2013

SIXTH REPORT ON THE CONDITION OF HIGHER EDUCATION IN OHIO:

Status of Implementation of Strategic Recommendations For Advancing Ohio's Innovation Economy

Ohio Board of Regents
University System of Ohio

John R. Kasich, Governor
John Carey, Chancellor

Ohio | Board of Regents
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On June 26, 2013, the sixth report on *The Condition of Higher Education in Ohio: Status of Implementation of Strategic Recommendations For Advancing Ohio's Innovation Economy* was respectfully submitted to the Ohio Board of Regents for consideration. After review and discussion, the Report was unanimously approved.

Vinod K. Gupta
Chairman

Lana Z. Moresky
Vice-Chair

Timothy M. Burke
Secretary

Thomas Humphries

Kurt Kaufman

Virginia M. Lindseth, Ph.D.

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Ex Officio Members

Sen. Peggy Lehner

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John R. Kasich, Governor
John Carey, Chancellor

Dear Governor Kasich, Senate President Faber, House Speaker Batchelder, Senate Minority Leader Kearney and House Minority Leader Heard:

In June of 2012, pursuant to the requirements of Ohio Revised Code section 3333.032, the Ohio Board of Regents published the fifth report on The Condition of Higher Education in Ohio (Fifth Condition Report). The report, ***Advancing Ohio's Innovation Economy***, was developed by a 32-member Technology Transfer and Commercialization Task Force, comprised of leaders from higher education, industry, technology transfer, venture capital and finance. The Task Force was convened in direct response to the Governor's call for increased job creation and economic growth in Ohio by advancing the state's innovation economy.

The Fifth Condition Report contained recommendations for how Ohio could position itself to compete and lead in the global innovation economy – in particular, by creating the conditions that would support enhanced levels of technology transfer and commercialization. Publication of the Fifth Condition Report generated much excitement and optimism among higher education and industry stakeholders, stimulating new partnerships and reinvigorating existing ones by bringing focus and new energy to those collaborations.

In acknowledgement of the critical role technology transfer and commercialization necessarily will play in shaping's Ohio economic future, the Board of Regents unanimously agreed to make the status of implementation of the Fifth Condition Report recommendations the sole subject of our Sixth Condition Report. Today, we are pleased to submit to you that report, which is entitled ***Status of Implementation of Strategic Recommendations for Advancing Ohio's Innovative Economy***.

Recognizing that not all of the Fifth Condition Report recommendations were likely to be implemented immediately, Task Force leadership extracted from those recommendations a set of strategically organized and prioritized activities designed to deliver maximum near-term benefit and impact. These selected action steps became the Board of Regents' eleven "Priority Goals" for advancing implementation of the Task Force recommendations.

Progress toward achieving the eleven Priority Goals is the focus of this report. Task Force members believe that focused efforts in these areas will help ensure the foundational components needed to improve commercialization throughout Ohio are intact and working to create a vibrant and sustainable commercialization ecosystem in our state.

One of the first steps the Board of Regents took to assess implementation activity to date was to survey Task Force members' institutions and organizations to provide an environmental scan of commercialization activities and policies already in place, underway or imminent. We were pleased to learn, as we believe you will be as well, that enthusiasm and activity levels are high – and in many cases are producing measurable results. In particular, we learned the following:

- Higher education and industry already are engaged in many productive collaborations aimed at accelerating commercialization, and recommendations from the Fifth Condition Report are having a positive, transformational impact on some of those partnerships.

- Colleges and universities are adapting their philosophy and approach to technology transfer to reflect a deeper understanding of and responsiveness to industry needs.

- Many colleges and universities are actively engaged partners in regional economic planning and development efforts.

- Institutions of higher education are engaging in a wide variety of creative activities to promote entrepreneurship among students, faculty and regional partners, and to strengthen Ohio's commercialization pipeline.

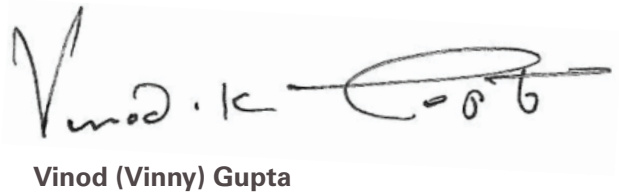
- Stakeholders understand that more effective communication and more extensive sharing of best practices will enhance commercialization success.

