

INNOVATION IN LOUISIANA

Maximizing Investment in
University Research to Promote
a Knowledge-Based Economy



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This report is dedicated to the memory of

Ben R. Miller Jr.

A longtime PAR board member, business leader and community champion who inspired this research.

He was never at rest — Ever challenging, questioning and innovating.



Table of Contents

Executive Summary	ii
Introduction.	iv
Chapter One: Innovation — What it is, Why it Matters	1
Universities: The Intellectual Infrastructure for Innovation	3
Measuring Innovation.	5
The Right Stuff	7
Chapter Two: Louisiana’s R&D Status	8
Ranking Louisiana Among The States	8
How Louisiana Universities Compare with Each Other	12
The Louisiana Tech Advantage	16
Chapter Three: Louisiana’s R&D Achievements	19
“Silicon Bayou”: UL Lafayette’s Leap to Big Data	19
Innovation Cluster: Louisiana Tech Prioritizes Cybersecurity	21
LSU Engineering and IBM: Integrating Workforce Solutions and Tech Research	22
Incubators and Venture Capital	24
A New Leadership and Mindset	25
Chapter Four: How Louisiana Minimizes Innovation Resources	28
State Funds for R&D	28
The Support Fund.	29
Thinly Spread Dollars	31
Empty Chairs	34
Low Leverage to Improve Outcomes	35
Louisiana Regulations and the Hourly Rate Obstacle	35
Chapter Five: Recommendations to Meet Louisiana’s Challenge	39
The Governor and the Executive Branch	42
The Louisiana Legislature.	44
The Louisiana Board of Regents	44
The Higher Education Systems and Management Boards	49
The Louisiana Innovation Council	54
Business and Industry	55
Appendix A: The Georgia Research Alliance (GRA) – A Model for Louisiana	56
Appendix B: Other State Models and Georgia Case Studies	60
The Innovation Ecosystem at Georgia Tech	61
The Research Foundation Model at the University of Georgia	64
In-House Expertise at Emory University	65
Endnotes	66



EXECUTIVE SUMMARY

Opportunity is knocking for Louisiana. The state and its metro regions can, and should, join the ranks of other areas across the nation and around the world with diverse economies built on creative human capital and innovation. These are the factors increasingly linked to quality job growth and regional economic prosperity. That kind of success must be nourished by universities with well developed cultures that promote enterprising research and development programs and maintain a strong focus on economic development.

Although the state and its colleges rank poorly on many key innovation metrics, Louisiana is in fact only a few steps off the right path toward becoming a relatively high-performance player in the new competitive world of university R&D. Leaders and innovators across Louisiana have begun to break down old walls and implement forward-thinking strategies to build creative and relevant programs with strong implications for economic development. Fresh leadership in higher-education institutions are attuned to the needs for change. Critical financial resources, even in these difficult budgetary times, are readily available. Now is the time for university, government and business leaders to answer the knock and take Louisiana to the next level.

Now is the time for university, government and business leaders to answer the knock and take Louisiana to the next level.

This report by the Public Affairs Research Council of Louisiana (PAR) makes the case for why innovation matters in Louisiana and focuses on two major elements: the intellectual infrastructure in our universities and the mechanisms for knowledge transfer into the economy. PAR's report offers an independent and statewide analysis; it is both more critical and more optimistic than many studies conducted in the past by the actors themselves or studies restricted to a regional or institutional level.

Chapter One provides a fundamental understanding of the role of innovation in modern economies and the key measurements and terms used to discuss the subject.

Chapter Two takes an in-depth look at the various measurements for state and university R&D performance and the trends leading to a more innovation-driven economy. No single metric can capture the whole story, but what emerges is a clear picture that the state and its schools overall do not stack up well nationally or regionally. This chapter also explains why Louisiana Tech is outperforming other universities in the state on many key measures.

Chapter Three relates the inspiring and underappreciated success stories for building innovation at several Louisiana universities. These examples are used to demonstrate the formulas, cultures and practices that lead to success and that should be emulated.

Chapter Four provides a detailed critique of Louisiana's use of innovation resources, in particular the Board of Regents Support Fund. Louisiana has the capacity to fund additional and more targeted R&D through the constitutionally dedicated Support

Fund, which delivers more than \$23 million annually in dedicated financing. Unfortunately, the funds are dispersed across nine programs and fail to target particular research priorities. This chapter analyzes how this fund is being underutilized based on 30-year-old guidelines that cherish small awards thinly spread to public and private colleges across the state. The opportunity cost is evident: Over the same period and with similar state financial resources, Georgia has developed a national model for a university research support program called the Georgia Research Alliance.

Chapter Five makes 46 specific recommendations for progress and encourages the adoption of new principles and a better culture of innovation. The recommendations are tailored specifically in messages to the governor and executive branch, the Legislature, the Board of Regents, the university systems and business and industry. Each of these sectors of influence has a job to do.

A great deal is asked of our universities these days. They are expected to offer diverse and solid academic environments, degree programs relevant to the Louisiana workplace and world-class research, all with diminishing finances. That is why the recommendations in this report are both important and realistic. Better leveraging of existing research funding is critical. Also, universities and their local economies can benefit by elevating the role of university research foundations to bring ideas to the marketplace.

The boldest step would be to launch a state innovation and jobs catalyst along the lines of the Georgia Research Alliance, which has achieved outstanding results. The Alliance has prompted cultural changes in the university communities and has adapted with the times. Not only does it offer incentive packages to lure researchers and equip labs, it sets a high standard and creates a strong interaction between universities and economic development. *Appendix A* in this report focuses on the Georgia Research Alliance and *Appendix B* reviews other models from around the country as well as lessons from Georgia case studies.

With so many economic, educational and political developments occurring in Louisiana, the subject of innovation policy may seem like a small, niche issue of no real concern to the general public. In fact, it is one of the most critical policy and program areas influencing the future of the state. Louisiana's decisions and direction on innovation policy will determine whether the economy of the state – and its metropolitan areas in particular – will be structured for growth and competition for the rest of the 21st Century.

But first, we have to hear the knock. We have to open the door. And we have to step up and greet the opportunity.



INTRODUCTION

For decades, Louisiana's leaders in business, higher education and economic development have recognized that the world is changing and that we must do more to compete in a global economy. "We are all now part of a global economy where new levels of competition and technology are going to determine the eventual winners and losers in economic development. Louisiana, which has been over-dependent on natural resources and under-dependent on human resources, now faces the difficult challenge of repositioning its economy."¹

That call to action was made by the then-Secretary of the Louisiana Department of Commerce in 1985. At best, limited progress was made in the years that followed to transition Louisiana to a knowledge-driven, 21st-century economy. Louisiana now ranks 46th on the New Economy Index, which measures essential elements to thrive in the global economy such as knowledge jobs (43rd), economic dynamism (35th), and innovation capacity (49th).² To break down this last category further, Louisiana ranks 48th in high-tech jobs, 48th in health information technology, 44th in scientists and engineers, and 44th in patents. Similarly, the state is 44th on the Milken Institute's State Science and Technology Index — consistent with the state's ranking when the study began in 2002.³

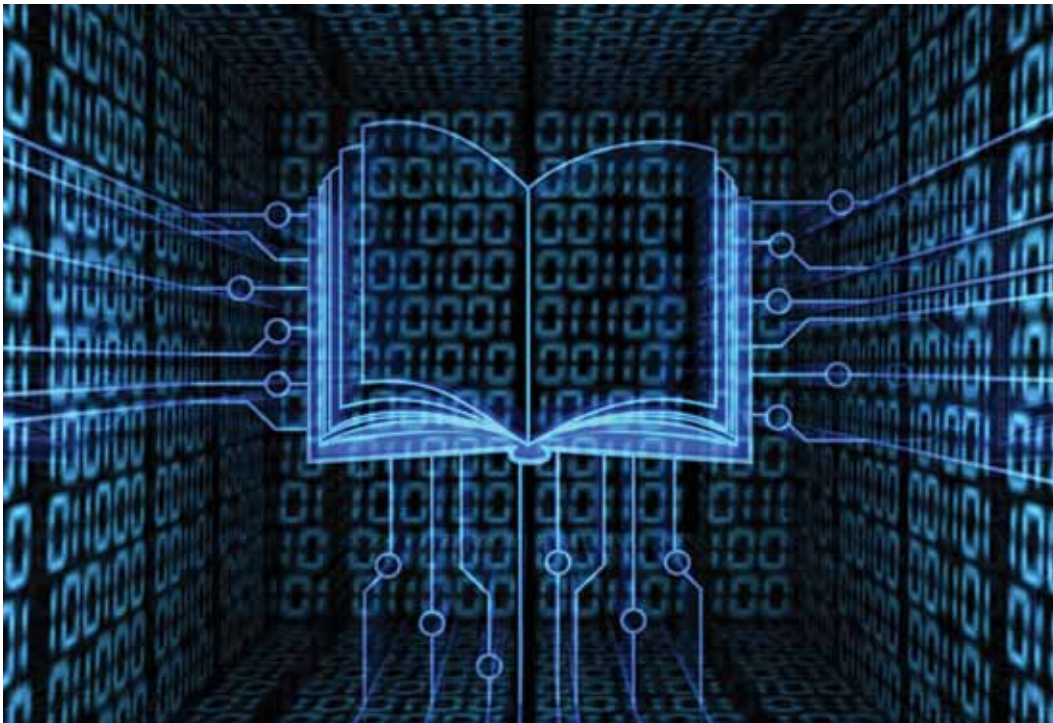
The most recent National Science Foundation comparison ranked Louisiana 40th nationwide in industry R&D. The legal and public policy environment, government resource allocations, and the culture and leadership in the public and private sectors all play a role in Louisiana's performance and outlook for innovation, and there is room for improvement across the board. Research & Development (R&D) expenditures in Louisiana total more than \$1.5 billion annually, ranking the state 35th in the nation.⁴ When compared with Gross Domestic Product in the state, however, Louisiana drops to 48th in the key measure of R&D Intensity.⁵ The most recent National Science Foundation (NSF) comparison ranked Louisiana 40th nationwide in industry R&D. For example, industry in Alabama paid for and performed about twice as much toward R&D⁶ as companies did in Louisiana. Within this investment, much of Louisiana's R&D is still conducted by companies in the oil, gas and chemical industries, the traditional economic backbone of the state.⁷

Nearly half of R&D expenditures in Louisiana are within universities, which is a much larger share of overall R&D than what takes place in universities nationally.⁸ Perhaps as a result of this concentration of research by the public sector, various actors within state government and in the Louisiana business community have analyzed and called attention to the need to improve the innovation economy in Louisiana. Still, until very recently, few pragmatic actions have followed. With notable exceptions in some areas, Louisiana by and large remains under-prepared for a knowledge economy and will be left behind in the years ahead if decades-old policies and mindsets do not adapt to new realities.

This report by the Public Affairs Research Council of Louisiana makes the case for why innovation matters in Louisiana and focuses on two major elements: the intellectual infrastructure in our universities and the mechanisms for knowledge transfer into the

economy. The researchers analyzed public and private R&D activity and trends in the state and reviewed the laws, policies, and resources in place to facilitate innovation. This report highlights pockets of excellence around the state as well as best practices nationally, including the Georgia Research Alliance, long considered a potential model to replicate in Louisiana. Researchers identified areas for improvement. The report concludes with concrete suggestions to the Louisiana Governor and gubernatorial candidates, to the Legislature, to the Board of Regents and institutions of higher education, and to business and industry.

Research for this report was conducted from June 2013 through November 2014. More than 50 subject-matter experts, business leaders, elected officials and administrators were interviewed. The research team visited sites in Baton Rouge, Lafayette, New Orleans, Ruston and Shreveport in Louisiana and traveled to Atlanta and Athens, Georgia. Thousands of pages of documentation and data were reviewed from Louisiana and national sources. We are grateful for the contributions of time, energy and ideas from leaders and experts who exhibited a singular focus and a common trait and goal—moving Louisiana forward through innovation and action.



CHAPTER ONE

Innovation – What it is, Why it Matters

The United States economy has been placing greater emphasis on technology, knowledge, and innovation. Jobs in professional services, educational services, health care and other sectors driven by human capital are claiming a larger share of the U.S. economy.⁹ As summarized by one economist: “Globalization and technological progress have turned physical goods into cheap commodities but have raised the economic return on human capital and innovation. For the first time in history, the factor that is scarce is not physical capital but creativity.”¹⁰ New ideas and new technologies have the capacity to transform the economy of a nation—from the light bulb to the smart phone.

Innovation can encompass particular industry sectors, such as information technology, life sciences or advanced manufacturing. It also can refer to creativity and efficiency in business practices and processes that will improve productivity and competition. According to the U.S. Chamber of Commerce, the economic impact of innovation can account for more than 40 percent of U.S. economic growth and employment.¹¹ Across the country, states and cities are recognizing the need to expand knowledge-driven industry sectors while also encouraging innovation and technological advancements in traditional sectors.

Although difficult to quantify, innovation is most often measured by the expenditures and outcomes of Research & Development. An economy’s long-term growth is linked to “research intensity,” which is the amount of R&D expenditures as a percentage of Gross Domestic Product.¹² “R&D is the key to an innovation treasure chest that contains new ideas, new products, new technologies and new ways of doing business. In advanced economies, it is the tried and true route to prosperity,”¹³ according to Innovation America, a study sponsored by the National Governors Association. More generally speaking, research tends to produce new technologies, which also tend to spur economic development. R&D is frequently recognized as a cornerstone of the U.S. global competitive edge, yet China’s total funding of R&D is projected to exceed that of the United States within 10 years.¹⁴ Last year, China for the first time topped the ranks for filings to protect intellectual property in all four categories: patents, utility models, trademarks and industrial designs.¹⁵

Nearly 2.7 million people across the United States are employed in R&D jobs in the public and private sectors, and an additional 6 million jobs support them.¹⁶ In Louisiana, the number of direct intellectual property jobs is estimated at 225,429; these are individuals working for

CHART 1

Characteristics of the World Economy Today

Southern Growth Policies Board



intellectual-property-intensive companies reporting positive R&D expenditures in manufacturing and non-manufacturing sectors, applying registered trademarks to products such as consumer goods, and businesses in copyright-concentrated industries.

SBIR AND STTR

The Small Business Innovation Research (SBIR) program incentivizes American small businesses to engage in R&D to commercialize their work; nearly \$2 billion was awarded in 2013. Through the Small Business Technology Transfer (STTR) program, the federal government fosters innovation through cooperative R&D between universities and small businesses; roughly \$200 million was awarded in 2013. Federal agencies with extramural R&D budgets of more than \$1 billion, such as the Department of Defense, are required to reserve 0.3% of that budget for STTR awards to small businesses that in turn must establish intellectual property agreements with the research institution to ensure commercialization. To boost SBIRs in the state and leverage federal research dollars, Louisiana created a research tax incentive for SBIRs within the state's Research and Development Tax Credit. The incentive awards a 40 percent cash boost to the cash value of SBIR awards.

Louisiana has received a total of 353 SBIR/STTR awards valued at \$76 million; only 14 of these awards are STTR for just \$3.5 million, which is the third lowest amount of any state. Louisiana ranks 41st in total awards. States with similar demographics such as Kentucky brought in 532 awards for \$156 million. Our neighbor Arkansas brought in 401 awards for a total of \$103 million. In one recent study, the Milken Institute ranked Louisiana at 50th for the average annual number of SBIR awards per capita.

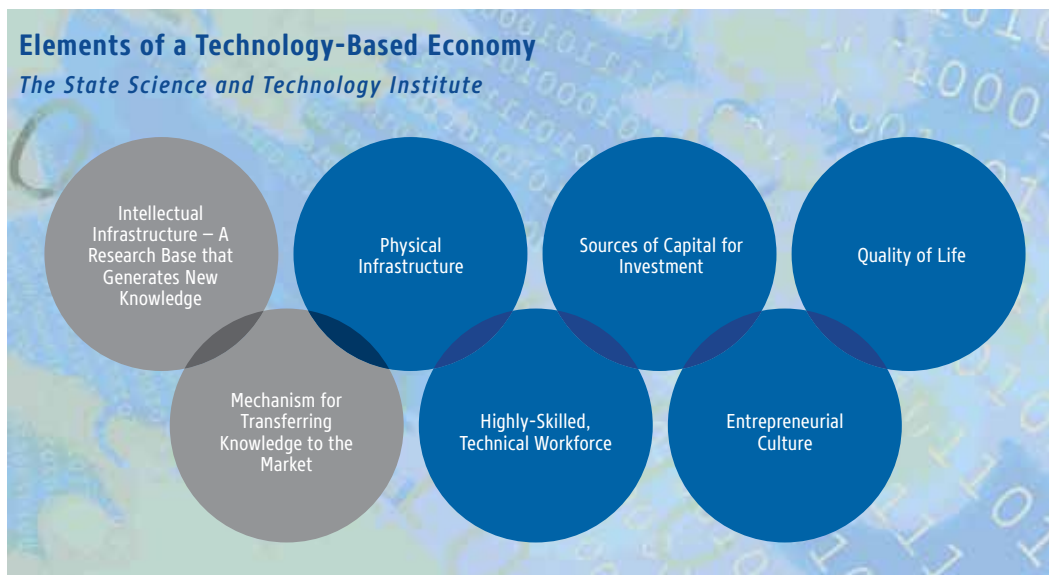
Companies in Louisiana applying intensive uses of intellectual property pay an estimated 41 percent higher wages than other companies.¹⁷ Studies have shown that innovation is a driver of higher per-capita income and leads to a variety of benefits, including the recruitment of new talent for universities and the workforce, entrepreneurial opportunities, new infrastructure and a spillover to higher wages in other job sectors.¹⁸ Economist and innovation expert Enrico Moretti estimates: "The innovation sector generates a disproportionate number of additional local jobs and therefore profoundly shapes the local economy... For each new high-tech job in a metropolitan area, five additional local jobs are created outside of high tech in the long run... These five jobs benefit a diverse set of workers" both professional and non-professional.¹⁹

Despite this fact, as a share of Gross Domestic Product, federal research has declined significantly over the past few decades and has flat-lined in recent years.²⁰ The U.S. government invested \$123 billion in R&D in 2014 through the Department of Defense, National Institutes of Health and the National Science Foundation, among other agencies.²¹ Meanwhile, industry R&D funding is on the rise and was projected to reach more than \$300 billion in 2014, although the focus of privately funded research continues to be specific to products and sectors relevant to each company's focus rather than basic research.²²

States are seizing upon the vision for greater innovation through policy changes and with their own resources. States are spending more on research in an effort to see a return on investment that is tangible and achieves both economic and quality-of-life goals for their citizens. As a result of the decline in federal funding and the targeted nature of industrial funding, state policy and investments in innovation can have more impact than ever before.²³

Targeting these investments in areas with “bang for buck” for the state is the first step. The amount of state-funded R&D remains secondary to how it is spent. “Studies show that it is not the amount of capital, but the effectiveness with which it is used that accounts for as much as 90 percent of the variation in growth of income per worker,” according to The 2014 State New Economy Index.²⁴ Innovation happens in a number of venues — from universities to non-profits to start-up companies and public-private partnerships. Some states are placing a priority on specific economic development sectors and incentivizing university and industry partnerships. This investment is targeted toward making advancements across various elements of the economy. (See Chart 2.)

CHART 2



This report focuses on two of the elements of the growing technology-driven economy in Louisiana: the intellectual infrastructure and the mechanisms for transferring knowledge to the market. In Louisiana, the intellectual infrastructure by and large rests within our universities. Yet moving discoveries and inventions into the market for the greater benefit of the public has been a long-standing challenge for the state.

Universities: The Intellectual Infrastructure for Innovation

Although industry continues to fund and perform the vast majority of R&D in the United States and around the world, universities and colleges conduct more than \$60 billion annually in research.²⁵ As historic epicenters of knowledge and innovation, universities conduct both basic and applied research and are funded by a variety of sources—federal and state governments as well as industry and non-profit entities. In 2012, the federal government funded more than half of U.S. university research in addition to expending \$5 billion for federal research centers at universities.²⁶

The climate for research and innovation has changed in the past 30 years. Historically, industry conducted R&D at large internal labs, developing and protecting knowledge, then only releasing it once considered “complete” or ready for profitable distribution.

