge that is generated, that is added to the collective store of information and understanding, that is one of the primary drivers of the massive economic impact that higher education brings.

Economic Domain

It is fairly easy to demonstrate that education pays at the individual level. Higher education brings higher earnings and lower unemployment rates. It can be more

difficult to show—though not difficult to prove—how that impact is felt on the larger macro-level. How does individual success drive economic value for everyone?

Because college graduates earn more and are less likely to be unemployed, they are less likely to need the assistance of government programs for income support. In fact, those higher wages yield more tax revenues. College graduates are more likely to have jobs that provide health insurance and to lead healthier lifestyles; this means a great deal of savings on expensive programs like Medicaid and a reduction in medical costs overall. College graduates are less likely to spend time in prison and areas with a more educated population have less crime. Again, this represents a significant societal savings associated with the costs of incarceration and law enforcement.

Many of the quantifiable measures of this kind of economic impact are explored using national datasets from the U.S. Census and related surveys or from the U.S. Depart of Labor. They explore the macro effect of higher education rather than the effect of a specific institution. There are, however, ways to look at an institution's economic impact at the macro level. The metrics this paper will explore include student loan default rates, workforce need and degree production, and analysis of wages and state appropriations.

Loan Default Rates. One of the main reasons the United States government provides educational loans to students is to invest in the future success of both individual students and the United States as a whole (Duncan, 2010; U.S. Department of Education). The Consumer Financial Protection Bureau (2013) indicated that student loan debt has reached one trillion dollars. This number is at historic levels and surpasses both mortgage debt and automobile debt in the U.S. This is an indication both of the increasing number of students participating in postsecondary education and of the rising cost of that participation.

Institutional success in graduating students who become gainfully employed is critical to the individual's economic status but also to the economic wellbeing of states and the country as a whole. The student loan default rate has an impact on the nation's economic strength. Defaulting on loans can have a huge impact on not only students but also can have an impact on communities and society (American Student Assistance, 2013).

The U.S. Department of Education's Office of Student Financial Aid has a database of information on student loan default rates.[2] Examining the student loan default rate by institution could provide an indirect measure of an institution's success in providing graduates with the skills and tools to gain post-graduate employment that allows the student to meet his or her financial obligations. Because there is national data available by school, comparisons to peers and state and national trends can add context. For example, the FY2009 national three-year default rate was calculated at 13.4 percent. For UT Austin it was 4.7 percent. Certainly this is an indirect measure of UT Austin's value added in both the educational and economic domains.

Workforce Needs. Are the degrees students are leaving with from universities overlapping with the current workforce needs? A goal for any university is to provide students with the skills that will set them up for success in the workforce. Examining the gap that exists between workforce needs and degree production is a macro-level measure of higher education's economic value added. The value-added measure is the gap percentage that exists between workforce need and degree production. Where possible, this should be evaluated at the local, regional, state, and national levels, since graduates may need or want to relocate. This question of workforce need should be considered when allocating resources to degree programs.

Diagram 1. Closing the Gap between Workforce Need and Degree Production

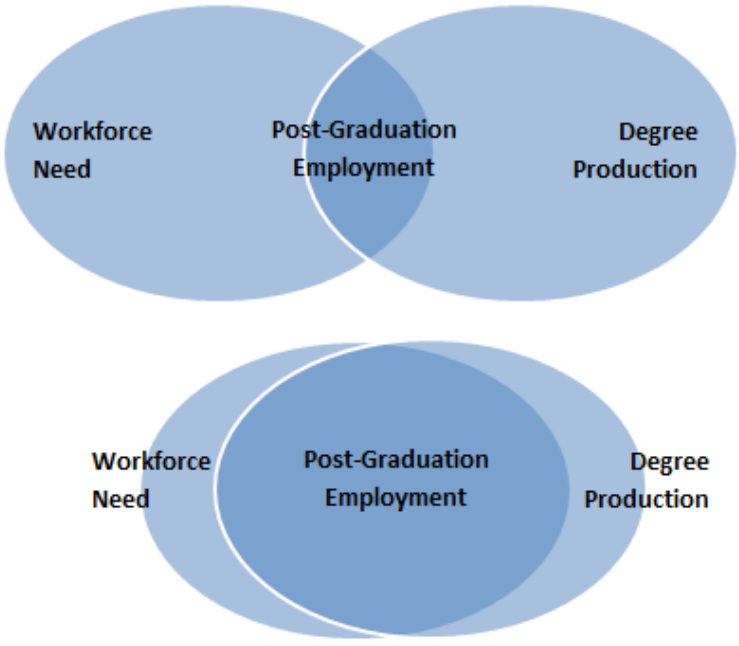

Diagram 1 illustrates the relationship between workforce need, degree production, and

[2] http://www2.ed.gov/offices/OSFAP/defaultmanagement/cdr.html

post-graduate employment. Using Texas Workforce Commission current and future forecasts on workforce demand, post-graduate student employment information, and degree production, UT System will measure the workforce gaps that exist, and develop strategic, long-term solutions to address these shortages.

The First Five Years. One approach to examine the economic impact of higher education is to account for the total short-term state wages produced by the students who received an undergraduate degree. Short-term wages are defined as the first five years of wages earned by students after graduation. Total wages can highlight how degree recipients have become gainfully employed and productive residents thus adding to the pool of revenue that fuels the local, state, and national economy.

The UT System will be following this approach using Texas Workforce Commission wage data to determine the actual amount of wages resulting from an undergraduate graduating class.

Table 1 is an example of what administrators might report on an annual basis (all wage numbers presented in the table are fictitious). In this example, the number of undergraduate students who received a degree in the 2002-03 was 12,377. In five years, those graduates who remained in the state had earned almost $2.5 billion.

Table 2. Example of Wages Earned by Degree Recipients in First Five Years After Graduation

Year of Graduation	Number of Students Graduating	5-Year Sum of Wages (Texas)
2002-03	12,377	$2,475,400,000
2003-04	13,064	$2,612,800,000
2004-05	13,032	$2,606,400,000
2005-06	13,149	$2,629,800,000
Total	**51,622**	**$10,324,400,000**

Total short-term wages can be calculated for the other graduating cohorts, and those can be aggregated. These earnings not only impact the quality of life for those graduating students but also help create a healthy Texas economy. To add further context, this information should be compared to the earnings data for those students who attended university but did not graduate. It would also be interesting to explore the short-term wages for

those in the same graduating high school class, though this would require coordination with state K-12 agencies (the Texas Education Agency in Texas).

State Appropriations to State Wage Cost-Return Analysis. State appropriations provide funding to universities based on a series of calculations on the number of full time student equivalents (FTE) at universities. These monies are critical to the success of campuses. A direct measure to capture the higher education economic value added to society is a cost-return analysis. A cost-return analysis takes into account the funding given to universities by the state and students' wages after graduation. (It is also of some interest to explore this in the context of lost revenues for those students who graduated but did not remain in the state and those who attended but did not graduate). Tables 3, 4, and 5 provide an example of the data needed to conduct a cost-return analysis.

In the example, administrators are interested in the amount monies the state invested in students who graduated with an undergraduate degree in 2006 and the amount of wages in the first five years of employment that were produced from the investment.

In order to conduct this sample analysis, analysts will need to

- Identify students who graduated in 2006 with an undergraduate degree.
- Take into account the number of years it took for students to graduate. The analysis will exclude students who took more than six years to graduate.
- Calculate the average amount of state appropriations per year per FTE for 2001 through 2006.
- Calculate the total based on the number of years a student is enrolled.
- This is captured in Table 3.

Table 3. Cost-Return Analysis Data:
State Appropriations *(Example Data, Not Actual)*

2006 Graduates	State Appropriations (2011 inflation adjusted)						
	2001	2002	2003	2004	2005	2006	Total
Student 1	$5,432	$5,145	$5,092	$4,987	$4,856	$4,732	**$30,244**
Student 2			$5,092	$4,987	$4,856	$4,732	**$19,667**
Student 3		$5,145	$5,092	$4,987	$4,856	$4,732	**$24,812**

Using Texas Workforce Commission wage data, the earnings for 2006 baccalaureate graduates will be captured for each year from 2007 to 2011 and then summed to capture the first five years of earnings. All wages should be adjusted for inflation. In addition, the median earnings for high school students who graduated in 2006 will be included. This data is captured in Table 4.