More recently, industry and universities have adopted the concept of “open innovation.” There is a growing recognition of the value of widespread disbursement of knowledge, that sharing ideas is good for business and academia—and good for society at large. In lieu of large internal labs, companies increasingly outsource targeted research to fill particular needs by partnering with universities, start-ups and other companies. When a technology is discovered, it is commercialized and companies and researchers can move to the next challenge.²⁷

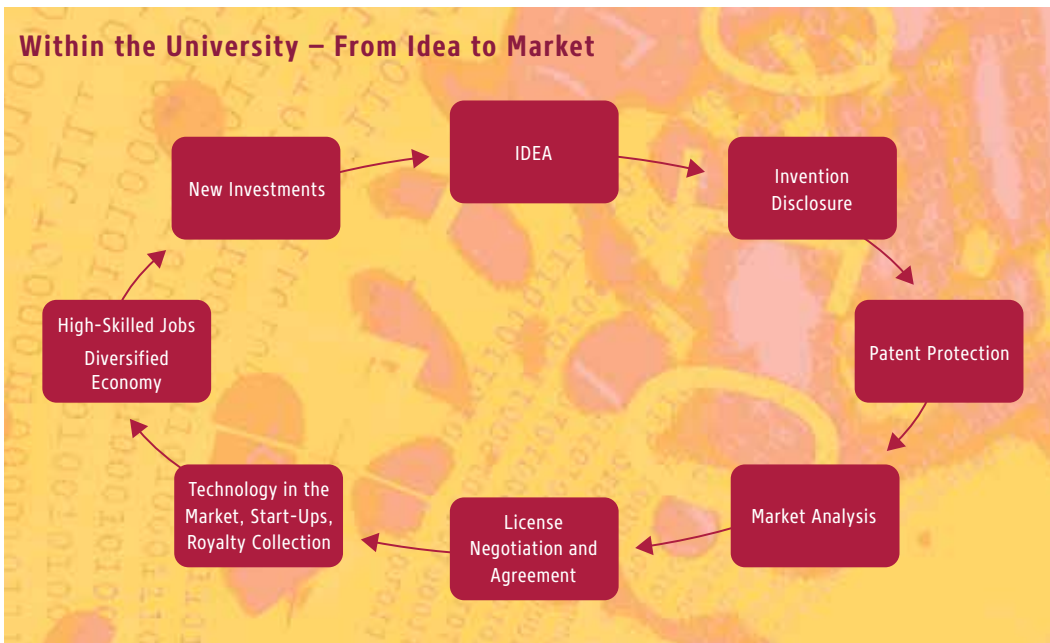
Similarly, many universities across the country no longer act as ivory towers of knowledge. Rather, cutting-edge research is under way in university labs with specialized facilities and subject-matter experts that companies can harness for particular needs. One think tank writes: “The drive to keep research secret is declining in favor of sharing information among multiple players... The ‘upstairs-downstairs’ relationship between the academy and industry is over...The early adopters of a collaborative approach are likely to gain a competitive advantage.”²⁸

TABLE 1

TOP 10 UNIVERSITY PATENT ASSIGNMENTS		
<i>Top 10 University Patent Assignments Represent Coast-to-Coast Investments With The Top Institution Far Out-pacing Others²⁹</i>		
Institution Filing for the Patent	2012 Patents	Total Patents
University of California System	357	7,488
Massachusetts Institute of Technology	216	4,017
Stanford University	182	2,403
California Institute of Technology	136	2,365
University of Texas System	141	2,321
Wisconsin Alumni Research Foundation	155	2,133
Johns Hopkins University	79	1,556
Cornell Research Foundation, Inc.	33	1,323
University of Michigan	97	1,267
Columbia University	78	1,098

A catalyst for greater university involvement in technology transfer was the Bayh-Dole Act of 1980, which provided the opportunity for universities, small businesses and non-profit entities to patent, control and market their federally funded research and inventions. Implicit in the Bayh-Dole Act is a federal mandate that taxpayer-funded innovations be brought to the market.³⁰ The Association of University Technology Managers reports that \$63.7 billion was expended for university sponsored research in fiscal year 2012, which was a 4 percent increase over the prior year. More than 5,000 licenses were executed, 5,100 patents were issued, nearly 600 commercial products were created and more than 700 start-up companies were formed that year as a result of research at U.S. universities.³¹ American universities remain the most prolific international patent filers.³² Of the top 50 higher education institutions seeking international patent protection last year, 27 were based in the United States.³³ (See Table 1 for the top 10 U.S. University patent filers.)

CHART 3



Measuring Innovation

Invention is a lengthy process with numerous points along the innovation continuum at which to gauge success. (See Chart 3.) Patents are merely one measurement in an innovation cycle that is evolving and complex. “There is no evidence that the level of patenting by universities is a measure of their scientific output or productivity... Patenting policy has less to do with real output than with modes of thought on technology transfer and relations between universities and industry more generally,” according to patents scholar Richard Gold.³⁴

This PAR report will focus on metrics at various phases of the innovation cycle to evaluate the status and progress of Louisiana’s higher education institutions. Below are brief descriptions of phases in the innovation cycle as they typically occur at a university.

Idea or concept: The input to innovation is basic or applied research, or even lab work funded by a specific industry for a specific purpose. Pre-requisites include financial resources and talent.

Invention and disclosure: The direct relationship between the volume of research performed and “deal flow,” or how many inventions are created and disclosed to the university by the researcher.³⁵ Federal research requirements mandate that faculty disclose inventions with commercial potential to the university. A nationally accepted benchmark is one disclosure per \$2.5 million of research.³⁶

Technology transfer: Most research universities have in-house technology transfer officers who work with researchers to disclose the invention and ensure that federal, state and university policies are followed. These officers typically assist in product

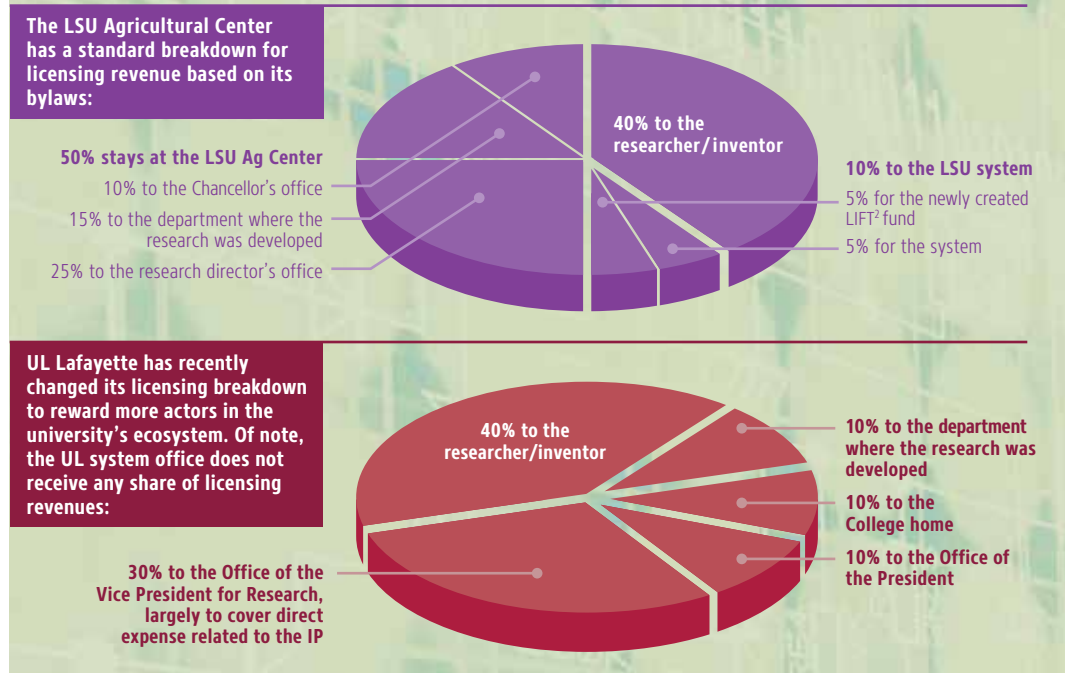
evaluation and market analysis to determine viability, commercial value, potential partners and next steps. The officers will work with faculty to file a patent application and negotiate a license with private industry. University licensing royalties range widely and depend on the technology, although national studies suggest rates typically fall between 2% and 5%.³⁷ Pursuant to federal law, universities typically share income from intellectual property with the inventors, the inventor's department and the university at large after covering expenses such as unreimbursed patent and legal fees.³⁸ (See examples in Chart 4.)

Entrepreneurship and economic impact: Once the technology has entered the market, it holds potential for economic development, job creation and new investment, sometimes taking the form of a start-up company. Federal reports indicate that young businesses create jobs at a disproportionately high level, making up 3% of total U.S. employment but responsible for 20 percent of job creation.³⁹ Because the innovations may be new, experimental or risky – and often without a clear commercial application – additional investment and risk might be required by the licensee.

This is also the phase when the university and inventor may begin to receive royalties, although in most cases the returns for universities are much smaller than is commonly believed. Some universities reportedly receive licensing income that equates to 1 or 2% of the university's research budget.⁴⁰ Royalties from intellectual property often generate just a few thousand or tens of thousands of dollars per invention. A Brookings Institute study found that 130 of 155 universities in a national survey did not generate enough licensing income annually to cover the salaries of technology transfer staff and the attorney's fees for intellectual property.⁴¹

CHART 4

SAMPLES OF LICENSING REVENUE DISTRIBUTION WITHIN THE UNIVERSITY



The Right Stuff

Studies have identified the common traits of universities that most effectively initiate and fuel knowledge economies in their states and regions.⁴²

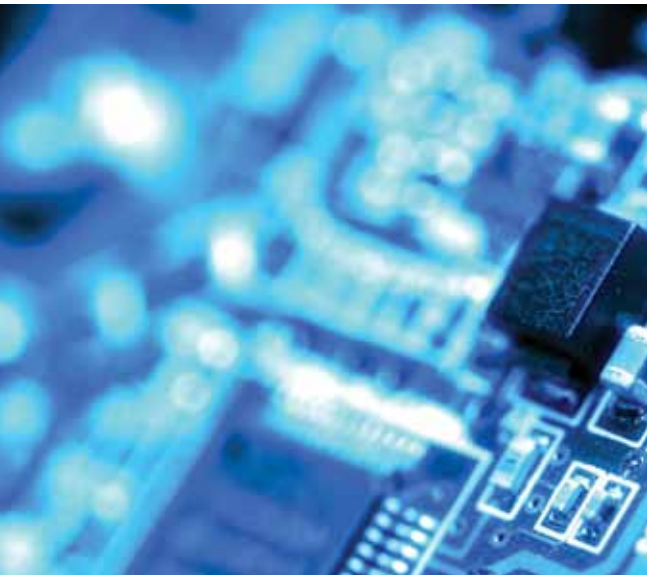
Strong leadership that values partnerships with industry and government for economic development

World-class research in areas of importance to industry clusters relevant to that region

Prominent faculty, nationally recognized in their fields, often oriented not just to research but to real-world applications

Physical infrastructure, including spaces that encourage interaction with industry

Tools, programs and resources to move research and inventions into the market



In general, those institutions with both a mission for economic development and a clear understanding of the concept of open innovation are leading the way. Although difficult to measure, the leadership and culture of a university arguably has the greatest impact on innovation—from scientific outcomes to industrial partnerships to patents and start-ups. Those institutions that recognize that a broad focus on economic development can generate more research funding and add real-world content to classrooms are likely to be more successful at bringing ideas into the public space.⁴³ According to analysts at the Rockefeller Institute of Government, those places where “knowledge is the lead incentive that states offer businesses they want to attract or grow” will have a competitive advantage in a global economy.⁴⁴

Louisiana's R&D Status

Despite recognition decades ago that Louisiana must move toward a knowledge-driven economy to thrive in the 21st century, only recently have state agencies taken concrete actions in terms of resources, policies or even serious attention. Similarly, Louisiana's universities have not traditionally embraced a mission of economic development, which has been relegated to second-tier status, or simply a talking point. This perspective led to a lack of commitment and accountability for technology transfer and the commercialization of research at many campuses.

The subject has garnered significant attention in recent history, as Louisiana begins to experience a revitalized manufacturing sector with project announcements in the billions of dollars and growing needs for a high-tech workforce. One national study ranked Louisiana at No. 6 for the average yearly growth of high-tech industries.⁴⁵ Software and digital technology companies have announced thousands of jobs in New Orleans, Baton Rouge, Lafayette and Shreveport/Bossier City. The call for industry partnerships with universities and the commercialization of research has never been timelier.

R&D expenditures or inputs in Louisiana are below average, particularly when adjusted for population size.

Ranking Louisiana Among the States

Louisiana has an interesting story to tell on both the input and output side of the R&D equation. R&D expenditures in Louisiana total more than \$1.5 billion annually, ranking the state 35th in the nation.⁴⁶ Furthermore, national figures indicate Louisiana is ranked even higher in R&D expenditures at universities and colleges (26th) as well as particular areas of focus (in a direct comparison, not adjusted for population). For agricultural sciences and environmental sciences, Louisiana ranks 16th and 19th respectively.⁴⁷ For math and computer sciences, Louisiana ranks 21st for R&D expenditures among the states.⁴⁸

Nearly half of R&D expenditures in Louisiana are within universities, totaling \$729 million in fiscal year 2011.⁴⁹ This figure represents a much larger share of overall R&D than takes place nationally, indicating that Louisiana universities are where most R&D is performed in the state. Correspondingly, the industry share of R&D expenditures in Louisiana (30%) is well below that of the nation as a whole (69%).

Of the \$729 million in R&D funds expended at Louisiana universities, the federal government is the source of nearly half of university research dollars; this is likely due in part to the concerted effort of the Board of Regents through the Louisiana's Experimental Program to Stimulate Competitive Research (EPSCoR), an initiative of the National Science Foundation designed to promote the science and engineering research capabilities in states that have historically received lesser amounts of federal R&D grants. Louisiana institutions fund another quarter within their own budgets,

the State of Louisiana funds 14%, and business funds 5%.⁵⁰ The industry share of R&D funding at universities is on par with a national percentage of 5%, the bulk of which flowed to medical sciences and engineering across the country.⁵¹ In Louisiana, however, the state government funds a much higher share of university research (14%) than the national average (6%) — a fact we will return to later in this report.⁵²

On the other side of the balance sheet, national studies confirm that outputs from Louisiana R&D at universities appear to be disproportionately low. Not all federally funded research (e.g., social sciences) is likely to generate new intellectual property, and not all forms of intellectual property protection may be reported in patent figures such as plant trademarks at Agricultural Centers for example.

The statistics in this report confirm that R&D expenditures or inputs in Louisiana are below average, particularly when adjusted for population size, but still call into question the historically poor outcomes as measured by common metrics such as disclosures, licenses, and patents.⁵³ For example, national benchmarks dictate that for every \$2.5 million in R&D expenditures, one new invention should be disclosed.⁵⁴ For \$729 million, that would indicate 292 invention disclosures from Louisiana universities. The actual number of disclosures by Louisiana’s research universities in fiscal year 2012 was 182.

It is important to acknowledge that Louisiana has certain challenges it may not easily overcome, such as a medium-sized population base, the lack of a major federal research facility, and low levels of private investment in industry-based R&D. Furthermore, state budget challenges in recent years have led to significantly less state support for research, but perhaps more importantly to low levels of morale that in turn led to the loss of faculty and associated research dollars. LSU alone estimates a loss of 220 faculty since 2008.⁵⁵

That said, there are states in similar positions that yield more activity and positive results, both quantitative and qualitative. For example, from a broad, statewide perspective, South Carolina has a similar population size to Louisiana and ranks 30th in R&D expenditures annually, compared to Louisiana’s position at 35th.⁵⁶ There are 56,230 science and engineering jobs in South Carolina (3.5% of the private sector) compared to just 44,200 in Louisiana (2.5%).⁵⁷

Zeroing in on performance metrics related to the commercialization of research, taking invention disclosures as an example, Louisiana’s universities fall at the bottom of institutions in the Southern region in direct comparisons, as evidenced below in charts with various institutions across the Southern Regional Education Board. Of note, there is more variance when adjusted for the amount of research dollars invested at each institution. While Louisiana Tech and the LSU-Health Sciences Center in New Orleans perform very well after this adjustment, most Louisiana institutions continue to fall in the bottom half of campuses in the Southern region.

TABLE 2

U.S. / LOUISIANA - R&D COMPARISONS

Most R&D in Louisiana is Performed at Universities, But Nationally Most R&D is Performed by Industry.⁵⁸

Source	Louisiana	United States
Federal	\$320 million (21%) ⁵⁹	\$53 billion (12%)
Industry	\$459 million (30%)	\$294 billion (69%)
Universities and colleges	\$729 million (48%)	\$62 billion (15%)
Non-profits	\$7 million (0.5%)	\$6 billion (2%)
State, Other Governments	\$7 million (0.5%)	n/a
TOTAL	\$1.5 billion	\$428 billion

TABLE 3**INVENTION DISCLOSURES AMONG SOUTHEASTERN UNIVERSITIES**

SREB Direct Comparisons of Invention Disclosures Indicate Very Low Performance of Louisiana Institutions, Although There is More Variance When Adjusted for Research Dollars Expended

Institutions	FY13 Invention Disclosures (AUTM)	Institutions	FY13 Invention Disclosures Per \$10M (AUTM)
University of Florida	335	Clemson University	13.3
Georgia Tech	296	University of Alabama (main)	8.7
North Carolina State	238	Louisiana Tech	7.2
Duke University	218	LSU – HSC (New Orleans)	6.7
Vanderbilt University	178	University of Florida	6.2
Virginia Tech IP Inc.	174	North Carolina State	5.7
Univ. of Virginia Patent Fdn.	162	University of Louisville	5.6
University of Tennessee	145	Wake Forest University	5.1
University of Georgia	140	Auburn University	4.4
UNC Chapel Hill	138	University of Tennessee	4.3
University of Louisville	105	Tulane University	4.2
Wake Forest University	102	Univ. of Virginia Patent Fdn.	4.2
Clemson University	102	University of Georgia	4.0
UAB Research Foundation	101	Georgia Tech	3.5
University of Miami	75	Virginia Tech IP Inc.	3.5
University of South Carolina	68	University of Arkansas	3.5
Auburn University	65	Oklahoma State University	3.5
Florida State University	58	LSU-Ag Center	3.4
Univ. of Kentucky Res. Fdn.	58	University of South Carolina	3.3
Tulane University	57	Vanderbilt University	3.2
Oklahoma State	50	University of Delaware	3.2
University of Alabama (main)	58	Florida State University	3.0
University of Delaware	45	LSU – HCSD (Shreveport)	2.7
University of Arkansas	44	Duke University	2.7
Mississippi State	35	Univ. of Kentucky Research Fdn.	2.4
LSU – HSC (New Orleans)	33	UAB Research Foundation	2.3
West Virginia University	31	UL Lafayette	2.3
LSU A&M	31	UNO	2.2
LSU Ag Center	30	University of Miami	2.2
Louisiana Tech	18	LSU A&M	2.1
UL Lafayette	14	West Virginia University	2.0
Pennington	10	Pennington	2.0
LSU – HCSD (Shreveport)	8	UNC Chapel Hill	1.8
UNO	5	Mississippi State	1.7
University of Mississippi	1	University of Mississippi	0.2

A closer review of the state’s flagship university confirms the trend that Louisiana is not getting bang for the buck when it comes to technology transfer, when measured by traditional outputs such as licenses and patents. (See Table 4.) The Baton Rouge Area Chamber (BRAC) has produced several analyses of LSU’s performance relative to a set of peers defined by the university administration.⁶⁰ BRAC’s 2013 presentation to the LSU Transition Advisory Committee illustrates shortcomings in invention disclosures, licenses, new patent applications and patents issued – even when adjusted for research expenditures.

TABLE 4

LSU SYSTEM / PEERS - RESEARCH INVESTMENT COMPARISON				
<i>BRAC Analysis Shows Louisiana’s Flagship University Lags Behind Peers* in Most Typical Performance Metrics, Even When Adjusted for the Level of Research Investment⁶¹</i>				
	LSU System (2011)	Average Peer (2011)	Peer Average Per Research Dollar Spent	LSU Per Dollar Spent
Invention Disclosures	96	168	.39	.23
Licenses Executed	33	54	.16	.08
New Patent Applications	51	80	.19	.12
Patents Issued	20	34	.08	.05

*LSU’s “self-identified peers” include the University of Tennessee, Texas A&M, the University of Maryland at College Park, the University of Illinois at Urbana Champaign, Purdue, North Carolina State, the University of Nebraska at Lincoln, Iowa State, the University of Georgia, Virginia Tech, Mississippi State, the University of Arkansas, and Colorado State.

A review of state rankings on science, technology, and the new economy generally confirm that with more investment in research, states tend to have more success in growing a technology-based economy. That foundational element cannot be ignored. Yet some states demonstrate more bang per buck. Texas, for example, spends 30th in the nation on a per capita basis, but comes in at 19th on the Milken Science and Technology Index. On the flip side, Alabama spends 28th in the nation on a per capita basis, but comes in at 41st on the New Economy Index.

Some states enjoy a strategic, geographic, or historical advantage. Leadership in certain states simply made a decision to prioritize innovation and a research agenda, specialize in certain areas, and recruit faculty accordingly. While increasing expenditures should certainly be part of the solution to the innovation deficit in Louisiana, there is no clear indication that more money alone would automatically lead to the outcomes the state needs in innovation and high-tech jobs.

Technology transfer experts at Louisiana universities point to the state’s fundamental economic weaknesses and say that critics of Louisiana’s R&D performance often fail to understand the commercialization process and overlook the success stories. In fact, a few Louisiana institutions have performed well on certain metrics at identified points in time or with sector-specific partners. There are certainly strong examples in the state, but the important takeaway is that the successes are sporadic. Until recently, little systematic effort had been applied effectively to maximize research expenditures for economic development across Louisiana’s higher education system or even within a particular university system.

How Louisiana Universities Compare with Each Other

Tables 5–9 illustrate the R&D inputs and outputs of various Louisiana institutions to present performance as measured by accepted metrics and compiled by national experts. For the purpose of this study, only Louisiana’s Tier One and Tier Two four-year research institutions are listed, as designated by the Southern Regional Education Board (SREB).

As noted above, no Louisiana institution ranks in the Top 100 nationally for R&D expenditures. Given the fact that the state as a whole receives a National Science Foundation No. 26 ranking for research expenditures at universities and colleges,⁶² Louisiana likely spreads resources too thin. Within the state, Tulane University spends slightly more than LSU’s main campus in Baton Rouge. Louisiana Tech expends the least with just \$26 million annually, nearly tying the University of New Orleans for last place.

TABLE 5

LOUISIANA INSTITUTIONS - R&D EXPENDITURES			
<i>FY 2012* R&D Expenditures for Tier One and Tier Two Four-Year Louisiana Institutions Lead to Exclusion from the Top 100⁶³</i>			
Louisiana Institutions	FY12 Research Expenditures (AUTM)	National Rank By Institution/System (AUTM)	In-State Rank
Tulane University	\$152,053,048	#103	#1
Louisiana State University (LSU) A&M	\$149,885,000	#104	#2
LSU Agricultural Center	\$88,866,000	#129	#3
University of Louisiana at Lafayette	\$65,000,000	#147	#4
LSU Health Sciences Center-New Orleans	\$53,712,000	#153	#5
LSU Pennington Biomedical Center**	\$46,644,000	#157	#6
LSU Health Sciences Center-Shreveport	\$29,365,000	#175	#7
University of New Orleans	\$27,238,849	#179	#8
Louisiana Tech University	\$26,546,000	#180	#9

*Although the FY2013 data was used for the regional comparison above, full data tables for all universities were not available from AUTM at the time of publication. In order to show national rank, PAR chose to utilize FY2012 data for the tables in this section.

**Of note, the R&D expenditure for Pennington could be considered inflated because it includes dollars spent on clinical trials. While trials are a necessary step in the development of new drugs, it is not the type of research activity that leads to innovation as defined in the following metrics.

If the measure of performance moves from research inputs to outputs, the picture changes dramatically as illustrated in the table below. Of note, these comparisons are all made after adjusting for levels of research funding, in response to the suggestion of Louisiana’s university technology transfer experts. In this comparison, Louisiana Tech rises to the top, not only within the state but nationally, ranking in the Top 10 institutions in the country with 10.5 invention disclosures per \$10 million expended. The second-highest ranking entity in 2012 was Tulane at 98th nationally with 3.6 invention disclosures. On the lower end, the University of New Orleans and the LSU Pennington Biomedical Center both ranked within the bottom five institutions surveyed nationally

by AUTM. It should be noted that Pennington is at a disadvantage with this particular measure because the center conducts many clinical trials that are not meant to lead to innovation as defined by this analysis.

TABLE 6

LOUISIANA INSTITUTIONS - INVENTION DISCLOSURE			
<i>FY12* Invention Disclosures Per \$10 Million at Tier One and Tier Two Four-Year Louisiana Institutions Give Rise to an Outlier, a Top 10 University⁶⁴</i>			
Louisiana Institutions	FY12 Invention Disclosures Per \$10M R&D (AUTM)	National Rank By Institution/System (AUTM)	In-State Rank
Louisiana Tech University	10.5(28 actual)	#9	#1
Tulane University	3.6 (55 actual)	#98	#2
LSU Agricultural Center	3.0 (27 actual)	#120	#3
Louisiana State University (LSU) A&M	2.5 (38 actual)	#145	#4
LSU Health Sciences Center-New Orleans**	2.2 (12 actual)	#162	#5
LSU Health Sciences Center-Shreveport	2.0 (6 actual)	#166	#6
University of Louisiana at Lafayette	1.2 (8 actual)	#181	#7
University of New Orleans	1.1 (3 actual)	#187	#8
LSU Pennington Biomedical Center	1.1 (5 actual)	#188	#9

*Of note, all institutions in Louisiana did improve the number of invention disclosures in FY2013 over FY2012 with the exception of Louisiana Tech and LSU A&M.

**As discussed later in this report, LSU-Health Sciences Center in New Orleans demonstrated dramatic recent progress. FY2013 data would like place the institution in the Top 25 in the country for invention disclosures per \$10 million.

The analysis shown in table 7 is similar, examining US patents issued to each institution per \$10 million in research expenditures. Louisiana Tech is again at the top, ranking in the Top 25 nationally for maximizing its dollars. The LSU Health Sciences Center in New Orleans comes in at 2nd in the state, and all other institutions fall in the bottom quartile nationally on AUTM’s survey. Two Louisiana institutions join only a handful across the country that received zero patents in fiscal year 2012. (These increased to three institutions with zero patents in fiscal year 2013: LSU-HCSD in Shreveport, UNO, and Pennington.) Of note, the recent Battelle study in Louisiana found that the number of patents issued in Louisiana actually declined by 40% from 2000 to 2011 even as patents increased 28% nationwide over this same period.⁶⁵

Measured by license agreements or options in fiscal year 2012, Louisiana Tech again out-performed other institutions in the state. (See table 8.) Tech demonstrated a clear ability to maximize research dollars for economic development and emphasize commercialization among faculty and staff. Of note, the LSU Agricultural Center came in second place when adjusted for research dollars, but actually executed the most licenses of any institution in Louisiana at nine in fiscal year 2012 alone. Two Louisiana research institutions did not create any license agreements or options in fiscal year 2012.

TABLE 7

LOUISIANA INSTITUTIONS - U.S. PATENTS ISSUED			
<i>FY12* US Patents Issued Per \$10 Million for Tier One and Tier Two Four-Year Louisiana Institutions Indicate Abysmal Performance in Most Universities⁶⁶</i>			
Louisiana Institutions	FY12 Patents Per \$10M R&D (AUTM)	National Rank By Institution/ System (AUTM)	In-State Rank
Louisiana Tech University	2.6 (7 actual)	#22	#1
LSU Health Sciences Center-New Orleans	.9 (5 actual)	#74	#2
LSU Health Sciences Center-Shreveport	.3 (1 actual)	#149	#3
LSU Agricultural Center	.3 (3 actual)	#150	#4
Louisiana State University (LSU) A&M	.3 (4 actual)	#160	#5
LSU Pennington Biomedical Center	.2 (1 actual)	#173	#6
Tulane University	.1 (2 actual)	#177	#7
University of Louisiana at Lafayette	0 (0 actual)	n/a	n/a
University of New Orleans	0 (0 actual)	n/a	n/a

*Of all Louisiana institutions, LSU A&M saw the most progress in patents issued in FY2013 over FY2012, increasing from 4 to 10.

TABLE 8

LOUISIANA INSTITUTIONS - LICENSES EXECUTED			
<i>FY12* Licenses Executed Per \$10 Million by Tier One and Tier Two Four-Year Louisiana Institutions Again Show Poor Performance Across Most Campuses⁶⁷</i>			
Louisiana Institutions	FY12 Licenses Per \$10M R&D (AUTM)	National Rank By Institution/ System (AUTM)	In-State Rank
Louisiana Tech University	1.88 (5 actual)	#30	#1
LSU Agricultural Center	1.01 (9 actual)	#70	#2
LSU Health Sciences Center-Shreveport	.68 (2 actual)	#113	#3
Tulane University	.52 (8 actual)	#130	#4
LSU Pennington Biomedical Center	.43 (2 actual)	#146	#5
Louisiana State University (LSU) A&M	.33 (5 actual)	#156	#6
LSU Health Sciences Center-New Orleans	.17 (1 actual)	#173	#7
University of Louisiana at Lafayette	0 (0 actual)	n/a	n/a
University of New Orleans	0 (0 actual)	n/a	n/a

*FY2013 saw several shifts with regard to in-state rank, although most institutions would likely have remained in the bottom tier nationally. LSU A&M actually dropped further, only executing two licenses in FY2013, while LSU-HCSD in Shreveport executed none. At the same time, the LSU Ag Center jumped to 15 licenses and would replace Louisiana Tech for most licenses executed in the state in a direct comparison or when adjusted for the amount of research dollars invested. Also of note, UL Lafayette executed four licenses in FY13, up from zero.

Across the components outlined above, an element of the success of Louisiana Tech must be attributed to its areas of focus – in this case, on applied science, technology, and engineering. These fields of research are more likely to be commercialized than basic research or social science research, for example, which is more prevalent on other campuses in the state. At the same time, Louisiana Tech has neither a medical school nor an agricultural program, which can drive research productivity and commercialization on college campuses.

Licensing revenue is typically highest in the pharmaceutical/medical and agricultural fields. Whereas engineering, computer science and digital media frequently involve strong private partnerships, the benefits are not always in revenue but more broadly in the workforce and the community. That trend holds true in Louisiana as well, where Tulane University (with hospitals and medical research) tops the list. (See Table 9.) The LSU Agricultural Center comes in second after moving several products into the market, generating \$9 million in licensing revenue in fiscal year 2012.⁶⁸ In perhaps the most well-known instance of technology transfer in Louisiana, the Ag Center signed an exclusive licensing agreement in 2003 with BASF and Clearfield Rice to produce a new herbicide-resistant rice varietal created by researchers at the Ag Center that has brought in more than \$20 million to date.⁶⁹ (The fiscal year 2013 list ranked the Ag Center No. 1 and Tulane No. 2.)

TABLE 9

LOUISIANA INSTITUTIONS - LICENSE REVENUE			
<i>FY12* License Revenue Per \$10 Million Invested in Tier One and Tier Two Four-Year Louisiana Institutions Indicate Rates of Return Far Below Expectations⁷⁰</i>			
Louisiana Institutions	FY12 Licensing Revenue	National Rank by Institution/ System	In-State Rank
Tulane University	\$10,629,051	#37	#1
LSU Agricultural Center	\$9,582,731	#47	#2
Louisiana State University (LSU) A&M	\$447,892	#133	#3
LSU Health Sciences Center-Shreveport	\$170,440	#151	#4
LSU Health Sciences Center-New Orleans	\$96,124	#157	#5
University of Louisiana at Lafayette	\$43,000	#168	#6
Louisiana Tech University	\$31,500	#174	#7
University of New Orleans	\$28,836	#176	#8
LSU Pennington Biomedical Center	\$25,618	#177	#9

*In FY2013, Tulane's licensing revenue dropped to \$3.8 million, leaving LSU Ag Center in the clear lead on licensing revenues within the state.

Licensing revenues were low in this particular year at Louisiana Tech than in prior or subsequent years. Generally speaking, lower licensing income may be an illustration of that institution's goal to move research into the market rather than seek a revenue windfall for the university. Licensing revenue as a measurement of performance is somewhat controversial and even contradictory. Universities "compete for prestige, and prestige is measured in terms of high-value contracts and licensing income,"⁷¹

according to a report from the Center for Technology Innovation at the Brookings Institute. However, aggressive negotiations for higher royalties can lead industry to turn in-house or simply look elsewhere.

If the goal of technology transfer is to move the product into the market, then protecting the university and generating revenues for the enterprise would naturally be of lower priority. In fact, some universities are reducing licensing fees in some cases on industry-sponsored research, such as Pennsylvania State University, which decided “the small payoffs it has seen to date aren’t as valuable as building strong industry relationships for faculty and students.”⁷² Nationally, of the \$63.7 billion in research expenditures at universities, only \$2.6 billion is generated in licensing income annually with more than 10,000 products sold that originated from university research.⁷³ While generating revenue is helpful and valuable, this metric is not a particularly useful measurement for overall performance and value of the research effort.

Although complete data at the campus level was not available at the time of publication, another important metric for technology transfer is the percentage of research expenditures that are provided by industry to the university. UL Lafayette ranked No. 10 in the nation with 19% of fiscal year 2011 total university R&D expenditures funded by business compared to less than 5% nationwide. UL Lafayette attributes this success to their effective institutionalization of partnerships with industry, noting the fact that company representatives regularly interact with faculty and students on campus. According to UL administrators, this daily communication flows easily into negotiations on licenses and revenue sharing.

PERFORMANCE METRICS

The tables in this section utilize the most commonly accepted metrics for technology transfer performance, as compiled by the Association of University Technology Managers (AUTM). Of note, there is a national debate under way to attempt to better measure the outcomes of university research, such as quantifying relationships with industry, support for student entrepreneurship, and capital raised by alumni for new companies, to name a few. These measures will improve our understanding of effective university R&D programs. For now, AUTM and the PAR report rely on the traditional, comparable metrics of research expenditures, invention disclosures, patents, licenses, licensing revenues, and startups.

The Louisiana Tech Advantage

While other Louisiana universities have resisted drawing on Tech as an example, the figures show they cannot be discounted. High levels of performance at Louisiana Tech are real when compared to the investments and do appear to be the result of specific policies and paradigms. The first is leadership and a culture that supports and understands the value of a knowledge-based economy. The school’s leaders also view the university as a primary driver to reach this goal and so have consistently aligned their activities accordingly. In the course of PAR’s research among Louisiana’s colleges, “job creation” rarely emerged as a goal of university R&D. In discussions with Louisiana Tech officials, however, that goal was repeatedly cited – much as it was in PAR’s site visits to the national models of innovation at Georgia institutions. Louisiana Tech’s president and senior staff noted more than once that “driving economic prosperity in north Louisiana is our mission” and commercializing research is a critical piece of that mission.

In a similar way, LSU Agricultural Center experts pointed to the number of companies created as a result of technology researched on campus. The overall success of the research effort at the Ag Center is attributed to decades of leadership that made commercialization a priority, hiring experienced staff and maximizing Louisiana’s competitive grants program.

Louisiana Tech has targeted very specific areas for R&D funds. University officials believe that a program of national quality is required to have a strong regional economic impact. Cybersecurity, advanced manufacturing and trenchless technology are important examples. These research “areas of excellence” have been in place for many years. Louisiana Tech has chosen to focus on specific areas for sustained periods, bearing fruit in terms of productivity of research and bang for buck. This, in turn, has led to the creation of such major assets as the Center for Secure Cyberspace that is now attracting and retaining new companies to north Louisiana as well as federal grants in partnership with the Cyber Innovation Center in Bossier City.

Tech officials say federal funding is in decline and industry partnerships are critical to the future success of their research efforts. In fact, administrators point to the importance of funding for research in general to be effective in innovation. Without funds to attract and support faculty in their research, “the ultimate mission fails.”

Thus, the university is finding quick, creative ways to secure dollars for both research and commercialization. PAR interviews at Louisiana Tech revealed a “philosophy to get the deal done.” University officials intentionally do not engage in lengthy negotiations with industry and do not “hold out for a huge payout.” Instead, they seek to negotiate market-based royalty rates as well as efficiencies through streamlined approval processes. Louisiana Tech makes it clear that resulting company partnerships, research marketability and benefits to the north Louisiana community are valued more than the possibility of short-term revenue gains for the university. The partnerships also stem from deliberate efforts with individual companies to develop curriculum and programs in particular areas of workforce needs, such as a telecommunications certificate with CenturyLink.



There are several specific examples of policies and infrastructure at Louisiana Tech aimed at promoting marketable research to grow the economy:

University policy is to approve licensing agreements on-campus; there is no involvement from the University of Louisiana system office. In addition, Louisiana Tech has created express license agreements to utilize as templates to expedite agreements with faculty spin-out companies and utilized option agreements with companies to allow them to validate the technology in-house at a reduced cost in order to finalize the deal.

Unlike large corporations, most small and medium-sized companies have little experience working with universities and they cannot afford dedicated technology scouts. Louisiana Tech has developed guidance materials to help the private sector navigate R&D negotiations, licenses, and contractual agreements.

The College of Engineering and Science includes patents, externally funded research, technology licensing and the creation of start-up companies as indicators of excellence and effectiveness in faculty tenure and promotion policies.

The university was one of six nationally in 2011 to receive a grant from the federal Economic Development Administration to create a Louisiana Tech “i6 Proof of Concept Center” to expedite green technology innovations into the market.⁷⁴ This annual federal competition is aimed at accelerating entrepreneurship across the country in high-growth sectors and involves the Departments of Agriculture, Commerce, Defense, Energy and others including the

National Science Foundation. Industry is heavily involved in the project, which spans the I-20 corridor from northeast Texas to west-central Mississippi, converging on the Enterprise Campus. The U.S. Department of Commerce highlighted the Louisiana Tech Proof of Concept Center’s work with researchers, students, industry, and other groups to commercialize solar smart panels, geopolymer concrete and piezoelectric generators.⁷⁵

Louisiana Tech also utilizes an NSF grant for its Venture Enhancement Teams that work to commercialize university Intellectual Property in a “comprehensive package to licenses to significantly reduce the risk...”⁷⁶ The Teams are multi-disciplinary and select projects that will benefit from the development of prototypes, business planning, and collaboration on IP. The federal grant is matched by the university, the Research Foundation, local angel network or private companies.

The university makes strategic use of Support Fund dollars from the state. Because of pre-existing partnerships with industry, for example, they are able to take advantage of the Industrial Ties program. Similarly, they have benefited from enhancement grants to make labs competitive and OPT-In funds to connect faculty inventors to companies. Louisiana Tech attempts to use Support Fund resources to match major grants from the federal government.

University officials believe their relative success is also attributed to an ecosystem approach, where the entire university is pulling in the direction of marketable research including faculty and student entrepreneurs.

CHAPTER THREE

Louisiana's R&D Achievements

The low rankings and unfavorable comparisons of Louisiana's R&D status are by no means the full story of the state's efforts to stimulate innovation at universities and in its regional economies. Remarkable programs are blossoming in several areas. The state has put in place a solid infrastructure of competitive tax incentives, favorable legal conditions and funding resources. New leadership is more attuned to innovation strategies.

The success stories themselves offer lessons for improvement and for an attitude adjustment in university management. Multiple studies over the years have encouraged state and higher-education leaders to think and act more progressively, and there are now clear examples of how this message is getting through. Recently formed pockets of innovation and new policy actions are moving some colleges in the right direction.

In particular, the key factors in the successful research institutions are the efforts to expand industry partnerships and recognize the value in the economic development mission of the university, particularly looking to the future as federal funds diminish. Best practices and model universities do this well.

Multiple studies over the years have encouraged state and higher-education leaders to think and act more progressively, and there are now clear examples of how this message is getting through.

"Silicon Bayou": UL Lafayette's Leap to Big Data

In 2012, the University of Louisiana at Lafayette partnered with Drexel University in Pennsylvania to create the Center for Visual and Decision Informatics (CVDI), the first such National Science Foundation center in Louisiana. This NSF Industry / University Cooperative Research Center is one of 66 across the country supported by industry and NSF grants. The Center's Industry Advisory Board has 15 members who help fund research to solve industry problems with Big Data. In its first year, CVDI used an investment of only \$700,000 for research that generated 13 potentially patentable discoveries and 12 potentially copyrightable discoveries.⁷⁷ When compared to UL Lafayette's low total output statistics as reported to the Association of University Technology Managers in 2012, this jump is dramatic and has attracted international attention. Finland's Tampere University and DIGILE recently chose CVDI as a partner after considering all 66 NSF centers across the US, making UL Lafayette only the sixth center in the country to have an international site.

The Center operates on an "open intellectual property" policy. The entire board has access to the intellectual property generated by the research unless a single board member enters into an exclusive license with the university. Occasionally, the board members negotiate deals with other companies on the board. UL Lafayette administrators say this type of R&D output is rarely counted by AUTM and traditional measurements of R&D progress. Yet technology transfer is clearly under way through the Center. CVDI estimates

THE WATER INSTITUTE OF THE GULF AND THE LSU CENTER FOR RIVER STUDIES

Founded in 2011 by public and private partners, the Water Institute of the Gulf is a non-profit research center that studies coastal, deltaic, river and water resource systems. The Institute was established in Baton Rouge through a joint effort of the Louisiana Coastal Protection and Restoration Authority, the Baton Rouge Area Foundation and former Sen. Mary Landrieu. Gov. Bobby Jindal has been a supporter and his administration has commissioned research contracts for the Institute.

The purpose of the Institute is to “help resolve the water related issues of the 21st Century” through the “practical application of innovative science and engineering, providing solutions that benefit society,” according to the research center. To achieve this mission, the Institute plans to serve as a hub of research activity joining the efforts of federal agencies, universities, private businesses, non-governmental organizations and the local government. The Institute is supposed to become financially self-sustaining. The CPRA selected the Institute as Louisiana’s Center of Excellence for receipt of Restore Act funding to establish a competitive grant program for coastal research. The Institute eventually will be based on the Water Campus, a development that recently broke ground on the banks of the Mississippi River in Baton Rouge.

The Water Campus will be home also to the Louisiana State University Center for River Studies, housed in a \$16 million facility that will feature a model of the lower Mississippi River. Researchers will use the model to test the river’s dynamics and examine the impact of proposed modifications, such as coastal restoration diversions. The Baton Rouge Area Foundation and its real estate affiliate have been instrumental in funding and developing the Water Campus.

the return on investment for industry board members as 22:1.⁷⁸ Examples of Louisiana members of CVDI include the private Lafayette-based company Stuller Inc., the Louisiana Immersive Technologies Enterprise (the LITE Center), and state agencies such as the Louisiana Department of Health and Hospitals. National board members include CGI, Johnson & Johnson, Lockheed Martin and Microsoft among others.

Through this Center and other programs, NSF announced in September 2013 that UL Lafayette is among the Top 10 universities in America for the percentage of industry-based funding for R&D.⁷⁹ Businesses provided 19% of ULL’s \$70 million R&D budget whereas the U.S. average and Louisiana average are roughly 5%.⁸⁰ This heavy industry involvement is not by happenstance. UL Lafayette administrators are intentionally soliciting the participation and support of business to grow their research program, setting ambitious goals to increase R&D expenditures. Leadership is targeting research expansion in areas that align with projected needs and growth in the region, such as healthcare. For example, they are engaging in interdisciplinary research to build on strengths in computing to support the healthcare industry. The White House recognized Lafayette’s work to become a “Living Lab for Health Innovation” and called the effort “a community-scale testbed for healthcare innovators to test their technologies in real-world settings...Lafayette will be an active partner in developing the future of healthcare through the power of gigabit networks and software defined networking, addressing such complex societal challenges as childhood obesity, aging in place, emergency medicine, and workplace health.”⁸¹

UL Lafayette attributes this latest recognition to efforts by the Center for Business and Information Technologies (CBIT) at the university, which aims to bring technology-driven innovations into the market. The Cajun-CodeFest is CBIT’s signature event and draws hundreds of participants from dozens of states that compete in a two-day health care coding competition. Following the inaugural event, Todd Park, the U.S. Chief Technology Officer and guest speaker, tweeted that “Silicon Bayou – aka Lafayette, Louisiana – is the best kept secret reservoir of innovation mojo in America.”⁸²

The real-world impact of UL Lafayette’s intentional partnerships with industry for R&D has been solidified with three announcements in 2014 for new and expanding companies that will create 1,000 direct IT jobs in the area. Most recently, in September 2014, the IT and management consulting firm Perficient announced plans to open a center in Lafayette with 245 full-time jobs, relying on computer science graduates from UL Lafayette. In July 2014, the Silicon Valley-based software development company Enquero ended their nationwide search at the LITE Center with plans for a 350-job technology center. This was preceded in March 2014 by an announcement that CGI, the world’s fifth largest independent IT services firm, chose the UL Lafayette Research Park for a 400-job U.S. technology center. As part of the CGI incentive package, the state will be funding a ten-year, \$4.5 million initiative to triple the number of bachelor’s degrees at UL Lafayette’s School of Computing and Informatics. Clearly, leadership and a track record of partnerships between industry and the university is making a difference in Lafayette.