Table 4. Cost-Return Analysis Data:
Earnings *(Example Data, Not Actual)*

2006 Graduates	Texas Wages (2011 inflation adjusted)					
	2007	2008	2009	2010	2011	Total
Student 1	$32,000	$32,000	$33,000	$33,000	$38,000	**$168,000**
Student 2	$52,000	$53,000	$55,000	$57,000	$58,000	**$275,000**
Student 3	$42,000	$45,000	$45,000	$46,000	$46,000	**$224,000**
Median Texas 2006 High School Graduate	$28,000	$29,000	$31,000	$31,000	$31,000	**$150,000**

Using the data in Tables 3 and 4, you can calculate the wage premium of graduates with a baccalaureate degree versus a high school graduate working the same years. To do this, you subtract the total for the high school graduate from the student total. This is the wage premium. To calculate the rate of return, you divide the wage premium by the total state appropriations. Summing the state appropriations and wage premiums for the graduating cohort, provides an aggregated rate of return that can be used to demonstrate value added to the state in the economic domain. In this example data, the overall rate of return within the first five years after graduation for the state dollars invested in these graduates is $2.90 in wage premium for every $1 in appropriations. This step is seen in Table 5.

Table 5. Cost-Return Analysis Data:
Dollars In vs. Dollars Out *(Example Data, Not Actual)*

2006 Graduates	5-Year Earnings of Baccalaureates (In Texas) Minus 5-Year Earnings of HS Graduate		Wage Premium	State Appropriations Totals	Rate of Return (WP/SA)
Student 1	$168,000 - $150,000	=	$18,000	$30,244	.595
Student 2	$275,000 - $150,000	=	$125,000	$19,667	6.356
Student 3	$224,000 - $150,000	=	$74,000	$24,812	2.982
Total			**$217,000**	**$74,723**	**2.904**

Employer Satisfaction. Employer satisfaction with graduates would provide an indirect economic value-added measure of higher education at the macro level. Surveying employers systematically about satisfaction levels with new

graduates they have hired would provide a potential wealth of information on how institutions are meeting the needs of employers and how they can do better. In Texas, UT System plans to work with the Texas Workforce Commission to develop and distribute such a survey on a regular basis.

In addition to producing an educated workforce, universities themselves contribute directly to the economy of the cities, regions, and states where they are located. Even small universities employ hundreds of people, with larger research universities and health institutions employing ten or fifteen thousand people. These employees live and spend their money in the community, supporting and fueling their local economy.

Social Domain

Higher education provides a broad range of benefits to society within the social domain. Research has tied higher education to a better standard of living, a healthier population, a lower crime rate, a more engaged and charitable population, and increased access to art, culture, and entertainment. The list goes on. Much of the impact in this can be complicated to measure or too abstract to quantify. For the purposes of this paper, we are exploring the social domain from the impact on an institution's immediate community.

The community around a university benefits from that institution's civic and community involvement. To improve quality of life, many universities create a specific division and allocate resources to focus on community engagement and community service. For example, universities participate in several service-based activities in the arts, health wellness, youth outreach, and environment.

Arts and Culture. There are several ways that universities add value to the arts and culture of their communities. University-based organizations promote the arts and culture through presentations, performances, and exhibitions. One main goal of these efforts is to increases individuals' awareness of different cultures. A direct measure highlighting this effort is to track the number of activities performed and, where possible, the number of attendees.

Health and Wellness. Individuals in society are facing many different types of health and wellness challenges. Many campuses have wellness centers that assist families in need of medical or mental health care. They provide healthy living classes and resources to improve their community's health and wellness. Administrators could track the number of individuals they assist and the number of service hours provided to individuals.

Youth Outreach. The future success of young children in education is a critical component to the success of higher education. Knowing this, campuses have allocated resources to reaching out to the communities to increase awareness for parents and children of the importance of education. There are a number of summer camps and informational P-12 education sessions on enhance students' perception of science, engineering, technology, and mathematics careers. Administrators must track the number of events that take place and number of students impacted by these activities. It would be interesting to explore the possibility of later follow-up with students to see what higher education outcomes were for these early intervention programs.

Environmental Impact. There are a number of university centers and organizations that work to increase awareness of environment issues and sustainability. A direct measure for value from higher education is to account for the number of activities taking place and the number of people that are contacted. It would also be interesting to explore if there are measurable changes within a community as far as recycling, public transportation, and other initiatives that might be tied to university activity.

Finally, universities themselves are often models for sustainability. This is an area associated with significant costs and cost savings. Whether it's alternative energy sources, LEED buildings, recycling, or just reduced energy consumption, there are a number of areas where universities could be measured and their environmental impact (or lack of) assessed.

Research Domain

In addition to teaching, faculty at universities engage in high-quality, innovative research. Research universities do more basic research and development than any other segment. This research generates the ideas, theories, and principles that are the foundation and drivers for applied research. And, across the country, universities have recently focused on commercializing more of that research—moving it from "bench to bedside."

From discovering scientific principles that permitted the computer revolution; to inventing new technologies that improve productivity; to developing medical procedures that save lives, shorten hospital stays, and reduce costs; to creating jobs and generating revenue, research is a critical part of the higher education mission and an area of tremendous value added to society.

Research Expenditures. The National Institute of General Medical Studies (part of the National Institutes of Health) says that "every dollar spent on

basic research yields returns ranging from $10 to more than $80."[3] Therefore, simply examining the research expenditures of universities provides a measure of impact. There is extensive data on research at the institutional and even grant level available from national sources (NSF, iPEDS, NIH). This makes peer comparisons and comparisons to state and national benchmarks easier.

Commercialization. In the past decade there is a great deal of interest in and focus on expanding and accelerating the process of turning basic research into practice or technology. One example of these efforts would be the Translational Science Ph.D. programs that came out of the NIH's initiative to accelerate research and development. Aside from the outcomes of these specific programs, the commercialization data available from AUTM (Association of University Technology Managers) and similar sources would provide useful measures of research outcomes. From number of patents to gross revenue from intellectual property, metrics related to commercialization demonstrate the value added of university research.

Job Creators. Institutions with valuable intellectual property may partner with entrepreneurs to create a start-up company. These startups are economic engines that create jobs and drive innovation. AUTM data includes the number of start-up companies formed by institutions. However, it does not include detailed information on the impact of those companies. Each year, the UT System campuses send out a Research, Technology, and Business Survey to their associated start-up companies. This survey can provide the opportunity for administrators to measure the number of jobs and revenue generated, in addition to information about patents and inventions.

For organizational purposes, this paper has structured this discussion of higher education's impact within the four domains. However, these domains are not silos; there is overlap in the impact on domains. For instance, value added in the research domain often advances knowledge (educational), leads to job creation and/or improved efficiency (economic), and saves lives (social)—though this can be a long-term process. This is only one example; there are many others that reach across one domain and have significant impact in others.

[3] http://www.nigms.nih.gov/NR/rdonlyres/8E46AC58-0B4B-486E-889A-7685CB3E45CD/0/curiosity.pdf

The structure of the micro (individual) and macro (societal) level measures is similarly limited. The reality is that almost every individual level benefit can be rolled up to a larger societal benefit. Higher salaries (individual) mean more tax revenues (societal). Better jobs come with health insurance (individual) which means a healthier population and lower healthcare costs (societal). However, the distinction is critical to framing the message correctly for different audiences.

The benefits of higher education to society are large in scope, and the breadth of that impact can be both difficult to measure and to communicate. But it is more important than ever that we make the effort to measure that which can be measured and to explain why higher education is a public good as well as an individual benefit. In fact, that public value expands as the number of graduates increases.