Innovation Cluster: Louisiana Tech Prioritizes Cybersecurity

Through a concerted effort by university leadership and targeted partnerships with industry, Louisiana Tech and north Louisiana have become nationally recognized as “one of the fastest growing cybersecurity clusters in the nation.”⁸³ The facilities, partnerships and nationally recognized efforts in a niche area of technology represent a diverse and growing innovation ecosystem.

This area of focus began with the development of the cyber-research park in Bossier City, where the non-profit Cyber Innovation Center is based today. Several years ago, economic development officials at the state and local level worked with public and private partners to build upon the assets at Barksdale Air Force Base – an effort that is now bearing fruit in academic programs and trained graduates for a growing cyber-job market.

Louisiana Tech is encouraging industry and government partnerships in a shared space known as the Enterprise Campus

In 2012, Louisiana Tech became the first university in the United States to offer a four-year cyber-engineering degree – an idea that was first suggested to the university by senior scientists at the Air Force Research Laboratory in New York. Student enrollment jumped after the first year with 23 students in Fall 2012, 76 in 2013, and 135 in 2014. Students are already being recognized, interning at the National Security Agency (NSA), whose high-level staff have since visited the campus at Louisiana Tech to explore further partnerships.⁸⁴

The university has achieved the status of a National Center of Academic Excellence in Information Assurance Research as well as Education from the NSA and the Department of Homeland Security (DHS) – the only university in Louisiana and among 35 nationwide. The goal of the federal program is to “reduce vulnerability in the national information infrastructure” by promoting research and growing the number of professionals with this expertise.⁸⁵

Louisiana Tech is encouraging industry and government partnerships in a shared space known as the Enterprise Campus. Located in Ruston, the research park recruits and retains faculty and students that want to develop their research into commercially viable products for the market economy. Tech Pointe is the first facility on the new Enterprise Campus and houses the Cyberspace Research Lab funded by the Air Force Office of Scientific Research with advanced computing, visualization, and networking facilities. Technology start-ups from Louisiana Tech are spinning out of the research programs onto the new Enterprise Campus as well.

TIGER BULLETS MEANS JOBS

Researchers at the LSU Agricultural Center produced a mechanism made from recycled plastics, used motor oil containers, and wood waste that prevents drilling fluids in oil wells from leaking into the environment. Using a patented process developed by Ag Center researcher and professor Quinglin Wu, the product is manufactured at Wallace Moulding and Millworks of Columbia, Louisiana. The company had produced parts for windows, doors, and cabinets but faced challenges during the national recession and decline in the housing market. Owners had laid off 30 employees, but began re-hiring to produce Tiger Bullets. The product is now marketed to oil companies by a New Iberia start-up company, Hole Pluggers. The initial research was funded with NSF grants, and Ag Center officials expect to receive state grants to fund the next generation of work through the Board of Regents Support Fund.

Down the interstate in Bossier City, the Cyber Research Park houses Boeing, the Computer Sciences Corporation (CSC), Huntington Ingalls, Northrop Grumman, Lockheed Martin, and Venyu among other large companies. Of note, CSC is partnering directly with Louisiana Tech on curriculum for graduates that will help staff its new 800-job technology center in Bossier City. CSC's executive vice president noted the importance of Tech's cyber engineering program and pre-existing relationship with Barksdale as "especially compelling" in its choice to locate in north Louisiana.⁸⁶ In Spring 2014, Louisiana Tech and the Cyber Innovation Center announced a new partnership through the Louisiana Cyber and Data Consortium to share operational and technical concepts and technologies related to protecting cyber assets. Through the consortium, members from Fortune 500 companies, small businesses and higher education work together to raise awareness of threats and share best practices from cyber security and data centers.⁸⁷

Another partnership among Louisiana Tech, Bossier Parish Community College, and the Cyber Innovation Center has spawned the National Integrated Cyber Education Research Center (NICERC) that focuses on curriculum design and teacher training in K-12 schools.

LSU Engineering and IBM: Integrating Workforce Solutions and Tech Research

The LSU College of Engineering, which includes computer sciences, has provided an example of an intentional and methodical effort to engage industry not only for workforce solutions, but curriculum and research as well. In 2013, the LSU College of Engineering made headlines for a new partnership formed with IBM Corp. and Louisiana state agencies to provide workforce solutions and innovative research supporting a new Baton Rouge-based IBM Services Center. The private Baton Rouge Area Foundation also played a key role in launching project. An estimated 800 people will

be employed by IBM in 2016 and many will be computer science graduates. A critical component of the state's economic incentive package for IBM is slated to fund the expansion of LSU's computer science program and is already yielding results. In the fall semester of 2013, the number of new freshmen entering computer science was up 60 percent.⁸⁸ LSU has subsequently partnered with IBM staff to re-design the curriculum, which now includes degree programs in cloud technology and data analytics.⁸⁹ With support from the state's economic development funds, the university's stated goal is to double the number of faculty and triple the number of graduates in the computer science program within three to five years of the IBM announcement.

This partnership did not emerge from a vacuum. Dean Richard Koubek has made economic development one of eight strategic goals of the College, specifically "Improving and Diversifying Louisiana's Economy." The five-year strategic plan recognizes that "innovation through academia and the business world will spawn a rich environment for companies and businesses to grow locally, paving the way for future diversification of our state's economy."⁹⁰ Prior to the IBM partnership, in 2012, the LSU School of Electrical Engineering and Computer Science was created to produce graduates and research aligned with the state's economic development initiatives in digital media, software development and digital and social gaming technology.⁹¹ When interviewed by PAR, Koubek said IBM is "the public face of what's happening behind the scenes." Industry contact with the college began with workforce discussions and, with time, segued to research partnerships.

Koubek has created and utilizes a scorecard to measure progress on a quarterly basis at the college and department levels. The scorecard covers R&D metrics such as research expenditures, new research funding, patents awarded, start-up companies and invention disclosures. Industry-related metrics are used at the College of Engineering to track numbers for corporate interactions, companies engaged for research, industrial research funding and roundtables with regional economic development organizations. Koubek said that holding leadership and faculty to a high level of accountability has generated better outcomes.

This focus on innovation and industry outreach is critical to the future of LSU's engineering school, which is undergoing a major expansion with the planned hiring of 50 new faculty positions "in areas that matter," Koubek has said. Student enrollment is increasing dramatically and has a greater diversity of minorities and women. The current freshman class overall is twice as big as five years ago. The College broke ground in November 2014 on a \$110 million renovation of the engineering building,

ESPERANCE

Esperance Pharmaceuticals Inc. is a young company working to develop a new cancer treatment that can kill malignant cells without harming normal cells. The biopharmaceutical firm is housed at the Louisiana Emerging Technology Center (LETC) on LSU's campus. Its research and products are based on technologies developed at the LSU Agricultural Center, Pennington Biomedical Research Center, and the main campus of LSU. Financial backing originated out-of-state and internationally, as well as through Louisiana venture capitalists including Louisiana Fund I also housed at the LETC. The treatment is now in clinical testing on humans, and Esperance is developing new drug compounds, as well. Interviewees pointed to this partnership among various entities as an example of how university research can translate into solutions for real-world problems.

Over the years, there has been no shortage of plans and strategies from universities and the State of Louisiana to increase research and development and grow the economy. Recent examples are as follows:

The Fostering Innovation Through Research In Science and Technology (FIRST) A Louisiana plan was generated by universities and unanimously approved by the Louisiana Board of Regents to feed into the Master Plan and the 2010 GRAD Act provisions.¹⁰⁰ Recent documents indicate a vision for the Plan is to address “near- and long-term employment needs and economic growth.”¹⁰¹

The Board of Regents Master Plan, which includes fostering innovation and research as one of three major goals, includes such activities as fostering “strategic collaborations among higher education, government, and Louisiana’s existing and prospective high-growth industry sectors.”¹⁰²

The Strategic Inventory of Louisiana Research and Innovation Assets by Battelle Technology Practice was commissioned by Louisiana Economic Development (LED) and completed in 2013 to identify strengths and recommend emerging growth sector and cross-sector collaboration initiatives.¹⁰³

The Research Advisory Committee of the Board of Regents Master Plan (MPRAC) made recommendations to the Louisiana Innovation Council in early 2014 based on a series of working groups and other efforts, which included the need for industry-university liaisons, matching support for research centers, and proof-of-concept funds.

The Council of Technology Transfer Officers was revived, in part, by LED and convened in the spring of 2014. Although there was little enthusiasm by most campus representatives at the meeting, participants generally agreed it was valuable to convene and share news and best practices from their respective institutions.

funded with public and private dollars, that includes a new chemical engineering addition that will be the largest academic space in Louisiana when it opens in 2017. With continued state and private support, the LSU College of Engineering could rise to an elite and enviable status nationwide.

Incubators and Venture Capital

To nurture infant businesses, Louisiana has fairly strong incubators, some which operate inside universities and others that are funded by state agencies or private groups. One national study ranked Louisiana No. 1 for the number of business incubators per 10,000 business establishments.⁹² The Louisiana Business and Technology Center (LBTC) in Baton Rouge is a prime example, with more than 30 incubator tenants and an estimated 2,278 jobs created since its inception in 1989.⁹³ Of its 140 graduated tenants, 110 are still in business (a 78% success rate).⁹⁴ With offices at the LSU Innovation Park and at NASA’s John C. Stennis Space Center in Mississippi, the Center operates the LSU Student Incubator as well as a technology transfer office that has assisted more than 2,500 Louisiana companies in securing innovation research awards such as SBIR/STTR valued at \$77 million since the office opened in 1999.⁹⁵

The New Orleans BioInnovation Center (NOBIC) was created with state funding as an incubator for health and bioscience start-up companies. Since its opening in 2011, NOBIC has helped form 66 companies – 34 tenants are in the facility today — and has raised more than \$24 million.⁹⁶ NOBIC officials have worked with technology transfer offices at area universities and report that 90% of the start-up companies supported by the Center were developed at universities.⁹⁷ Officials also note that states are aggressively recruiting their start-up companies, and some are selling their businesses before the product even makes it to the market.

Venture capital is also on the rise with successful efforts such as Louisiana Fund I, housed at the Louisiana Emerging Technology Center in Baton Rouge. After raising millions to provide early-stage capital to more

than a dozen Louisiana-based companies, the organization is preparing to initiate Louisiana Fund II.⁹⁸ Similarly, BVM Capital in Shreveport has made several investments in major initiatives developed at Louisiana universities and incubators. The Milken Institute ranked Louisiana No. 1 on the 2012 Science and Technology Index for the increase in the number of companies receiving venture capital investment and No. 8 for the number of business starts per capita.⁹⁹

A New Leadership and Mindset

Louisiana has had no shortage of studies recommending improvements in university R&D policies. See the sidebar on page 24 for a partial list. Among the stronger reports were ***The Innovation Economy in Louisiana***, a 2009 study by the Baton Rouge Area Chamber, and ***The Strategic Inventory of Louisiana Research and Innovation Assets***, prepared by Battelle Technology Practice in 2013 for the Louisiana Innovation Council. These documents have provided insight and value, but their impact has been dependent on the leadership and guidance from gubernatorial administrations and their appointments on the Board of Regents, at the university system, and on campuses across the state. As illustrated by the pockets of innovation detailed above, decentralized policies brought by leaders with a vision for innovation and a knowledge-based economy are far more likely to inspire faculty, make the appropriate industry connections, steer limited resources accordingly and move the bar on R&D.

Indeed, new leaders in higher education have taken office and shifts appear to be under way at the institutional level in policy and in pragmatic ways. LSU completed a self-analysis in 2013 and hired System President and Baton Rouge campus Chancellor F. King Alexander for the new combined post. The LSU Transition Advisory Team held meetings across the state and examined challenges through sub-groups, including a Research and Discovery Sub-Committee and a Commercialization and Technology Transfer Task Force. A variety of recommendations related to research were pushed forward, such as focusing on strategic priorities based on the Louisiana economy. In addition, specific changes were suggested to long-standing university policy on technology transfer, including decentralizing patent protection processes to the campuses, the removal of additional layers of legal review when expedited templates are utilized, and delegating some functions to a foundation.¹⁰⁴ Significantly, the LSU Board of Supervisors is no longer required to vote approval of every intellectual property contract, a move that reduces unnecessary delays. Instead, signature authority for licensing agreements has been delegated to the chancellors of each institution within

THE LSU LIFT2 FUND

The Leverage Innovation for Technology Transfer Fund was created in January 2014 in response to recommendations from the LSU transition advisory council and the President's Committee on Technology Transfer. Housed at the LSU Research and Technology Foundation and available to all entities across the system, this Fund is intended to help researchers across the "valley of death" between the invention disclosure and the point of validation and interest from investor. Although faculty from all disciplines are invited to apply, the state goal is to "increase the number of inventions which are licensed to a corporate partner." The grants are competitive, externally scored, and will be made twice annually in amounts up to \$50,000. Funding for the grants was re-directed from licensing revenues previously dedicated to the Office of the President. Fifteen awards were made in July 2014 totaling \$500,000.

the LSU System. This policy change and other recommendations are consistent with national models and will likely result in improved outcomes in bringing research to the market, if implemented well.

Shortly after the new LSU President's arrival, he appointed a Committee on Technology Transfer that agreed with some of the Transition Advisory Team's recommendations. Specifically, a "shared services partnership with the LSU System Research and Technology Foundation" was suggested to centralize certain administrative tasks such as an intellectual property database and website, the retention of legal counsel, licensing compliance, marketability evaluations and the identification of potential licensees.¹⁰⁵ This partnership formally began in July 2014.

The recommendations also outlined \$1 million in Year One funding for the Foundation to implement the proposed "hybrid" technology transfer model; nearly half is designated for legal fees. Funds for the Foundation's work will be provided by the LSU Office of the President (20%) and the five participating campuses. The LSU President's Committee recommended the creation of the proof-of-concept fund, LIFT2, which was created in 2014 and has already disbursed \$500,000 (see sidebar on page 25). Indeed, PAR research indicates the university is moving forward aggressively with several Committee recommendations, such as streamlining related LSU policies.

Even with visionary leaders and strong policies for commercializing research, the importance of talented staff in the right positions cannot be underestimated either. Technology transfer officers are on the front lines with visibility on the faculty members and research under way. In too many Louisiana campuses, these positions are part-time. These professionals should have private sector experience and engagement. More than almost any other position, having the right person in this role can be the difference maker. Louisiana is fortunate to have recently recruited some of the most experienced professionals within the technology transfer industry. For example, David Winwood was recruited to the Pennington Biomedical Research Center in 2014 as the Chief Business Development Officer; he has 20 years of experience in commercialization at prestigious universities including the University of Alabama at Birmingham, North Carolina State, and Ohio State. Andrew Maas was also hired in 2014 as LSU's Assistant Vice Chancellor for Research-Technology Transfer, and his experience began in the private sector in engineering and includes starting his own company and pursuing a law degree focused on IP. Another example is Patrick Reed at the LSU Health Sciences Center in New Orleans. A Louisiana native and a former member of Georgia Tech's successful commercialization team, Reed was recruited back to Louisiana where he has utilized templates and techniques from his experience in Georgia to triple the number of disclosures in his first year on the job.¹⁰⁶ For example, he has created a 30-page Inventors Guide for faculty and a Commercialization Roadmap and Scorecard to transparently and efficiently evaluate invention disclosures.

In sum, Louisiana's higher education leadership is attuned to the weak performance in R&D in years past and is making attempts to challenge the internal status quo, build bridges to other state and private entities and prioritize innovation on campuses. However, improving outcomes requires politically difficult decisions in many cases, and only time will tell if leadership is willing to implement the recommendations of this report and so many others.

THE LOUISIANA INNOVATION COUNCIL

The public responsibility for promoting a culture of innovation in Louisiana rests not only within higher education but at the LED office, the Louisiana Department of Education and the Louisiana Workforce Commission, among other agencies. In 2009, the Legislature created the Louisiana Innovation Council (LIC) to promote coordination and “shape the Louisiana innovation agenda.”¹⁰⁷ The 31-member committee includes representatives of state agencies and universities as well as entrepreneurs and leaders in economic development. Although the group has no budget and is supported by LED staff, the Council is statutorily tasked with developing prioritized recommendations on an annual basis. The Council remains active as the primary entity in Louisiana law tasked with supporting innovation, although private-sector members have become frustrated with its limited impact thus far, particularly the inability to hold institutions accountable and move the bar to improve innovation outcomes.

In its first year, the LIC presented a report to the Legislature analyzing the formation of a possible Louisiana Research Alliance, based on a successful program in Georgia. Members recommended a focus on the recruitment of eminent scholars and the creation of centers of excellence that would generate science, technology,

engineering and mathematics (STEM) jobs and leverage public and private investment. No further action was taken to develop this concept, as the report itself noted that possible funding sources “are currently used to support other high-priority programs... In the absence of an identified funding source, the LIC will continue to explore options to achieve the desired outcomes.”¹⁰⁸

In 2012 on behalf of the Council, LED commissioned Battelle Technology Practice to prepare an inventory of Louisiana R&D assets to determine areas of strength for potential development toward national competitiveness. Battelle identified emerging sectors such as digital media, coastal and water management and advanced manufacturing. The report also recommended cross-sector collaboration on technology transfer and commercialization.

Higher education officials working with the Battelle group prepared recommendations specific to technology transfer to complement the report.¹⁰⁹ In large part, there seemed to be agreement that improvements are needed. Recommendations included the creation of a statewide pre-commercialization fund, a catalog of university intellectual property policies and internal faculty governance discussions on the possible inclusion of commercialization activities in promotion and tenure.



CHAPTER FOUR

How Louisiana Minimizes Innovation Resources

Money. Is there ever enough? In Louisiana, the state has expended significant resources over time with questionable results, which should prompt a re-examination of how funds are spent in parallel with discussions on the need for more research funding in general. Existing sources of dedicated revenue are available to Louisiana that would provide sufficient funds to generate a significant R&D program on the scale of the Georgia Research Alliance, a nationally recognized success story that has helped generate thousands of technology jobs. The problem is that the money needs to be spent with more focus and strategic purpose.

The Board of Regents Support Fund - which dispenses more than \$23 million per year - is a dedicated revenue source separate from the state general fund. Its allocation system spreads awards thinly and deserves a close re-examination.

This chapter reviews special sources of R&D funding in Louisiana and illustrates how critical capital is spread thinly under an outdated and inefficient way of allocating vital resources. The Board of Regents Support Fund is of particular concern and a new way of targeting these funds is recommended. The newly created WISE fund holds potential for encouraging results-driven R&D, but only a portion of this fund is available for this purpose and it, like some other state innovation funds, has no regular means of financing and is subject to a politicized process. Also, this chapter reviews a state policy that may be penny-wise but pound foolish; by adhering to a rigid system for obtaining specialized legal assistance with technology transfers and intellectual property commercialization, the state may be perpetuating an obstacle to innovation.

State Funds for R&D

The State of Louisiana includes R&D expenditures in the operating budget for colleges and universities. State funds in fiscal year 2014 for higher education totaled \$1.1 billion.¹¹⁰ According to the Board of Regents, \$181 million was allocated for research at colleges and universities within this year's budget from all available funding sources, which constituted a slight increase over the prior year.¹¹¹ The Board of Regents utilizes a performance-based funding formula to distribute state appropriations. Funding that is meant explicitly to support and incentivize research is just 2% percent of the total formula allocation for higher education. Regardless of their distribution, the dollars become part of the universities' overall funding allocation; in that sense, they act as a block grant and do not specifically flow to research.

In 2014, the Louisiana Legislature established a dedicated fund with a research function: the Workforce and Innovation for a Stronger Economy (WISE) Fund. The stated goal of Gov. Jindal and legislative leadership is for the Fund to support degree production and research priorities in higher education in high-demand fields to help meet the state's workforce and innovation needs. Subject to appropriation, the new law allows a \$40

million annual deposit to the Board of Regents that will be distributed to two- and four-year institutions in accordance with a statewide workforce demand and gap analysis developed by the WISE Council. This group is made up of the four system presidents, the higher education commissioner and representatives of several state agencies. The distribution formula must direct 80% based on degree and certification production in high-demand fields and 20% based on federally funded research expenditures. To qualify for funds, the management boards must certify a minimum 20% private match, which can take the form of cash, materials, construction, scholarships or endowments.

Of note, in its first year, the funding was based on a patchwork of sources that entail a number of limitations on how the dollars can be spent. Roughly \$12 million in the Fund comes from federal Community Development Block Grant recovery appropriations with restrictions on its use.¹¹² Another \$11 million comes from the state construction budget and can only be used for one-time costs such as equipment.¹¹³ The debate has been intense over how to distribute the dollars across four-year and two-year institutions.¹¹⁴ This combined approach of incentivizing degree production and research in high-demand fields as well as mandatory industry involvement bodes well, given that demonstrated success in innovation hinges on progress in both of these areas. The future forms and amounts of financing for WISE are unknown, particularly under continued tight budgets for the state.

In recent years, the Legislature has made various attempts to set aside additional funds for research and innovation. With support from regional economic development partners, legislation was passed in 2013 to establish the Louisiana MediFund with a goal of creating centers of excellence in biosciences and biomedicine, support research and improve health outcomes. Similar to other funds, however, there has been no identified funding source for the MediFund. The board was appointed and convened in 2014 and has received a \$150,000 support grant through the U.S. Economic Development Administration and the Baton Rouge Area Chamber, which is providing staff support and research to identify funding sources.

The Support Fund

Louisiana maintains a constitutionally designated source of state dollars for higher education research known as the Board of Regents Support Fund. The money -- more than \$23 million per year -- does not come from the state General Fund and therefore flows separately from the politically charged state budgeting process. The Fund and its system of allocation deserve a close re-examination.

In 1986, an amendment to the Louisiana Constitution was passed by a popular vote to create the recently renamed Kevin P. Reilly Sr. Louisiana Education Quality Trust Fund (LEQTF). The source of the fund is a permanent dedication of the proceeds from a state settlement with the federal government related to a dispute over revenues from oil and gas production on the Outer Continental Shelf of the Gulf of Mexico. The Fund began with an initial investment of \$540 million and has since grown to more than \$1.2 billion.¹¹⁵ Within the LEQTF are two components: 1) the Louisiana Education Quality Support Fund, which receives 75% of earned investment and royalty income

from the LEQTF and 25% of the earnings from net capital gains/losses; and 2) the Permanent Fund, which receives the reverse. All three sources of income (investment, royalties, and capital gains) are allocated equally to the Board of Elementary and Secondary Education (the 8g fund) and to the Board of Regents (the Support Fund).¹¹⁶ Both utilize a competitive grant process to further distribute the funds to improve academic achievement and educational outcomes.

TABLE 10

REGENTS SUPPORT FUND RECIPIENTS FY 2014			
<i>The Board of Regents Allocated \$14.5 Million in New Grants from the Support Fund to 32 Public and Private Institutions Last Year¹¹⁷</i>			
Institution	FY13-14 Allocation	Institution	FY13-14 Allocation
Baton Rouge CC	\$199,000	McNeese	\$0
Bossier Parish CC	\$75,879	Nicholls	\$840,493
Centenary	Did not apply	Northshore TC	\$45,000
Delgado	\$0	Northwestern	\$196,754
Dillard	\$116,290	Nunez CC	\$97,632
Grambling	Did not apply	OLHC	\$120,445
Fletcher	Did not apply	OLOL	\$44,250
Louisiana College	\$172,162	River Parishes CC	Did not apply
Delta CC	\$0	St. Joseph	Did not apply
LSU Ag Center	\$121,000	SLCC	\$0
LSU Alexandria	\$490,085	Southeastern	\$191,662
LSU Main Campus	\$3,803,245	Southern BR	\$0
LSU Eunice	\$62,500	Southern N.O.	\$315,785
LSU Law	Did not apply	SU Shreveport	\$254,635
LSU Pennington	\$148,639	SOWELA	\$31,633
LSU Shreveport	\$118,335	Tulane	\$2,263,349
LSUHSC N.O.	\$112,000	Tulane HSC	\$987,148
LSUHSC Shreveport	\$0	UL Lafayette	\$1,569,588
Louisiana Tech	\$1,414,469	UL Monroe	\$91,000
Loyola University	\$76,466	UNO	\$441,426
LUMCON	Did not apply	Xavier	\$136,030

Since Fiscal Year 1986, more than \$700 million has been invested in Louisiana universities through the Board of Regents Support Fund, with more than half dedicated to the category of the enhancement of academics and research (\$363 million).¹¹⁸ According to the Board of Regents, the Support Fund has a rate of return of \$1.61 for every \$1 invested in all projects funded since 1987. Reported results include more than:

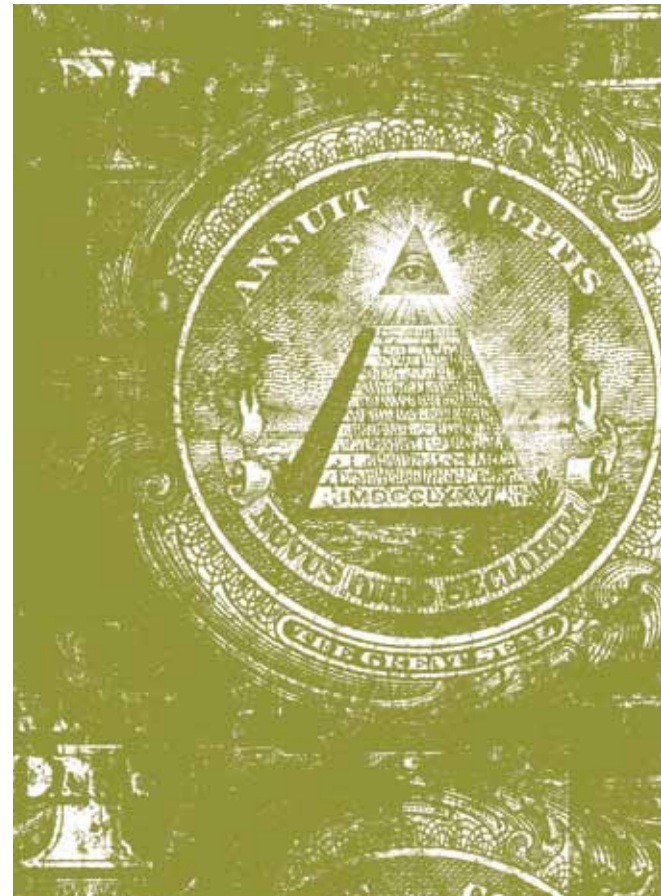
- 3,060 external research awards and \$1.2 billion in external funding from federal, private, and other sources, which Regents estimates in turn to have generated \$2.5 billion in new revenues to Louisiana firms and nearly 45,000 new jobs

- 314 endowed chairs for Eminent Scholars at 26 campuses
- 2,262 endowed professorships at 39 campuses
- 1,514 superior graduate fellowships at 16 campuses¹¹⁹

Thinly Spread Dollars

In the Fiscal Year 2014-15 budget, the Board of Regents estimated \$23.5 million from this constitutional dedication and prepared a budget to that estimate. (Since that time, the Louisiana Legislature appropriated \$27.2 million; the excess is all designated for endowed professorships.) Within the \$23.5 million Board of Regents budget proposed for the Support Fund for Fiscal Year 2015, \$12.4 million was allocated for the enhancement of academics and research, \$4.6 million for “carefully designed research efforts”, \$3.6 million to recruit superior graduate fellows, \$2 million to endow chairs, and \$842,000 in administrative expenses.¹²⁰ These categories are outlined in the Louisiana Constitution and in statute. The Board of Regents has since created 13 programs and subprograms within the four categories, as follows, serving various goals and purposes:

- The **R&D Program** for “carefully defined research efforts”¹²¹ has three sub-programs, which required \$2.2 million this fiscal year to fund prior commitments:
 - The *Research Competitiveness* subprogram (\$1.4 million in new first-year funding) is designed to assist competitive researchers in select fields to overcome the final obstacles to compete for federal R&D dollars.
 - The *Industrial Ties Research* subprogram (\$585,000 in new first-year funding) supports proposals with “significant near-term potential for contributing to the development and diversification of the Louisiana economy.” According to an analysis by LED, nearly half of completed projects within this program were successfully commercialized or in the process of commercialization, and the Board of Regents estimates a direct return of \$11 for every dollar invested. However, there are various troublesome aspects with this Subprogram, which on paper should be hugely important to the goal of building a knowledge-based economy through research and innovation, but instead represents a very small piece of the Regents R&D support. For example, more than 40% of projects were not able to report moderate or significant industrial interaction.¹²² Furthermore, Regents documentation notes that university faculty have



found it difficult to “foster meaningful partnerships with state-based industries” and attribute this assertion to “Louisiana’s undiversified industrial economy and dearth of large industrial-based corporations” and few industries with “substantial capacity for R&D spending.”¹²³ Finally, the Board’s policy, rather than target specific industries anticipating growth or tailored to state economic development goals, is to accept proposals from all research areas.

- The *Awards to Louisiana Artists and Scholars* subprogram (\$450,000 in new first-year funding) was created in fiscal year 2002 to provide support for productions with a potential for broad impact on a regional or national level. The subprogram’s justification within the “carefully defined research efforts,” according to the Board of Regents, was a result of the Board’s strategic plan to improve educational quality “at all levels in all disciplines.”¹²⁴
- The **Endowed Chairs Program** (\$2 million) was created to recruit and retain distinguished faculty with 314 funded chairs in 26 institutions and a total endowment of \$362 million.
- The **Graduate Fellows Program** (\$3.6 million) similarly was created to attract and retain high-quality graduate students into particular departments. Nearly all of the current year funds simply go toward prior obligations.
 - The *Traditional Graduate Fellows* subprogram primarily supports doctoral-level fellows.
 - The *Graduate Fellowships for Teachers* subprogram supports pre- and in-service teachers seeking master’s degrees in science and math, requiring a commitment to teach in the Louisiana school system for at least one year.
 - The *Board of Regents/Southern Regional Education Board Doctoral Scholars* subprogram provides fellowships to build diversity in graduate programs.
- The **Enhancement Program** for “academic, research, or agricultural departments or units within community college, college, or university” is the largest component of the Support Fund, three times the amount of the R&D program – despite the stated constitutional goal of the Support Fund for “higher educational purposes to enhance economic development.”¹²⁵ Much of the annual appropriation funds prior obligations. The Board notes these grants are available to all Support Fund-eligible colleges in the state through six programs:
 - The *Traditional Enhancement* program (\$4 million) is used for the acquisition of instructional and research equipment, identified as “the area of greatest need” in the Enhancement category. Although funds were initially limited to instrumentation, other requests are now awarded for curriculum revision projects, service learning projects, colloquia, and other activities.
 - The *Undergraduate Enhancement* program (\$1.6 million) was established specifically to aid those universities without sizeable graduate programs.

- The *Enhancement Program for Two-Year Institutions* (\$1.1 million) was created in 2002 to ensure community and technical colleges received Support Fund dollars as well.
- The *Federal Matching Grants* Program (\$1.6 million) is used as the state match for federal grants including NASA and EPSCoR.
- The *Endowed Professorships* program (\$2.8 million) is similar to the endowed chairs discussed above. It requires \$60,000 from non-state sources to be matched with \$40,000 from the Support Fund for a minimum \$100,000 professorship. Campuses are allowed to use federal funds to match one professorship per year due to Regents concerns that not enough institutions would benefit. There is currently a sizeable backlog of requests.
- The *Endowed Undergraduate Scholarships* Program for First-Generation College Students (\$1 million) guarantees each four-year institution a \$40,000 endowed scholarship to match a private or institutional contribution of \$60,000 to permanently endow a scholarship fund for first-generation students. Two-year schools are guaranteed \$20,000 with a \$30,000 private match. Students must receive a minimum of \$1,000 annually along with structured support from the university and campus employment.



TABLE 11

REGENTS SUPPORT FUND ALLOCATIONS FY 2014	
<i>Regents Support Fund Category</i>	<i>FY2014-15 Budget</i>
Enhancement	\$12,403,706
Research and Development	\$4,620,000
Graduate Fellows	\$3,614,000
Endowed Chairs	\$2,020,000
Administrative Costs	\$842,294
TOTAL	\$23.5 million

The Louisiana Constitution establishes the four programs, but provides the Board of Regents with complete discretion over the sub-programs and funding allocations of each component on an annual basis. The only exception is for funds already committed to prior multi-year awards, which can be a substantial amount. The most recent Support Fund budget includes a notation from the Board of Regents that the quality of the applications and demand for funding is continuously on the rise.

In addition to the four programs outlined above, the Board of Regents Support Fund also contributes to **Louisiana’s Experimental Program to Stimulate Competitive Research (EPSCoR)**, an initiative of the National Science Foundation. The decision to participate in this federal initiative was made in 1991. In the current stage of the program, \$2 million in Support Fund money serves as a match to \$4 million in NSF dollars for five years, leading to \$30 million in total for the program (one-third state, two-thirds federal). At a national level, the EPSCoR program was designed to promote the science and engineering research capabilities in states that have historically received lesser amounts of federal R&D grants. Given Louisiana’s No. 26 national ranking for R&D expenditures at universities, the Program appears to have met its stated goal increas-

ing federal dollars for research competitiveness. The Board of Regents notes a direct return on investment of \$4.19 for every dollar awarded in NSF grants. According to the Board of Regents, these targeted matches of federal grant opportunities have “enabled the State to progress from receiving minimal support from NSF for research collaboration in the 1980s, to the current environment, in which Louisiana is among the elite of EPSCoR states in successful research-related grants and activities.”¹²⁶

Empty Chairs

PAR’s research indicates many of the universities are satisfied with the Support Fund programs and purposes. Administrators appreciate the external reviews, believe the competitive processes are fair, and feel their faculty and institutions have benefited from the various programs. Interviewees say additional resources could be added within this program to yield even greater benefit to the state.

A review of the programs, however, calls this assessment into question. The Endowed Chairs program is an example, where a recent internal analysis revealed that the earnings from more than \$100 million in endowment corpus were not used for educational or research purposes due to substantial, lengthy vacancies in approved endowed chairs.¹²⁷ This program pairs a 60% private-sector match with a 40% Board of Regents award to endow a chair for nationally recognized scholars. Endowments are made at \$1 million, \$2 million, and \$3 million. Awardees are selected in a competitive process by external reviewers with criteria that include contributions to economic development and academic enhancement.

However, more than 100 endowed chairs (33%) were not assigned a faculty recipient in April 2013, even though the private dollars had already been matched with Support Fund resources. The 2012-13 external review team noted “it is imperative that institutions make greater efforts to fill those positions with aggressive searches conducted within two years of the receipt of the Board of Regents matching funds or within two years of the departure of an existing chairholder.” This analysis resulted in a slight change in Regents policy to assure new chairs would only be assigned if vacancy rates were reduced – and to ensure donors were better informed – but no changes were suggested to affect existing endowments.

TABLE 12

VACANT ENDOWED CHAIRS			
<i>One-Third of Louisiana’s Endowed Chairs are Vacant</i>			
Higher Education System	Private and Public Match	Vacant	% Vacant More than Two Years
LSU System	135	54 (40%)	42 (31%)
La. Association of Independent Colleges and Universities	95	14 (15%)	7 (7%)
UL System	75	31 (41%)	25 (33%)
Southern System	4	2 (50%)	2 (50%)
LCTCS	n/a	n/a	n/a
Statewide Total	309	101 (33%)	76 (25%)

The budget for Endowed Chairs was also reduced and funds shifted instead into the Endowed Professorships program to the tune of \$2.8 million due to the volume of outstanding requests from campuses. Of note, however, 450 of more than 2,000 endowed professorships (22%) were also vacant at the time of the Regents analysis. While the new policy applies to professorships as well as chairs, the fiscal year 2015 budget for the Support Fund notes they will maintain “funding guarantees of two \$40,000 matches per four-year and special purpose campus, and one \$40,000 match per two-year campus.”¹²⁸ Dollars will be spread across campuses, which begs the question of whether any real changes will occur to ensure the utilization of state dollars to find and fund high-quality scholars in key areas of study.

Low Leverage to Improve Outcomes

In sum, there are more than 20 programs funded with Support Fund dollars constitutionally dedicated to enhancing economic development in public and private universities in Louisiana. Faculty awards and institutional totals tend to be relatively small in comparison with the overall annual budget of more than \$25 million. For example, in fiscal year 2013, 22 of the 44 eligible institutions received Support Fund dollars in 162

competitive awards for a total of \$19.6 million in commitments. However, with only two exceptions, institutions that benefited from competitive awards received less than \$1 million total in first-year funds, one as low as \$57,000 for the entire campus.¹²⁹ The average first-year award was just \$85,000.¹³⁰

While EPSCoR seems to have achieved its intended goal to increase federal R&D in Louisiana, the commercialization of research and other technology transfer outcomes at universities do not seem to have improved as a result. Although each individual sub-program might be worthwhile and fulfill a need in higher education, there is serious question as to whether 20 distinct efforts across 44 eligible institutions resulting in relatively small allocations are truly leveraging the state’s investment and fulfilling the constitutional purpose of enhancing economic development.

Louisiana Regulations and the Hourly Rate Obstacle

Across Louisiana, interviewees almost unanimously agreed the state’s laws are favorable to innovation, R&D, and investment. Yet the vast majority also agreed upon one specific regulatory obstacle to their work over the years. The Louisiana Office of the Attorney General has historically imposed a low hourly rate on the amount state agencies can spend on outside legal counsel. Louisiana law requires that the Attorney General appoint private legal counsel to represent state agencies, with the concur-



rence of the Commissioner of Administration.¹³¹ The procedure for such appointments is established by the Attorney General and the Governor or their designees. As part of this process, the Attorney General maintains an hourly fee schedule for the use of special attorneys by state agencies. The current cap is \$225 per hour, which was recently raised from the \$175 per hour cap that was in place since the administration of former Attorney General Richard Ieyoub (1992-2004).

While this amount may sound reasonable, the LSU Transition Advisory Team pointed out the average hourly rate for an intellectual property attorney in the southeast United States is more than \$500 per hour.¹³² The costs for attorneys include patent and trademark searches, filing and protection fees, maintenance fees, and drafting expenses. Even without attorney fees, the costs of acquiring a U.S. patent in 2011 ranged from \$8,960 for a provisional patent to \$10,910 for a plant patent.¹³³ Experts note: “The patent search alone can take weeks, in addition to the average 22-month period between application and issuance.”¹³⁴ Universities nationwide spent \$345 million in external legal fees related to intellectual property and technology transfer.¹³⁵

The attorney fee limit may be a deterrent to finding specialized legal help with patents and licenses, but the AG office grants waivers when justified.

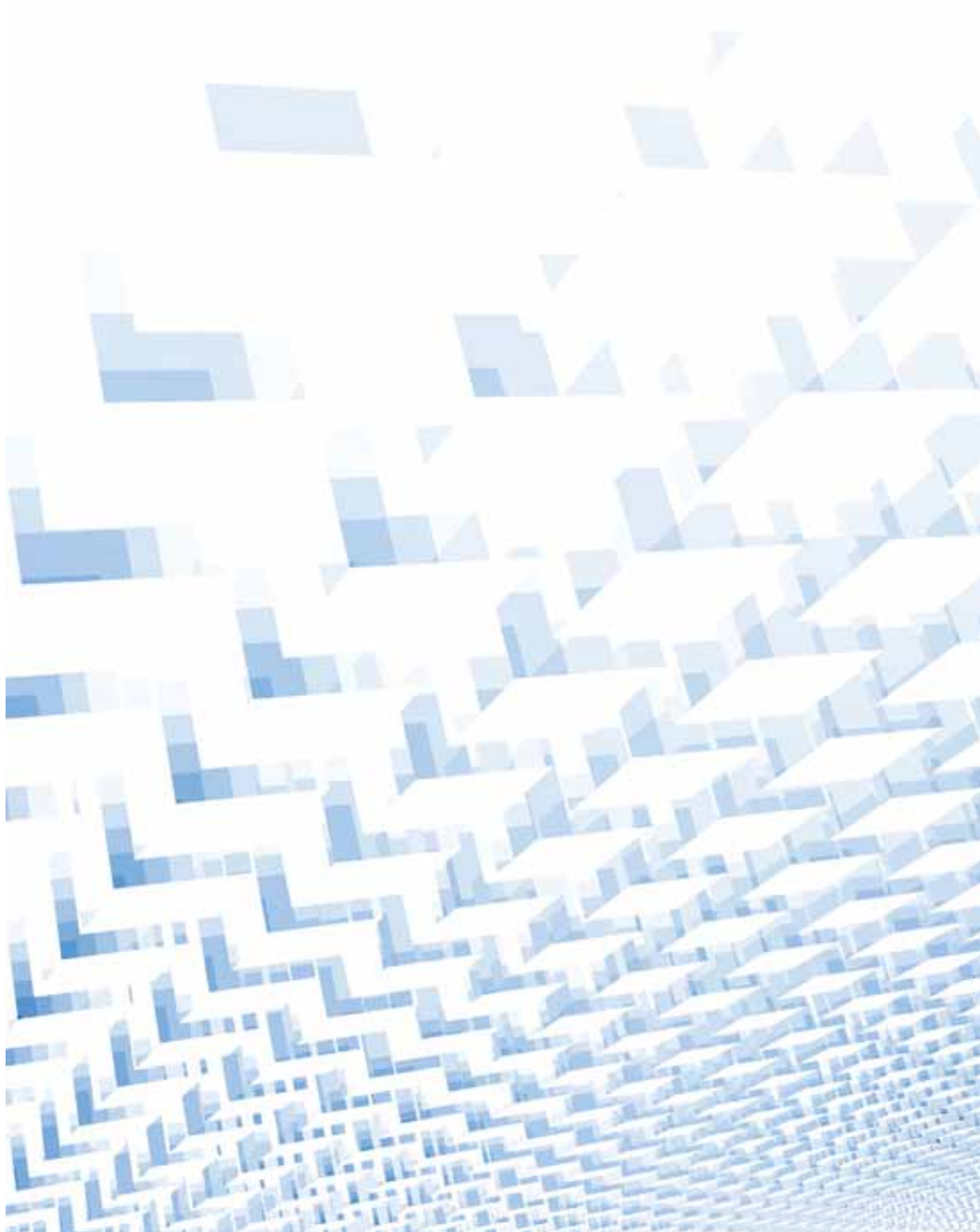
In the 2014 legislative session, a new law was passed in Louisiana to place more stringent requirements on the use of private legal counsel by state agencies. The new law bans the use of most contingency fee contracts, caps attorney fees at \$500 per hour, and requires detailed record keeping. Of note, Act 796 of 2014 exempts “public postsecondary education institutions” from the contingency fee ban and the maximum hourly rate.¹³⁶ It can now be argued that, at least according to statute, Louisiana’s colleges have more flexibility than other state agencies in funding attorneys for intellectual property and other needs although the Attorney General’s hourly fee schedule remains in place.