After Data Collection

This paper has outlined a number of metrics that can be used to demonstrate the value added of higher education both for the individual (micro level) and society (macro level). But it is not enough that these things be weighed and measured. The data must be analyzed, the patterns found, the connections made. And, then, the information must drive change where it is needed and communication where there are messages to share.

Collecting all of this data, analyzing it and synthesizing it, is time consuming and hard work. It cannot be simply for reporting purposes. The data should inform policy- and decision-making within higher education, but also within those realms that impact higher education such as government and industry. And the results—and plans for moving forward from those results—must be shared with stakeholders.

Suggestions for Communication Strategies

Communicating complex information to multiple groups requires a careful, strategic approach. Metrics should be relatively easy to interpret so that numbers are not taken out of context or misunderstood. They should tell a meaningful and truthful story that can be targeted to particular audiences.

The first step to effectively communicating about the value added of higher education is to make sure the information is available, transparent, and comprehendible. An online dashboard would make the data publicly available, easy to find, and interactive, providing current year overviews and detailed trend analysis.

The University of Texas System's Productivity Dashboard (data.utsystem.edu) is a good example of an online, interactive data portal that allow the user to drill in to the fine detail or even build a graph or table that answers the questions they have. It provides increased transparency and accountability on students, faculty, research and tech transfer, and finance and productivity. Data are easy to access and interpret. The dashboard is a powerful tool that has up-to-date data on how universities are adding value to students and society.

Many of the metrics that were discussed above—and many others—are already available on UT System's dashboard. The system's recent partnership with the Texas Workforce Commission will provide a source for additional measures and analysis. UT System will be exploring the development of a value-added section that will pull these various measures together to tell the whole story. It is, however, a complex story, and efforts will need to be made to ensure that the information is not overwhelming.

An effective method of distilling a lot of information into meaningful bites is through interactive story card dashboards. Interactive story card dashboards are very similar a series of PowerPoint slides in a presentation where each slide provides context and meaning when describing a metric. Each segment of the storyline would build on the previous segment until the user is provided with a complete description of the value-added metric.

The interactive story card can be designed for specific users in mind. Parents and students can be provided information on admissions data, cost of attendance, and post-graduation debt. University administrators and legislative officials might focus instead on retention and graduation rates, state appropriations to State wage cost-return, and loan default rates. Business leaders might look at information about degree production in major fields. UT System will be investigating how to use existing tools to add story card dashboards on special topics such as value added to the Productivity Dashboard.

Conclusion

Higher education stakeholders (current and perspective students, parents, alumni, business leaders, and legislative officials) are being inundated with messages focusing on the accessibility, cost, and quality of higher education. For example, newspaper articles are written daily questioning the value of higher education and describing the difficulty some students are having paying for college during and after they graduate.

It is critical that higher education administrators take a proactive stance and use data in a systematic way to craft information that can be easily disseminated in a meaningful way to these stakeholders. To better highlight the value of higher education has for students, as well as for communities and society, this paper has identified various ways that educational, economic, social, and research related outcomes can be measured using both direct and indirect metrics. While anecdotal evidence can be compelling, it is incumbent on us to move beyond one student's story—good or bad—to a data-driven view of what is actually happening to students on campus and after they graduate and join the workforce.

Developing metrics for measuring the value of higher education should be an ongoing activity by all university administrators. But we cannot work just within our institutions or even states. To be most effective in both measuring value-added and in communicating to constituents, these measures must be used across institutions, across states, at a national level. Metrics should be developed that can be applied to all institutions, with common data sources and definitions. Administrators must be able to demonstrate how higher education adds value to students, communities, and society in order to remain relevant to stakeholders.