Licenses and patents can be technical and complex, particularly for high-tech devices or pharmaceuticals. The \$225 per hour standard for attorney fees appears to be an outlier when examining other states. It can place Louisiana faculty and universities at a disadvantage when seeking expert advice on bringing research to the market. Because of this low rate, at one point, only one law firm was handling licenses and patents for the state’s flagship research university. Flexibility with attorney fees could help reduce the potential for delays and backlogs and assist universities in hiring industry-specific national legal experts when necessary.

If justified under the circumstances, the Attorney General’s Office has the ability to grant university requests to pay hourly contracts at rates above the fee schedule. Before 2014, only about 6% of 800 annual requests from state and local government included a request to approve outside counsel at a higher hourly rate, according to the Attorney General’s office.¹³⁷ Even fewer such requests have been made since the standard fee was raised in 2014. Furthermore, senior staff in the Attorney General’s Office interviewed for this report believe they have never turned down such a request from a Louisiana college and esti-

mated at least three or four such contracts were in place at the time.

This point stands in contrast to the interviews from university officials, who note that the Office “typically rejects requests to find niche attorneys out of state for particular negotiations.”¹³⁸ When asked about this issue, the staff in the Attorney General’s Office suggested a disconnect between the research and technology officers on campus and the university system attorneys who are trying to keep costs down and may not actually request the higher fee. It is most likely that both are correct – that the fee schedule serves as a deterrent to finding the most appropriate counsel and those universities do not always take the extra step and request the waiver of the fee schedule.



LOUISIANA'S TAX CREDIT INCENTIVES

Louisiana provides a variety of incentives that encourage private investment in R&D, innovation, and technology transfer from Louisiana's universities. While not a direct appropriation, these incentives certainly represent a state expenditure and investment in R&D and innovation. In fiscal year 2013, LED verified and the Louisiana Department of Revenue issued more than \$25 million to companies that qualified for the tax credits.

R&D Tax Credit (\$24.3 million, FY 2013) – Named by the Tax Foundation as the third most generous R&D credit in America, this incentive provides up to a 40% tax credit on qualified research expenditures incurred in Louisiana. It has neither a minimum requirement nor a cap. Louisiana law specifically denotes the credit is for research that is technological in nature and excludes research conducted in the social sciences. It is set to expire in 2019 without action by the Legislature. The administration recently streamlined the awards process to address concerns about the lengthy time to process applications and disburse funds.

Technology Commercialization Credit and Jobs Program (\$105,000, FY 2013) -- Capped at \$250,000 per application, this incentive provides a 40% refundable tax credit for businesses that invest in the commercialization of technology created by

a Louisiana business and researched by a Louisiana college or university. Qualifying costs include machinery, equipment, licenses, patents, copyrights, and payments to the schools or third-party research centers in Louisiana. It is set to expire in 2017 without action by the Legislature.

Angel Investor Tax Credit (\$1.8 million, FY 2013) – Capped at \$5 million annually, this incentive provides a 35% tax credit on investments by accredited investors funding companies certified by the Louisiana Department of Economic Development as "Louisiana Entrepreneurial Businesses". These companies must have sales of less than \$10 million annually or a business net worth of less than \$2 million. Qualifying funds include capital improvements, equipment, R&D, and working capital. It is set to expire in 2015 without action by the Legislature.



Recommendations to Meet Louisiana's Challenge

Past studies of Louisiana innovation have made useful recommendations, including some repeated in this report. Progress has been made. But there has been insufficient action and definitively too little impact. New leadership in higher education holds great promise if they can embrace this mission and get the necessary support from state and legislative leaders. PAR's report is one of only a few that offer an independent, statewide analysis, rather than a study by the actors themselves or studies restricted to a regional or institutional level. From this vantage point, three issues appear to represent the core of the innovation dilemma in Louisiana: 1) the role of leadership and institutional culture, 2) a historic lack of respect or interest by institutions of higher education in participating as partners in economic development through commercialization or other means; and 3) the prioritization of resources, both financial and talent.

The role of university leadership and institutional culture cannot be overly emphasized.

Louisiana is decades behind other states on the intellectual infrastructure for innovation because some leaders, by and large, did not prioritize the economic development mission of the university or commercialization of research in general. Gubernatorial administrations, economic development agencies and the higher education enterprise share the responsibility for creating and improving Louisiana's innovation ecosystem and historically this was neither well-coordinated nor executed on a statewide basis. To be clear, this is not a judgment against the decisions of Louisiana's elected officials and institutions to prioritize, for example, the advancements in access of undergraduates to the university and a pipeline for a talented workforce. However, a focus on academic success and workforce does not necessitate a trade-off in world-class research.

While the private sector has begun to embrace the "open innovation" model, some Louisiana universities have leaned toward protecting the institution rather than moving research into the market. This cautious approach, often at the behest of legal counsel at universities or system offices, is arguably a major reason for the shortage of outcomes and knowledge transferring out of the university and into the market. Yet one of the most significant ways universities can positively influence regional and state communities is to push innovation out rapidly and easily while building private-sector ties to improve the economy.

Experts note that universities must actively seek to overcome barriers to technology transfer, including "informational and cultural barriers" such as university-industry clashes, entrenched bureaucracy, and concerns that working with the private sector will "interfere with academic freedom", among others.¹³⁹ The change must start at the top, and Louisiana is not unique in its struggle to change attitudes and culture. One official at Ohio State University notes the decade or more it took to change the perception of technology transfer at his campus: "Now what you hear from the governor all the way down to the chairperson level is that commercialization is a good word.



It is a culture change, and it is not going to happen by a tsunami. It is going to happen by continued diligence.”¹⁴⁰ Effective results have been achieved in other states for a variety of reasons, including policies and resources as well as a supportive culture and leadership, particularly in higher education.

The bottom line is that the important work and discoveries occurring in Louisiana universities should not remain in laboratories or scholarly journals. The benefits to our state of a well-orchestrated, multi-institutional, public-private campaign to improve innovation are too great to allow bureaucracy, personalities, or turf battles to serve as an excuse to continue running in place. Universities with strong track records in technology transfer do not have the same protective approach. When the priority is moving the research out of the lab and into society, that is what happens.

There are different avenues to achieve this goal – some institutions emphasize commercializing as many discoveries as possible for community and to maximize their chances of “hitting it big.” Others are more selective with their time and investments in technologies that are likely to make it in the market. Others encourage spin-off companies to avoid the financial risk to the

university. Regardless of the mechanisms and approach, it is the leadership and culture of expectations that can make the difference – that research will be commercialized, that an impact on the economy of the state is important, and that each institution has unique niches and areas of expertise that should shape their role in that process.

The most often cited reason why Louisiana continually ranks low on the outputs from applied research is resources. Interviewees inside universities frequently note that without more funds, without more expenditures on R&D, the institutions cannot be expected to produce more. This is true to a certain extent, and it is also true that other states have made significant targeted investments in R&D in recent years to develop niche areas and targeted wins. To accomplish this, Arizona has raised taxes through a vote of the people, West Virginia has earmarked taxes by a vote of the Legislature, Kansas has enacted Tax Increment Financing, and Ohio and California have issued bonds. Still, other states, including Georgia and Kentucky, have worked within their general budget to appropriate funds on an annual basis.¹⁴¹

Louisiana has the capacity to fund additional and more targeted R&D through the constitutionally dedicated Support Fund. In the past ten years, that budget has averaged more than \$23 million annually. However, it is dispersed across nine programs with grant awards that tend to range from less than \$100,000 to a few hundred

thousand dollars – very small amounts that are not targeted toward a particular research priority for the state, or economic area of strength or growth, or niche area for Louisiana. Despite recent attempts by the state to catalog R&D assets and identify priority areas for research, there is no indication that the Support Fund investments will be any more targeted as a result. As noted by many experts and throughout this report, focused spending is critical to ensuring state investments have the desired outcome.¹⁴²

Even as Louisiana’s challenges in this area are arguably over-studied, recommendations are implemented rarely and slowly, particularly with regard to funding priorities. For example, various campuses have stressed both the value and the need for pre-angel seed funding to verify the commercialization possibilities for research projects. Venture capital is only available at later stages of research, and angel capital is a high-risk endeavor that requires some basic validation prior to investment. However, neither the Board of Regents nor the Louisiana Innovation Council have re-examined the Support Funds or re-allocated the dollars to fulfill a need for proof-of-concept funds, a form of very early-state risk capital. These grants for commercialization could translate to significantly more technology transfer. Universities are attempting to take on this task directly instead, even as state dollars are constitutionally dedicated for exactly this purpose.

Louisiana is fortunate to have a dedicated funding stream for R&D already approved by the people in the Louisiana Constitution and enacted by the Legislature — with the flexibility in the law for the Board of Regents to approve policies to keep the Fund relevant and effective. Prioritization and directing resources accordingly can solve some of the challenges to bringing research to market. The Board of Regents dashboard for the Master Plan indicates hundreds of millions of dollars are already being used for “aligned investment of State and campus resources in areas of high potential for research commercialization.”¹⁴⁴ That statement simply cannot be reconciled with the outcomes. A more narrow focus, more selective priorities, and better targeting and leveraging of resources is a clear necessity for the Board of Regents and for management boards alike.

National best practices and PAR’s site visit to Georgia only confirms the assertion that innovation and market-driven research must be prioritized in resource allocations. As interviewees stated: “Basic research is not the purpose of GRA (Georgia Research



TABLE 13

SUPPORT FUND ALLOCATIONS OVER PAST DECADE

Annual Allocation for the Louisiana Board of Regents Support Fund Shows A Substantial Commitment and Investment Over the Past Decade¹⁴³

Fiscal Year	Allocation (*Budgeted)
FY2015	\$23.5 million*
FY2014	\$23 million*
FY2013	\$29.2 million
FY2012	\$23.9 million
FY2011	\$23.7 million
FY2010	\$25.4 million
FY2009	\$34.6 million
FY2008	\$34.0 million
FY2007	\$32.7 million
FY2006	\$29.7 million
FY2005	\$34.4 million

Alliance) dollars. These funds must be focused and specific as an enterprise.” While all research is important – and basic research often forms the foundation for applied research and inventions – it is time for Louisiana to make a deliberate choice to boost applied research. Findings have remained in labs and in articles for far too long at Louisiana’s major institutions, and leadership should swing the pendulum in the other direction, at least for a time.

The higher education system cannot control some factors that enhance technology transfer, such as proximity to numerous and concentrated high-tech firms. But Louisiana can use existing resources to replicate best practices and successful models. There is a unique window of opportunity in Louisiana to enact important changes. A new governor will take office in 2016 along with a number of new legislators as a result of term limits. The Board of Regents has just completed a national search and selected a new Commissioner of Higher Education. The presidents of three of the four university systems have been on the job a relatively short time. With new leadership and a re-energized commitment, higher education leaders can make decisions that will likely be unpopular on some campuses and among some faculty, but will model Louisiana more like other states, maximize our existing resources, and put us on the path to accelerate toward a knowledge-driven economy.

For comparative purposes, looking back 10 years ago, few would have predicted that Louisiana would now top popular rankings across the country for progress in economic development. Louisiana takes first-in-the-nation honors for Business Climate by Business Facilities magazine and ranks in the Top 10 in three other national rankings from Area Development, Chief Executive, and Site Selection.¹⁴⁵ Without a doubt, the state has turned the corner in attracting business investment and creating jobs due to a variety of policy and resource allocation decisions. It is not far-fetched to believe that same scenario can occur within Louisiana’s R&D community – with new policies, a re-direction of resources, and the commitment of leadership in state government, in higher education, and in the private sector.

The Governor and the Executive Branch

- **Appoint and empower a designated leader for Louisiana innovation.** Coordination and commitment is key to making inroads to improve the state’s research performance and outcomes. Some states have a cabinet-level position, such as the Oklahoma Secretary for Science and Technology, while others have entire public agencies devoted to this effort such as the Arkansas Science and Technology Authority. A senior-level Executive Director for the Louisiana Innovation Council could lead and execute a statewide strategy, consistently connecting the dots across the Board of Regents, four higher education systems, the Louisiana Department of Economic Development, and business and industry. Much like the Louisiana FastStart program – now recognized as the best in the nation for customized workforce training – prioritizing and focusing on innovation within LED could bring about real results.

- In making appointments to the Board of Regents, **the Governor should consider individuals with private-sector experience and/or with expertise in innovation**, high-demand industries, venture capital, entrepreneurship, and other areas of relevance to furthering the mission of economic development within higher education.
- **The Louisiana Economic Development Department should continue to aggressively engage higher education to advance a statewide innovation agenda**, as it has begun to do in recent years. Funding the Battelle study and convening stakeholders was an important first step, but implementation and ongoing relationships will be key in the future to sustain a new mindset that facilitates an innovation ecosystem across the public and private sectors. Furthermore, LED should consider the assets and needs of universities in its own work – in recruiting businesses to Louisiana, finding workforce solutions, and creating jobs. The targeted financial support provided to Louisiana universities as components of economic development incentive packages for companies like IBM and CGI to improve academic programs and produce more graduates is a model that should be advanced. Similarly, the recent announcement of LED’s participation in securing a top-notch national expert for a cyberengineering effort at LSU is another example of what the agency can do to advance university-based innovation. LED and the Louisiana Innovation Council should play a leadership role in the discussions to re-prioritize the Support Fund toward applied research and commercialization. On a smaller scale, a simple but useful step would be to include technology, innovation, and research needs in their business expansion and retention visits with in-state companies and summarize the findings annually for the universities.
- **Continue to recruit companies in high-tech sectors and with R&D capacity.** Major successes were achieved in 2014 with high-tech announcements of new and expanding firms that frequently include university partnerships as a major component of the economic development plan. This is a trend that should continue to diversify the state’s economy while also incentivizing industry-university research and workforce partnerships.
- **Consider co-location of relevant staff across agencies.** In model states for innovation, the economic development offices are physically located in the same building with high-growth workforce development training programs, business incubators, and university (or foundation) technology transfer offices. Private companies tend to locate nearby also, creating a physical ecosystem that can promote collaboration merely from proximity and relationships.
- **Utilize the newly created Governor’s innovation award and “Innovation Month” to highlight successful university-private partnerships.** Consider a financial component through philanthropic or private sponsorship opportunities.

Ideally, modernizing the Support Fund would begin with a Constitutional Amendment to start with a clean slate.

The Louisiana Legislature

- **Authorize and direct the Attorney General to establish criteria for a new approval process for the use of higher attorney rates by universities for the pursuit of intellectual property legal advice.** These rates should not be applicable for legal contracts related to litigation. While the hourly fee schedule is an important mechanism for cost control across state government and the Attorney General does indeed grant waivers, in this instance regulatory controls are potentially deterring opportunities for innovation for the benefit of the state. Along with the criteria for the use of higher rates – and the inherent constraints of university budgeting and prioritization for intellectual property attorneys – the 2014 law requiring detailed record keeping will help provide transparency to limit possible abuse of the exception.
- **Re-authorize the relevant innovation tax credits and rebates that are yielding a return on investment.** These incentives were recognized in and out-of-state as encouraging the right behaviors by companies and universities.

Slight improvements may also be necessary. For example, the angel investor credit excludes partnerships and is only authorized for individuals who may not always have the expertise to make the particular investment on their own. Authorizing credits to transfer to investors and partners, even within a start-up for example, is likely to produce more sizeable funds for researchers and entrepreneurs. Federal laws now enable crowd funding and non-accredited investors to make equity investments, which might be useful to replicate in Louisiana's law. Innovation tax credits should expressly specify that industry-sponsored research at universities can qualify for the incentive.

- **Provide sustainable funding for the newly created WISE Fund and consider expanding the intent and goals to other higher education funding mechanisms.** While workforce is the primary focus of the WISE Fund, a smaller component is dedicated to improving research. The combined approach of incentivizing degree production and research in high-demand fields as well as mandatory industry involvement bode well, given that demonstrated success in innovation hinges on progress in both of these areas. Ideally, this approach would be integrated in other Regents funding mechanisms for research from the general appropriation to the Support Fund.

The Louisiana Board of Regents

- **Emphasize economic development as one of the stated fundamental missions of the Louisiana higher education enterprise.** Model states recruit an Associate Commissioner for Economic Development to lead the effort, enhancing the level of industry partnerships at each system and campus across the state. Valuing commercialization and bringing products out of the lab and into society must start at the top. This is not a new idea. The topic remains over-studied and much discussed. It is time for leadership to take action.
- **Modernize and re-vamp Louisiana's long-standing research program, the Board of Regents Support Fund.** A number of Louisiana technology transfer officers noted the

importance of some of the Regents Support Fund dollars, particularly the industrial ties program and research competitiveness funds. Of note, these two programs total less than \$2 million in new first-year funding of the \$23.5 million expended by the Support Fund in the current fiscal year.¹⁴⁶ There are also facets that cut across all of the Support Fund programs that are laudable, such as the emphasis on collaboration across institutions, the use of national peer reviews, and strict conflict-of-interest provisions.

In general, however, the PAR analysis shows that millions of dollars annually flow to other programs largely unrelated to research and economic development, such as the arts program and individual scholarships. In place since 1986, and now with 13 sub-programs, the time has come for an overhaul of the Support Fund to focus on 21st century models of innovation, to target dollars more strategically, and to improve performance.

Ideally, modernizing the Support Fund would begin with a Constitutional Amendment to start with a clean slate. In this scenario, funds would no longer flow only through the Board of Regents, but decision making would involve critical stakeholder groups outside of higher education such as the Louisiana Department of Economic Development and the Louisiana Innovation Council – operating more like the newly created governance body for the WISE Fund that requires some consensus and agreement with actors both inside and outside higher education.

Based on the research and recommendations in this report, the state should be funding three major areas of work within the Support Fund's current mission of "higher education for economic development purposes." First, Louisiana should create a true Eminent Scholars program to recruit and retain nationally recognized faculty in niche areas of work that will support Louisiana's economic development goals, provide them with equipment, and support their research teams. Second, additional and targeted statewide proof-of-concept funding is vital to transferring the research out of the labs and into the market. Finally, the state should continue to participate in the EPSCoR program in partnership with the National Science Foundation, even as the dollars should be more targeted and leveraged to sub-programs that have the greatest impact.

Because the majority of annual funds are already committed to prior year awards, it's important to begin this process sooner rather than later. Recognizing that an overhaul with a constitutional change is a lengthy and long-term initiative, **the following recommendations are offered that can begin immediately.** Neither legislative action nor additional resources are required. The Board of Regents can simply make the decision to re-design the program within its current constitutional and statutory mandate to be more focused on creating an innovation ecosystem based on best practices and model states.



- **Narrow and align the Support Fund’s goals with the state’s economic development plan and fund research accordingly.** Focus investment on industry clusters of relevance to Louisiana’s economy and future growth, utilizing the Battelle study and others to build a resource strategy. Further, define these strategies – and how targeted areas of Support Fund research fit into this mission – to university systems, the peer review and selection committees, and the researchers and awardees themselves. Support Fund recipients need clear expectations for how they should be contributing to economic development within their specific area of work. In fact, an analysis by the Board of Regents in 2009 noted that administrators “requested additional clarification and guidance in how to describe, deliver, and assess the economic development contributions.”¹⁴⁷ To state the desired outcome for “economic development” of research by scholars and Support Fund recipients without definition or benchmarks is a disservice to the faculty and to the state.

The Board of Regents is quick to note that more than 90 percent of Support Fund resources have been allocated to science, technology, engineering, and math initiatives (STEM). However, STEM can be very broadly defined. A more narrow and aligned focus within STEM is required. After defining economic development more specifically for researchers, the Board of Regents should consider increasing the scoring value assigned to this purpose. Finally, set clear goals for outcomes and measure progress to better gauge performance and promote accountability to the intended purpose. The LSU College of Engineering scorecard is an example of such a tool.

- **Embrace a competitive, mission-driven approach, and stop spreading resources to the point of diluting impact.** Every institution in Louisiana has a unique role, scope, and mission. Yet research and development to build a knowledge-driven economy is not the purpose of every entity. While it may be an attempt to address political or parochial interests, it is unwise to expend resources on Eminent Scholars in two-year schools without substantial research programs, for example, just as the requirement for new professorships annually in every institution can mean that opportunities are lost and resources are not adequately leveraged. **A sizeable portion of the Support Fund, particularly within the R&D program, the Endowed Chairs Program, and the Graduate Fellows Program should be restricted to Tier One and Tier Two research universities only** with few exceptions for outstanding cases only. The Board of Regents should move away from attempting to distribute funds equitably across all institutions and instead leverage the dollars more strategically where the outcomes of commercialization and economic development can best be realized.
- **Evaluate the levels of funding for each sub-program and consider the decrease or elimination of areas that are not directly contributing to the Constitutional goal of the Support Fund, which is “to enhance economic development.”** While the Constitution defines four broad categories, it does not limit the Regents to any particular allocation for each of the programs. In fact, the Board of Regents is authorized to allocate Support Fund dollars “for *any or all* of the following higher educational purposes to enhance economic development.” That is to say, the Board

of Regents could shift funds out of the enhancement category (undergraduate scholarships) and into endowed chairs in its plan and budget in any given year, without additional legislative authorization.

The Regents have expanded the Support Fund uses over the years to ensure all campuses benefit, regardless of public or private, two-year or four-year, research or academic. While the intentions may be sincere, dollars are spread too thin as a result and Louisiana's progress toward innovation suffers. PAR recommends specific changes below, but there are several sub-programs, such as the Undergraduate Enhancement Program (\$1.6 million) and the Enhancement Program for Two-Year Institutions (\$1.1 million) that could potentially remain in place at low funding levels in order to ensure some statewide benefit while still maximizing dollars in other areas at a sufficient level to fulfill the intended Constitutional mission of the Support Fund.

The Board should adopt plans to:

- **Transform the Endowed Chairs program** (\$2 million) to replicate aspects of the Georgia Research Alliance Eminent Scholars model through the redirection of funds from other Support Fund programs as well as dollars designated for endowed chairs and professorships that are unused today. The Board of Regents, the Louisiana Innovation Council and university systems should work with private donors to collapse some vacant endowments, then aggressively recruit nationally known eminent researchers in targeted areas. The end result could be fewer chairs and professors, but rather a more effective recruitment of world-class and well-funded Eminent Scholars that are capable of bringing in research teams and dollars for years to come. Over time, this transformation could significantly enhance Louisiana's ability to attract more federal and private-sector research in targeted areas.
- **Collapse the various sub-programs within the Graduate Fellows Program** (\$3.6 million) and utilize at least some of these dollars to build packages of support for graduate research teams that would accompany Eminent Scholars recruited for targeted areas of work.
- **Narrow the focus of the Traditional Enhancement Program** (\$4 million) to acquire research equipment that will support the recruitment of Eminent Scholars or existing labs in the state's targeted economic sectors, rather than awarding dollars for such activities as colloquia. The total dollar amount might also be reduced as well and used for other areas of need.
- **Establish a proof of concept funding mechanism.** "Technology triage" is needed in Louisiana to help those institutions and faculty whose research is viable and should proceed to the market. This was a noted gap in Louisiana's funding scheme and one that could prove to be a high return on investment and give the state a much-needed boost for immediate increases in commercialization figures. The private sector must play a role in the creation and oversight of the funding mechanism. The Board may also want to con-

sider regional proof-of-concept funds to recognize and address more localized needs more efficiently.

- **Pool dollars for short-term pre-identified purposes**, such as a coordinated, multi-institutional effort to recruit a federal research center as suggested in the course of the assessments with Battelle, LED, and the Master Plan Research Advisory Committee.
- **Remove the requirement that all campuses benefit annually from the Endowed Professorships program**, a criterion that has no goal other than to spread the dollars across the state, regardless of need or size of the institution or research impact.
- **Eliminate the Endowed Undergraduate Scholarships Program for First-Generation College Students** (\$1 million). While a noble goal that fulfills a real need, there are other sources of federal, state, and private funds to serve this student population, rather than the constitutionally dedicated dollars for higher educational purposes aimed at economic development.
- **Eliminate or alter the Awards to Louisiana Artists and Scholars sub-program** (\$450,000). If kept, this category should be changed to fit the definition of a high-growth sector for the state.
- **Expand and advertise the Industrial Ties Research Sub-program** by working closely with LED to identify industry needs and connect businesses to research while directing funds to specific industries anticipating growth or tailored to state economic development goals. The Regents should not accept proposals from all research areas for such limited funding.
- **Incentivize linkages across the technology transfer continuum.** Ensure that researchers across the state are aware of the incubators, chambers of commerce, and other public and private resources available to assist them beyond their own campus. Scale up best practices from the campuses to share across the state. Leverage state assets that were documented in the recent Master Plan and Battelle reports for statewide gain.
- **Establish a more rigorous review system to determine if Regents research dollars are truly having an economic impact and make attempts to more widely publicize the work.** Revise the Master Plan dashboard and ensure that data is available and comparable by institution. Today, there is no centralized location to learn how many start-up companies have resulted from state R&D dollars, for example, and where they are located or how they are faring. Metrics are important beyond the R&D input figures and should track the national movement to add new performance measurements for university research. Furthermore, publishing examples and success stories to highlight the value of commercialized research and start-up companies to the state's higher education and economic development goals is easily accomplished through online articles. The Regents should consider something as basic as publishing and promoting the contact information for technology transfer officers at all Louisiana campuses on a dedicated webpage and including links to the business incubators, as well.

The Higher Education Systems and Management Boards

- **Institutionalize economic development as a priority in university systems and on campus.** This recommendation should be embraced at the Board of Regents level, as outlined above, and is largely under way within the Louisiana Community and Technical College System, which has a more direct connection of curriculum, certifications and degrees leading to the workforce. This is not a major resource issue, but a choice of leadership by system boards as well as management in each system and campus. Mission statements and campus visions should incorporate the goal of economic development and job creation. Management boards should direct campuses and departments to have a person or team that pursues economic development and industry partnerships. Administrators should be designated as industry liaisons, or hired as economic development leaders. Department heads and chairs should gradually become champions of the broader societal benefit of their work among the faculty. The state's target economic sectors for growth should be common knowledge, and industry contacts should be encouraged, valued, and developed strategically and methodically. With a comprehensive perspective and approach – that starts at the top but penetrates the university to the faculty and student level – the commercialization effort will grow organically.
- **Know your niche, how it contributes to economic development, and excel at it.** While universities certainly have a variety of missions and constituencies to serve, leaders should have situational awareness on the strengths within the university that can contribute to Louisiana's knowledge-based economy. It is these areas where commercialization opportunities must be emphasized and resources prioritized.
- **Trend away from the “university protection” mindset and towards viewing commercialization, economic development, and public benefit as primary goals of university research.** Earlier this year, the LSU system was correct to abandon the requirement that the Board of Supervisors approve all intellectual property agreements. Such high-level approvals are not required at effective research universities around the country. Assisted with templates and guardrails, universities should seek to decentralize this authority to vice-chancellors or licensing officers – or to foundations. Moving research seamlessly into the market should be a priority. To that end, management boards should seek to simplify rules that enable companies to contract with university researchers and to use research equipment and labs. University officials need to be honest about the strengths and weaknesses within their university. The faculty tend to know where the gaps are and can help identify and address them. Then they are able to pounce into a particular area in a timely and strategic way.

Move away from bureaucracies and toward a streamlined process more like model states. Experienced licensing officers need to be empowered with authority and resources. Licensing staff should be strong enough to evaluate risk and potentially write the provisional application if they have the technical background.

- **Create and empower research foundations.** In other states, research foundations are providing important services and support to universities' research and technology transfer mission, offering flexibility from bureaucratic process and state laws

and provisions affecting public agencies. Careful evaluations must be made of the potential trade-offs with public access to records so that foundations are not used to conceal documents that properly belong to the public.



While a few Louisiana universities have research foundations in place to support technology transfer, no public university is currently taking advantage of the flexibility these entities can provide. For example, the intellectual property developed at Louisiana Tech is legally the property of the university's research foundation. However, in part because officials were able to negotiate a higher reimbursement rate with the state Attorney General's Office, Tech continues to utilize the state's procurement process for intellectual property attorneys, even as the university is not the contracting agency and the foundation is. The LSU System Research and Technology Foundation was founded in 2002 with a stated purpose of transferring the university's intellectual property and research into the market, yet until very recently it served primarily as a business incubator on campus. New leadership is well on the way to making the shift to a shared services model.

Elevating the role of the research foundation to actually license and patent university research removes some legal and bureaucratic barriers and moves away from protecting university assets toward a more focused effort on bringing research into the marketplace. It also speeds up the process, as a foundation can approve licensing and patenting by working directly with the technology transfer offices from each campus. Centralizing the development of licensing templates and instituting a single process for protecting intellectual property is more likely to encourage the support of industry, cut across campuses, and elevate the level of sponsored research. Other best practices from university research foundations include shorter periods from disclosure to licensing, access to more experienced and specialized attorneys, and greater accountability for the overall outcomes of the university research enterprise.¹⁴⁸

University systems in Louisiana should consider the research foundation model as a means to streamline and expedite commercialization. Even though Louisiana Tech already has a research foundation, which owns the intellectual property developed on campus, it is under-utilized. The university should consider transferring more responsibility for commercialization along with the ownership of the IP itself in order to reap the benefits of flexibility, such as the ability to seek legal contracts at higher, more specialized rates. Similarly, the University of New Orleans Research and Technology Foundation Inc. exists but serves the university with facilities financing and acquisition and management functions, rather than technology transfer or commercialization support. The University of Louisiana System should explore the

benefits of creating a new research 501(c)(3) entity that would serve a distinct centralized commercialization purpose to complement the more philanthropic orientation of the existing foundations at Tech and the University of Louisiana at Lafayette and the management functions at the University of New Orleans.

Under the new agreement at LSU, the system has the best opportunity in recent memory to fulfill the mission of the university's existing research foundation and transfer the responsibility for major aspects of commercialization. At a minimum, through a "shared service" model, the foundation appears to be assuming such tasks as databases and record keeping and legal services. The university should also consider transferring the ownership of the intellectual property itself and the responsibility and oversight for performance of technology transfer operations. This move could simplify a process that is dramatically different in each entity within the LSU system and also encourage the breakdown of silos where opportunities for cross-collaboration could be lost today. There is no question that technology transfer services, staff expectations, lines of authority and reporting, performance goals and reviews are different at every research entity within the LSU system today – leading to a complex and confusing web with varied outcomes. The Baton Rouge Area Chamber's analysis recently found that research universities with foundation models generate 176% more licenses than LSU and 101% more patent applications.¹⁴⁹ While the university has made a commendable decision to begin a hybrid model with shared services, LSU should seriously consider a complete shift to a foundation model and demonstrate leadership for the state in the execution of this model. Incremental change is good, but bolder steps would produce even better results.

At the same time that foundations have an important role to play, it is vital that core functions of commercialization remain decentralized and on campus. Technology transfer officers, even if employed by a foundation, must remain embedded in labs and classrooms, staying in constant contact with faculty. Such intensive and regular on-the-ground engagement is critical to success and should not change, regardless of the entity that ultimately owns the intellectual property and assumes the risk. In addition, these licensing officers need the authority to negotiate intellectual property agreements.

- **Engage faculty regularly and consistently, and incentivize commercialization among researchers.** Faculty must become aware of the importance of this endeavor and be incentivized to participate. The LSU Health Sciences Center Commercialization Guide is an example of the kind of clarity of information and approach to outreach that should be modeled by campuses across the state.

As a first step, university administrators should be openly encouraging dialogue and suggestions for incentives for commercialization through faculty committees, perhaps bringing in guest speakers on the topic to present as well. Perhaps more importantly, management boards should immediately review and adapt promotion policies to better align with the mission of economic development. According to a national survey, roughly half of research universities include patents and commercialization in tenure decisions or permit sabbaticals for faculty members to pursue commercialization activities.¹⁵⁰ The University of Virginia's School of Medicine, for example, includes innovation and entrepreneurship activities as promotion and

tenure criteria, where candidates are asked to report on inventions, license agreements, and the economic development impact of their work.¹⁵¹ Similarly, Tenure and Promotion Guidelines at Louisiana Tech's College of Engineering and Science include intellectual property and economic development as indicators of excellence and effectiveness. Benchmarks include "reports of invention, filing a patent, issuing a patent, licensing the technology, starting a technology company, growing the technology company, or serving as an active board member. The T&P committee will take these accomplishments into account along with other measures of scholarly productivity and national competitiveness."¹⁵²

- **Establish and utilize innovation metrics.** Campuses should instill accountability for innovation and commercialization from faculty to department heads to deans to campus administrators. Performance metrics that take innovation into account are also important, such as granting equal weight to an SBIR as a federal research grant. Industry-sponsored research is also not captured in performance metrics and tends to be under-valued, even as federal dollars are expected to continue to decline and private money is needed to fill the gap. The scorecard from the LSU College of Engineering offers an example of how the goals of industry partnerships, technology transfer, and growing a knowledge-based economy can be articulated and detailed in action items and tangible strategies.

- **Support the Board of Regents to reform the Endowed Chairs program.** With vacancies at a high level – even as there is an express need for world-class scholars and the research dollars they bring – university systems should consider the state's target economic development priorities and how Endowed Professors and Chairs can better feed into areas of growth, where both federal and industry dollars will more likely flow. If the Board of Regents embarks on the PAR recommendation to move toward an Eminent Scholars approach, the systems should partner with donors and the state to implement the reforms.



- **Systematically engage industry, not just for philanthropy but for sponsored research, partnership opportunities, insights on future growth, and input on curriculum and programming.** Many large companies have established relationships through philanthropy or contacts with department heads or even key faculty. But smaller businesses and start-up companies seeking to sponsor research or form a relationship have no obvious way to initiate a conversation that could lead to a new partnership. At most campuses across the state, there is no single point of contact or mechanism for industry to engage the university. Institutions should consider university-industry liaisons and other ways to attract private partners.

Campus-based industry liaisons should create a practice of outreach to regional and statewide businesses and partner with regional economic development agencies and LED in business visitation efforts. As federal support continues to decrease as a

percentage of university research, the focus must shift to industry to fill the gap, and model programs and institutions have already moved in this direction. There is substantial growth under way in the backbone sectors of the Louisiana economy such as oil and gas, chemical, and manufacturing, which should make for low-hanging fruit for universities given the likelihood of companies' strategic interest in engaging and investing in the state at this particular time.

- **Develop streamlined and express license agreements and intellectual property template contracts** based on models from other states, such as Georgia, and from in-state entities where licensing works well. If needed, embark on a similar process as Georgia Tech where private patent attorneys and universities collaborated for a two-year period to develop an optimal standard agreement that can be easily customized and replicated for any given invention. Where necessary, university policy may need to adapt to the need for express agreements and templates as well.

Several universities in Louisiana are developing such templates, and LSU is the most recent to undertake this best practice. Once developed, the system office should provide these models as resources to all campuses. Even within this framework, technology transfer officers should serve as the personnel authorized to customize the templates within certain parameters that ensure state law and university policies are followed but otherwise are adaptable. Bureaucracy should be kept to a minimum, particularly when qualified staff are in the licensing positions.

Taking this one step further, the Board of Regents, LED, and the Louisiana Innovation Council could work together to produce a standardized set of agreements and templates across all Tier One and Tier Two Research institutions, branding Louisiana to private firms as one of the first states in the country to simplify the development of technology and partnerships with researchers on a statewide basis.

- **Recruit and fund experts as technology transfer officers**, and ensure sufficient numbers in the office to make an impact. Technology transfer is a quasi-private initiative within a massive state bureaucracy, so “head butting should be no surprise,” as one Louisiana technology transfer officer put it. These commercialization leaders absolutely must have some private sector experience and preferably a technical background as well so they can connect with faculty and have first-hand understanding of grant writing and tenure. So-called “soft skills” are also important to forge the necessary relationships with industry as well as faculty. Emory University actually describes their senior staff liaisons for faculty as “tech scouts” who conduct hundreds of hours of meetings with university researchers annually to find inventions that might be viable in the market. When adequately staffed with professionals, technology transfer officers can serve as “one-stop shops” for faculty and students, offering streamlined technology disclosure and protection processes and linking the inventors to opportunities on and off campus. Experts note a properly staffed technology transfer office “can greatly increase the productivity of a university’s technology transfer activities.”¹⁵³
- **Centralize or regionalize technology transfer from smaller campuses.** Not every institution has a significant body of research that can be commercialized, enough to justify a full-time office and professional expert staff. There are some functions

that can be centralized on a system level with the appropriate staff, or perhaps even a regional basis across system lines to allow for on-campus interactions, to support grant applications, patents, and commercialization regardless of institutional affiliation.

- **Create or incentivize pre-angel funding opportunities**, which are effective in amounts as small as \$25,000. Interviewees consistently mentioned the need for “gap funds” to analyze a research concept or finding to determine market viability. Private investors will not take the risk without some knowledge of the potential gain. In the absence of Board of Regents reforms or action, university systems or campuses should attempt to raise or direct funds for this purpose. LSU’s new LIFT2 Fund is a good example.
- **Bring venture capitalists into the university labs.** While Louisiana is certainly not akin to Massachusetts or Silicon Valley with a critical mass of venture capital firms, this also means that the relatively few investors should be easy and obvious for universities to access and engage on a regular basis. Technology transfer officers, incubator heads, industry liaisons, and university administrators should establish these relationships, bring potential investors into labs and on campus, facilitate meetings with researchers, and be open to partnerships.

The Louisiana Innovation Council

- **Stay energized and stay relevant.** As one interviewee noted: “You can’t legislate leadership and culture – people just have to do it.” The Louisiana Innovation Council is the intersection of higher education, state economic development, and industry. Its leaders must continue to elevate the issue and push both public institutions and private companies to work together to prioritize the issue, develop creative solutions, and implement recommendations. The Council’s Battelle report should not sit on a shelf, rather it should lead to a management plan to help guide the state to prioritize research in certain areas and serve as the basis to insist that the state invest more strategically.
- **Promote the use of Louisiana’s innovation tax credits**, raising awareness in the private sector and at the universities of these resources. The technology transfer commercialization credit, in particular, is highly underutilized and could drive private dollars into the higher education research enterprise.
- **Raise public awareness of the research assets and activities of Louisiana’s universities.** Convert the Battelle report into easily digestible content and ensure it gets into the media and the private sector. Create an annual competitive award or host an event that showcases the top discoveries from the state’s institutions and demonstrates the value of the work to the state and the public.
- **Produce an annual innovation index** that is similar to the Massachusetts model with 20 economic indicators across the state’s priority industry clusters. It measures



such factors as industry cluster employment and wages, manufacturing exports, corporate R&D expenditures, patent grants, engineering degrees awarded, and investment capital. Neither public nor private entities in Louisiana are regularly compiling relevant data across the spectrum of innovation. Similarly, produce a higher education scorecard that publishes data on R&D and outcomes from each campus in the state. Without it, performance at institutions cannot be adequately measured or compared, and smart policy and funding decisions are difficult. This seems an ideal role for the Innovation Council.

- **Gather more information on industry's needs**, working with LED. Survey the top employers in key markets, the top 25 companies in the state, or the top R&D industry leaders in the state to find out what they need to engage universities in their work. Publish the results and connect industry with the right people in the state and in higher education institutions to start the ball rolling.

Business and Industry

- **Seek out university partners in the regular course of your work.** Actively engage the institutions, departments, or incubators of relevance to your work, and invite administrators and faculty to explain their work to your staff and explore how universities can add value to your company.
- **Help create Louisiana's innovation ecosystem through systematic, in-depth partnerships.** The success of the Georgia Research Alliance was not possible without the multi-year, financial commitment of donors, philanthropists and industry partners. The commitment from the business community is what incentivized university leadership to make the commercialization of research a top priority – not just in general but in key areas of strength for Georgia. The business community has certainly been vocal on the need to elevate this issue – and there is an unprecedented level of partnership underway through the WISE Fund – but a more systematic and organized campaign is necessary to realize that goal. The Louisiana Innovation Council could serve as a rallying point for industry to promote the next step, even as universities undertake internal reforms necessary to lay the foundations for the kind of partnerships and outcomes seen in successful states.
- **Be ready to make contributions of your time, as well as your money.** Philanthropic partnerships are the most traditional form of engagement for industry in Louisiana with universities. However, institutions need to be held more accountable by private donors for the use of those funds, which can be directed in more targeted ways. Furthermore, if Louisiana is to pursue a sustained campaign for innovation, industry voices and input are required to make the model work. At the campus level, as well, universities need the input of leading businesses in their field – in their curriculum, in their research, and more. That takes not only money, but time, which can potentially yield an even greater return on investments through long-term partnerships and dialogue.

The Georgia Research Alliance [GRA] – A Model for Louisiana

Georgia is a state facing many of the same education and economic development challenges as other Southern states. But in its pursuit of R&D, Georgia has leveraged resources and pioneered best practices with modest investments to great effect. One of the most well-known national models to encourage, fund, and commercialize university R&D is the Georgia Research Alliance (GRA). Since it was established in 1990, GRA has generated \$2.6 billion in external investment in Georgia, launched 300 new companies, created 6,000 “high-skill, high-value” jobs, and led to dozens of inventions and technologies with benefits that extend far beyond state lines.¹⁵⁴ University R&D expenditures have tripled in Georgia in the past two decades.¹⁵⁵

GRA is set up as a 501(c)3 nonprofit organization that closely partners with the Georgia Department of Economic Development and six public and private Tier One research universities in the state. The GRA board embodies the public-private partnership with high-profile members from industry, academia, and government.

Operations and management of GRA are funded by private sources, including individuals, companies, foundations, and even partner universities. There are fewer than a dozen staff. Public funds do not flow through GRA but through the state’s Board of Regents. The Georgia state appropriation for GRA projects generally ranges from \$20 million to \$25 million annually. As mentioned earlier in this report, Louisiana’s annual Support Fund allocation is roughly this same amount.¹⁵⁶ At one point, the annual appropriation in Georgia fell to less than \$5 million during the state budget crisis resulting from the national economic recession.¹⁵⁷

Since 1990, the State of Georgia has invested \$595 million total in GRA programs, which is less than the \$700 million expended through Louisiana’s Support Fund since 1986.¹⁵⁸ It comes as no surprise that the Louisiana Legislature specifically instructed the Louisiana Innovation Council to investigate this GRA model and consider the formation of a Louisiana Research Alliance. The subsequent Council report was largely written by



**GEORGIA
RESEARCH
ALLIANCE**

GRA DISCOVERIES

Support by the Georgia Research Alliance has led to the placement of Eminent Scholars at universities and the creation of start-up companies in Georgia. Here are a few highlights of recent work made possible by that support.