Appendix A. Value in Higher Education by Domain and Level

Educational Value

Micro Level:
- Improved graduation and retention probability based on campus experiences
- Student learning outcomes associated with a degree plan
- Preparation for licensure exams and professional certifications

Macro Level:
- Continuing education offered at low or no cost
- Otherwise inaccessible library resources, books and publications
- Museums, performing arts programs and cultural events
- Community outreach programs for younger students

Economic Value

Micro Level:
- Improved gainful employment rates and provides access to higher wage careers
- Increased expected lifetime earnings at each level of educational attainment

Macro Level:
- Lowered loan default rates for graduates, providing government revenue
- Occupational demand is met in high-skill industries
- Graduates and students go on to found companies that provide revenue and employment

Social Value

Micro Level:
- Opportunities to learn and participate in civic engagement
- Provides interaction with a diverse student body
- Fosters a sense of social justice and moral development

Macro Level:
- Fulfills societal needs through volunteerism efforts
- Medical schools provide charity care and other outreach programs for the poor both domestically and internationally

Research Value

Micro Level:
- Undergraduate research initiatives increase student engagement and improve graduation success

Macro Level:
- Scientific research and scholarly works add to the collective knowledge base

Appendix B. Value-Added Outcomes

Outcome	Measure Type	Description of Measure
Retention and Graduation	Direct	- 1st year student retention rates
	Direct	- 4, 5, and 6 year graduate rates
	Direct	- Probability estimates for 1st year retention and graduation (4, 5, and 6 years) controlling for prematriculated predictors
Student Learning Outcomes	Indirect	- Competency maps: accumulated number of student learning outcomes associated with courses taken by students
Standardized Exams	Direct	- Collegiate Learning Assessment (CLA) examines students' critical thinking, analytic reasoning, problem solving, and written communication
	Direct	- Percent of students who passed licensure exams
Employment Rates	Direct	- Percent of students who are employed within Texas and outside of Texas (limited to 32 States based on data restrictions)
Wage	Direct	- Students' first five years of wage data post-graduation (TWC data)
	Direct	- Wage differentials that exist when taking into account gender, degree level, degree major, occupation type, years of experience, UT System campus, graduating cohort year, and graduated in four, five, and six years (TWC data)
Ratio of Debt to Potential Lifetime Earnings	Direct	- Ratio: Total student debt (excluding parental education loans) by lifetime potential earnings (TWC data)
Graduate Education	Direct	- Percent of students continuing on to graduate or professional school among the UT System campuses by graduating undergraduate cohorts (Institutional data)
	Indirect	- Percent of students continuing on to graduate or professional school by graduating undergraduate cohorts (VSA data)
	Direct	- Percent of students continuing on to graduate or professional school by graduating undergraduate cohorts (NSC data)
Volunteer Hours	Indirect	- Number of hours students volunteer (NSSE and SERU surveys)
		- Number students and number of organizations participating in
	Indirect	service-based activities
Service-based Academic Courses	Direct	- Number of service-based courses offered and number of students who enroll in service-based courses
	Indirect	- Number of volunteer hours and activities performed within the service-based course
Civic Engagement Competencies	Indirect	- Percent increase of competency rating when comparing Freshmen to Seniors (appreciate diversity, social responsibility, self-awareness and understanding) (SERU)
Give Back to the Community	Indirect	- Number of alumni that either lead/create service-based organizations or number of hours participating in service-based organizations
	Direct	- Amount of alumni donations and number of hours alumni participate in alma mater activities (Alumni Association)
Graduate Student Resources	Direct	- Number of graduate students who receive graduate research assistantships
	Direct	- Number of labs and computer equipment purchased using research dollars
Undergraduate Research Initiatives	Direct	- Number of undergraduate students who participate in research activities

Providing Educational Resources to the Public	Direct	- -	Number of libraries and museums open to the public Number of university-sponsored public events
Adding to the Academic Discourse	Indirect Direct	- -	Inventory of research findings from the UT System campuses that have had an impact on society Number of books and publications by faculty within UT System campuses
Loan Default Rates	Direct	-	Percent of students who default on their student loans (VSA)
Workforce Needs	Direct	-	Gap percentage that exists between workforce need and degree production (TWC data)
The First Five Years	Direct	-	Sum of 5-year wages for graduating cohorts who reside in Texas
State Appropriations to State Wage Cost-Return Analysis	Direct	-	Total State appropriations results in the total Texas wages earned for a specific graduating cohort