- The development of a drug by a GRA Eminent Scholar at the University of Georgia that prevents HIV from inserting itself into the host DNA, which is now in pre-clinical testing.
- The invention of a new sensor to identify contamination by food manufacturers, poultry producers, and others by a start-up company founded with GRA investment.
- Ground-breaking findings from a GRA Eminent Scholar that autism can be observed in infants by using software developed at Emory with equipment purchased by GRA.
- The creation of new technology to deliver drugs inside the eye by a new company launched at Georgia Tech and Emory with GRA investment.

state agencies and university staff and was careful to note that existing funding sources were already utilized, and new money would need to be found. The report states: “The LIC has researched several potential State funding sources for the Louisiana Research Alliance; however, these sources are currently used to support other high-priority programs.”¹⁵⁹

The fiscal year 2014 public appropriation for GRA was \$23 million.¹⁶⁰ GRA’s public funds are spent directly on core programs and leveraged in a strategic way, resulting in the \$2.6 billion in additional outside investment in Georgia – a rate of return of \$4 to \$5 per dollar invested.¹⁶¹ The four key areas where GRA invests are as follows:

- Recruitment of prominent scientists to Georgia universities as GRA Eminent Scholars in nine targeted areas that overlap with industry priorities. Their work extends beyond the lab and the classroom, frequently contributing to start-up companies and recognized as drivers of Georgia’s economic development strategy.
- Cutting-edge technology for university labs that attracts highly competitive research grants from federal and private sources.
- Commercialization of inventions at universities through GRA Ventures (Formerly VentureLab), which makes early-stage investments, and GRA Industry Fellows who offer relevant expertise for developing enterprises.
- The creation of alliances among universities and industry with the goal of economic competitiveness.

GRA was founded at the insistence of the business community in Georgia to make the state more competitive. This primary mission for economic development and job creation remains at the forefront of GRA’s agenda, and insiders attribute business leadership to GRA’s success at securing state funds through the General Assembly year in and year out. Georgia officials note that it is the business community that has been definitive that the GRA funds not be weakened or watered down to please all institutions.

The annual state appropriation for GRA falls within the economic development budget. Its performance metrics reported to the state legislature include the numbers of jobs created as a result of GRA research in the public and private sectors. GRA staff and leadership have private-sector backgrounds. GRA experts are strategically placed

GRA EMINENT SCHOLARS

The Eminent Scholars program at the Georgia Research Alliance is widely recognized as a national model. Relying on matching private dollars for every \$1.5 million endowment, GRA support also is available for equipment for a researcher’s laboratory and team. Salaries are paid for by the universities. Criteria for recruitment include the ability of the researcher to attract external funding in the first couple of years, to perform work in one of “nine intersections of science and industry,” and an interest and enthusiasm for commercialization and entrepreneurship. The first Scholar was appointed in 1993, and there are 64 active Scholars today - each credited with bringing millions in research dollars and national recognition to the state.



GRA INDUSTRY FELLOWS

The Georgia Research Alliance launched the Industry Fellows program with the inaugural class in January 2014. GRA convened experienced professionals from the life sciences and technology sectors to support and advise faculty and entrepreneurs in the start-up companies where GRA invests. This level of expertise is seen as critically important in the early days of managing a new company and bringing the discovery into the market.

in university research centers with the sole purpose of seeking out and facilitating opportunities for commercialization. Eminent scholars are recruited with a private match in targeted areas identified as GRA and state priorities that can have a national impact. These scholars are required to participate in economic development, and many have started their own companies. University of Georgia officials noted they have 16 GRA Eminent Scholars, and 10 have started companies,¹⁶² with some on their second or third deal.¹⁶³ One Georgia expert noted several scholars are “walking commercialization machines” with up to 100 people on one scholar’s staff. When vacancies occur, the funding is re-purposed to fill other GRA needs.

Interviews across institutions in Georgia articulated that they “are not Silicon Valley” and they are not trying to replicate that model. (A popular button sported by Georgia R&D proponents shows the word “Valley” with a red line across it.) They are working to grow their own economy organically based on what makes sense in that state and region. Encapsulating the strategic focus on economic development, a GRA spokesperson noted: “If it’s not on the cusp of a new technology or a sector that is growing jobs, then it may not be a priority at this time.”

Among the chief benefits of GRA are that it prompts cultural changes in the university communities and adapts with the times. Not only does it offer incentive packages to lure researchers and equip labs, it sets a high standard and creates a strong interaction between universities and economic development.

In interviews with Georgia universities and GRA, a common knowledge and practice is that “you can’t be all things to all people.” From the start, GRA was targeted only to six Tier One research universities in the state as defined by SACS accreditation: Clark Atlanta University, Emory University, the Georgia Institute of Technology, Georgia Regents University, Georgia State University, and the University of Georgia. Today, two more colleges would be applicable under this definition (Mercer University and Morehouse College), so some grants are being made although these two schools are not full GRA members. Even among these six institutions, Georgia university officials noted that GRA funds the best project, regardless of balance or amounts across the GRA-eligible universities. They do not hesitate to invest more heavily in one university over another if the evidence calls for it. “They are ruthless in that regard. They don’t view themselves as a social welfare program,” one close observer said.¹⁶⁴

Research and development must be done with institutional focuses and sector focuses. Georgia officials note that faculty typically complain when more funding goes to one department than another, but “enlightened leadership” must manage that.¹⁶⁵ Even within targeted sectors, there needs to be a concentration. One professor noted that even within bio-technology, for example, they are focusing their research and investment on vaccines.

Of note, Georgia interviewees were familiar with the Louisiana context, having been consulted by officials and non-profit groups from the Bayou State on various occasions. Although not surprised that Louisiana has not yet instituted major changes, Georgia leadership repeatedly expressed disappointment, even saying they were “baffled”, that Louisiana has not been able to capitalize on available resources and advantages within the state to build a stronger R&D foundation, partnerships with industry, and innovation ecosystems. They point to strong business engagement pushing the innovation issue, pockets of excellence in university research, civic partnerships and community backing for universities, and obvious areas of strategic advantage in the state’s economy such as coastal restoration and the petro-chemical backbone. One official with knowledge of the Louisiana context was explicit: “It’s time for people in Louisiana to come together and figure it out once and for all.”

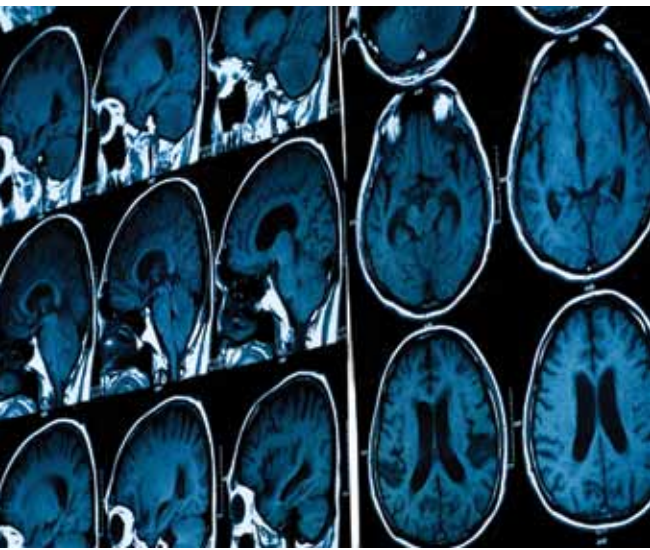
Georgia must continually prove its value to industry and to scholars. North Carolina was mentioned as a state that regularly approaches GRA Eminent Scholars and key faculty, particularly those starting companies. They offer facilities, angel investment, and venture capital. GRA must stay strategic and focused in order to compete.



Other State Models and Georgia Case Studies

States and universities nationwide are prioritizing innovation and commercialization of research as a means to growing their economies. This section of the report highlights models in some other states and takes a close look at how universities in Georgia are setting an example.

Perhaps the most widely cited example in the South is the **North Carolina** Research Triangle, a commercial real estate development that was converted in the 1950s into a non-profit group with a strategy to attract major research companies building on the strength of the nearby universities in Chapel Hill, Raleigh and Durham. The Triangle boasts 190 companies and 50,000 jobs.



Since then many other states and colleges have launched programs to promote an R&D environment that promotes both education and economic development. In 1997 **Kentucky** created the Bucks for Brains program, matching state dollars with private donations to recruit top researchers and build research infrastructure. The focus was on commercialization of research, the creation of knowledge-economy jobs, and the improvement of Kentucky's economy. In its first 13 years of operation, when state funding was strongest, Bucks for Brains led to an increase in endowed chairs from 56 to 252. University R&D spending nearly quadrupled and extramural research expenditures generated by faculty at the University of Kentucky and the University of Louisville increased from \$105 million to \$365 million.

Louisiana State University in 1997 had a strong lead in R&D rankings and university R&D expenditures over UK and Kentucky in general. Boosted by the Bucks for Brains program, UK caught up with or surpassed LSU on key R&D metrics. UK's trend was upward while LSU's trend was downward in the rankings. In 1997, overall university R&D spending in the Commonwealth of Kentucky was less than half the amount measured for Louisiana; by 2011 Kentucky had reached 82% of Louisiana's total. It is no wonder the University of Louisville's president called Bucks for Brains a "game changer" for the school and the state.

In 2006, the **Utah** Legislature created and funded the Utah Science Technology and Research Initiative (USTAR). Overseen by a majority private-sector board, USTAR helped build state-of-the-art research facilities at two major universities, recruit star faculty in targeted areas identified as important to economic development, and boost technology transfer in four regions of the state. In the first few years, the USTAR-spon-

sored faculty, which make up only 1% of university faculty positions, have increased extramural funding by 5%. Disclosures and patents are on the rise. From 2006 to 2011, higher-education R&D expenditures grew nearly 50% in Utah, according to the National Science Foundation. (The increase in Louisiana was 26% for the same period.) Annual state funding in 2013 and 2014 ranged from \$20 million to \$25 million.

In 2012, the state of **Washington** created the *Joint Center for Aerospace Technology Innovation* to fund university research that meets aerospace industry needs. With a majority industry board, the Center has so far awarded \$2.5 million for 34 projects at universities in response to a Request for Proposals. Similarly, the much-acclaimed *Life Sciences Discovery Fund* in Washington starts with a targeted problem for the state, then identifies academics and industry to perform the research – a program credited with an 8:1 return on investment and 12 percent growth in life sciences employment since 2007. The *Washington Life Science & Global Health Center*, launched in December 2014, will serve as a virtual resource dedicated to aggregating state programs available to help this industry thrive in Washington.

In 2013, the University of **Alabama** at Birmingham's Research Foundation became the Institute for Innovation and Entrepreneurship, a one-stop, coordinated entry point for researchers and industry to engage with the university, which is ranked No. 20 among National Institutes of Health recipients. The program has helped create 61 start-up companies and has generated \$65 million in licensing revenues since the Foundation was created in 1987.

Maryland, South Carolina and other states also have stories to tell about high-level efforts to improve R&D. For this report, PAR looked closely at the Georgia Research Alliance model and the corresponding efforts of three Georgia universities for lessons on how to produce results. The universities participating with GRA represent some of the strongest “best practices” in the nation for university research and commercialization. PAR researchers visited the campuses and interviewed leaders at the Georgia Institute of Technology (Georgia Tech), the University of Georgia and Emory University. Each institution provides models in key aspects of the innovation cycle, such as technology transfer, industry partnerships, and infrastructure investments.

The Innovation Ecosystem at Georgia Tech

Georgia Tech tops a variety of university rankings for research, innovation, and commercialization and last year placed No. 7 among all public universities by U.S. News and World Report. The Atlanta-based university is ranked No. 7 also for the number of invention disclosures made in 2012 with 408,¹⁶⁶ and the U.S. Patent and Trade Office places the Georgia Tech Research Corporation at No. 15 nationally for the total number of patents held at 916.¹⁶⁷

Research at Georgia Tech has deep roots, evolving over time and with significant investment into a complex system of inter-connected components to form an innovation ecosystem. The synergy and partnerships across universities, state agencies, and industry

is well-known, but did not occur by accident. Economic development is seen as a core mission of the university. This theme is reflected in the areas of research and the deliberate, consistent focus on commercialization. Georgia Tech commercialization leaders report that their first metric for performance is job creation, followed by dollars invested in the state of Georgia.¹⁶⁸ The mantra is engrained that “as a public university, Georgia Tech has a responsibility to ensure its research results are available for the benefit of the general public.”¹⁶⁹ The commercialization process is defined as “faculty-friendly” and intentionally “designed to minimize friction, not maximize licensing revenues.”¹⁷⁰ An estimate from one official is that Georgia Tech issues a license a day.¹⁷¹

Georgia Tech’s Enterprise Innovation Institute is located in the same building with the state economic development agency and Georgia’s QuickStart workforce training program (used as a model for Louisiana’s FastStart program). The building also has offices for GE and Panasonic and is across the street from labs and classrooms. The university has opened industrial relations offices around the state with some joint faculty and industry appointments. They have found that proximity alone has a positive impact.

In 1937 Georgia Tech established the Georgia Tech Research Corporation (GTRC) “to stimulate industrial development, to promote the fullest utilization of natural resources, and to foster research invention and discovery...” Unlike the structure of most major research universities in Louisiana, GTRC is a 501(c)(3) that serves as the patent agency for Georgia Tech inventions, licenses, and contracts.¹⁷² GTRC’s licensing associates are responsible for every step of the commercialization pipeline, from evaluating the disclosure to marketing to executing licenses and ensuring compliance.¹⁷³

To “ensure that Georgia Tech innovations have the opportunity to evolve into products and services that benefit society,” GTRC created the Office of Industry Engagement with staff to manage industry-sponsored research on campus, commercialize technologies through licensing, facilitate industry partnerships, and form start-up companies. In 2012 alone, with \$700 million in research expenditures and fewer than 20 staff,¹⁷⁴ this office had more than 900 research contacts with industry, evaluated more than 400 inventions for commercial viability, executed 89 licenses, received 79 new US patents, and formed a dozen start-up companies rooted in Georgia Tech inventions.¹⁷⁵ The Office is continuously looking to improve its performance, launching a new Contract Continuum in 2013 with four template agreements for industry-sponsored research designed to make it easier for companies to work with Georgia Tech researchers and facilities at any point in the R&D process.¹⁷⁶

For decades, Georgia Tech has emphasized industry partnerships in a variety of forums, which are now encapsulated in the Enterprise Innovation Institute (EI2). Officials note EI2 evolved from the traditional 100% state-funded model for economic development but has become the nation’s most comprehensive program for technology commercialization and economic development at any university in the country with a mission to “increase the competitiveness of enterprises in Georgia through the application of science, technology, and innovation.” Within a single organizational structure,¹⁷⁷ Georgia Tech houses its programs for the commercialization and incubation of faculty and student research,

entrepreneurship, and growth of early start-ups as well as regional and local economic development and direct support to Georgia companies. The organization has a \$20 million budget of which one-third is a state appropriation, another third is federal, and the final third is self-generated in fees for services primarily to companies. In fiscal year 2013 alone, EI2 officials say their services created or saved 11,300 jobs in the state of Georgia.¹⁷⁸

Georgia Tech's Integrated Program for Startups (GT:IPS) is an example of the collaboration of GTRC and the Enterprise Innovation Institute. It trains faculty and students on commercializing research from developing elevator pitches to fundraising to intellectual property protection. Officials say they can move faculty onto successful commercialization paths in a matter of weeks. The program has vetted a streamlined licensing agreement with major Atlanta law firms to ensure transparency and quick turn-around times. The general estimate from EI2 staff is just 30 days. Officials note that the creation of a streamlined license was a two-year effort that required significant work with the university's legal teams.

One of the most well-known EI2 programs is VentureLab, which ranked second among 800 university-based incubators in a global survey in June 2014.¹⁷⁹ The initiative took first place among engineering and science incubators as well as early stage incubators.¹⁸⁰ The ranking was based on performance indicators such as jobs created, revenue per client, successful graduates, survival and growth rate, venture capital and angel funding received, and more. The program offers tools, training, and other resources to Georgia Tech faculty, research staff, and students who want to commercialize their work into a start-up company. Since its creation in 2001, Georgia Tech's VentureLab has launched more than 300 companies that have raised more than \$1.1 billion in outside capital.¹⁸¹

A key component of VentureLab (at Georgia Tech and all GRA institutions) is the support of GRA commercialization funds, which are available in three phases:

- Phase I grants serve to validate technology and determine viability, which usually fall in the \$50,000 range. (Roughly half of awardees proceed to Phase II.)¹⁸²
- Phase II grants assist with business planning, licensing, and further validation of technology.
- Phase III is not a grant, but a loan of up to \$250,000 in two tranches with a simple-interest, five-year note that requires companies to remain in-state.

Complementing the work of the Georgia Tech VentureLab is the Advanced Technology Development Center (ATDC) at EI2, a start-up incubator for technology entrepreneurs that serves the state of Georgia, not just the university. In 2013, Forbes magazine listed ATDC as one of twelve business incubators "changing the world."¹⁸³ ATDC provides coaching, networking, mentoring, connections to capital and industry partners, and access to Georgia Tech labs and equipment for an estimated 400 member companies in 2014 that in turn have attracted \$2.5 billion in investments and created more than 5,500 jobs since its establishment.¹⁸⁴

The officials at EI2 and GTRC report to the Georgia Tech Vice President for Research, coordinating the entire effort. This deliberate long-term creation of an innovation ecosystem at Georgia Tech has clearly yielded great benefits to industry, as well as the state as a whole. While this report does not expect Louisiana to make such massive strides in the near or even immediate future, the leadership, culture, and deliberate strategy of Georgia Tech should serve as a starting point.

The Research Foundation Model at the University of Georgia

The University of Georgia in Athens created the UGA Research Foundation in 1978 as a distinct 501(c)(3) organization to perform the technology transfer function for the university. The Research Foundation secures research contracts from industry and government agencies for the university, receives all disclosures, applies for patents and other IP protection, and handles the licensing of faculty inventions to the private sector. The Research Foundation board includes ex-officio members of the UGA administration, as well as appointees from the UGA Alumni Association, faculty, Georgia-based companies, and non-profit associations. While UGA sets the research priorities, the Foundation exists to help fund the work and owns all IP from the UGA research enterprise. More than 500 products have entered the market from UGA research, ranking the university in the Top 5 for total number of licenses and options executed and the Top 15 among public universities for total licensing revenue (roughly \$8 million in Fiscal Year 2013).¹⁸⁵



This success is attributed, in part, to the flexibility that results from a Foundation approach in funding, contracting, legal terms, and more. As noted above, various Louisiana interviewees have expressed frustrations with some of the bureaucracy involved in the commercialization process, particularly state approval of legal contracts at pre-determined rates.

In Georgia, a single Memorandum of Agreement between the Regents of UGA and the Foundation outlines the roles of each party. No state dollars are currently utilized at the UGA Research Foundation, which is funded by licensing revenue and largely staffed with UGA personnel on assignment or loan from the university to support the Foundation. The Foundation is the contracting party to all research agreements funded externally, after which the Foundation sub-contracts the performance of the research to UGA. State contracting rules, which limit tort liability and have other restrictions, are not required for licenses at the Foundation. Neither is board approval. The Executive Vice President of the Foundation signs licensing agreements, facilitating the establishment of 150 last year alone.

The Foundation generally keeps half of licensing revenue, which is used for attorney fees, marketing, and other consultants working to protect the intellectual property. Of note, the streamlined process for licenses generally puts the risk on the licensee, which is reflected in lower amounts for revenue sharing. Officials from UGA and the Foundation point to the mission of land grant universities in their philosophy: “If there is a technology that can benefit the state, then a broader audience, then they will try to make that happen through a commercial agreement.”¹⁸⁶ They measure success not only on revenues, but also the number of products that reach the marketplace from UGA research. They want a strong baseline and diverse set of products in the market for the long term.

Commercialization is consistent with the mission of the Foundation, even more so than the university itself. Still, UGA has a vice-chancellor responsible for economic development to work with the 17 universities across their system and ensure they recognize and prioritize economic development. The individual works closely with counterparts at other university systems as well and is called upon by the state economic development agency to assist in recruiting companies.¹⁸⁷ Louisiana institutions that already utilize a research foundation should take note of this method of commitment to the economic development mission of public universities.

In-House Expertise at Emory University

Housed across the street from the federal Centers for Disease Control and Prevention in Atlanta, Emory University focuses its research largely on life sciences and biomedical fields. There is no engineering or agricultural program at the university. Emory’s Office of Technology Transfer notes more than \$4 billion in sponsored research funding in the past decade alone with 1,700 disclosed inventions and 1,300 patent applications as well as 18 products in the market and \$738 million in licensing revenue.¹⁸⁸ A private school, the approach and goals of tech transfer at Emory University stand in contrast with a land-grant public institution like UGA.

Emory does not face the same public-sphere legal or contracting obstacles and therefore has a dedicated in-house staff for technology transfer that includes patent attorneys and dedicated marketing experts. Emory utilizes a team approach to triage discoveries and evaluate their potential. A primary goal of the transfer office is to protect the intellectual property on behalf of the university. Using a technology scout, they actively work to reach faculty before the research is published. They frequently file patent applications before an analysis of the marketability is conducted.

Research revenues are highly valued, bringing in more than tuition dollars for the university. There is recognition, however, that significant investment must occur for long periods of time in the biomedical fields before a product reaches the market. The estimated time is more than a decade.¹⁸⁹

At Emory, there is noticeably less focus on economic development and industry partnerships than at Georgia Tech. There are far fewer start-up companies that spin out of Emory research, partly given the lengthy research timeline from startup to market in biomedical fields. Instead, Emory officials point to the 5,000 people employed and supported by the research occurring at the university.

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