- Higher education and industry partners are enhancing efforts to measure the effectiveness of their work to promote technology transfer and commercialization.

This report represents a snapshot of a moment in time. As the report makes clear, progress is under way on many fronts, and momentum is building. Nonetheless, much important work remains if Ohio is to thrive in the new economy. Sustained activity and continued progress over time will be needed to create the kind of environment that will support robust technology transfer and commercialization activity throughout Ohio; drive economic growth in all regions of our state; and create, attract and retain high-value, high-wage jobs.

In closing, we thank Task Force members for their dedicated service to our state over the past two years, and for their many valuable insights that have informed our work. We are similarly inspired by the enthusiasm, creativity and collaboration we have observed on college and university campuses and in diverse industry settings and communities across Ohio. Buoyed by these efforts, we look forward with great optimism to working with our state-level executive and legislative leaders to ensure sustained energy, action and progress in the area of technology transfer and commercialization that is so critical to the future of our state.

Respectfully submitted,



Vinod (Vinny) Gupta
Chair, Ohio Board of Regents
Chair of the Ohio Board of Regents'
Technology Transfer and Commercialization Task Force

The Great Lakes Innovation & Development Enterprise (GLIDE) Center
on the campus of Lorain County Community College

Ohio Board of Regents

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Entrepreneur-In-Residence (EIR) for JumpStart Entrepreneurial Network Advisors, served as President and CEO of Technocast, Inc. and Ohio Cast Products, founding President and Board Member for both the Ohio Cast Metals Association and the Asian Indian Alliance

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Former member of the Board of Lake Erie College, Director of Community Services in Cuyahoga County, Acting Executive Director of the Women's Law Fund, Vice President of Heights Fund Inc., and elementary school educator, inducted into the Ohio Woman's Hall of Fame, earned bachelor's degree from Pennsylvania State University

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Thomas Humphries
President and CEO of the Regional Chamber, former general manager for Sprint's Ohio East region, principal of Data Voice Systems Review, Inc., his experience in the telecommunications industry has spanned 40 years, founding member of Team Northeast Ohio (NEO), serves on the boards of several local, regional and state community and economic development organizations, received a governor's appointment to the board of Partnership for Continued Learning in Columbus

Kurt Kaufman
Resident of rural Auglaize County, attorney for over 20 years at a general practice in Lima with an emphasis on workers' compensation, probate and business and family law, former volunteer EMT with the Wayne Township EMS, active in the Waynesfield-Goshen Athletic Boosters and the Wayne Post of the Sons of the American Legion, member of St. Luke's Lutheran Church, the Ohio State Bar Association, FOPA and the Farm Bureau

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An educational psychologist, founded The Institute for Educational Renewal (IER) at John Carroll University, Doctorate and Executive Master's of Business Administration from Case Western Reserve University, Master's of Arts degree from John Carroll University in Guidance and Counseling

Ex-Officio Members

Senator Peggy Lehner
Ohio Senate

Representative Gerald L. Stebelton
Ohio House of Representatives

John Carey
Chancellor, Ohio Board of Regents
An experienced lawmaker, served nine years in the Ohio House of Representatives and eight years in the Ohio Senate, one of the few legislators in history to serve as chairman of both the House Finance and Appropriations Committee and the Senate Finance and Financial Institutions Committee, former mayor of the City of Wellston, former Assistant to the President for Government Relations and Strategic Initiatives for Shawnee State University, graduate of Ohio University with a degree in political science

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Rebecca Bagley, President and CEO, NorTech
Roy Church, President, Lorain County Community College
Rod McDavis, President, Ohio University

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Lloyd Jacobs, President, The University of Toledo
Para M. Jones, President, Stark State College
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External Groups

Research Officers Council
Technology Transfer Officers Council

Executive Summary

SIXTH REPORT ON THE CONDITION OF HIGHER EDUCATION IN OHIO:

Status of Implementation of Strategic Recommendations For Advancing Ohio's Innovation Economy

Executive Summary

The Ohio State University

In June 2012, the Ohio Board of Regents submitted to Governor John Kasich and the Ohio General Assembly the Fifth Report on The Condition of Higher Education in Ohio (Fifth Condition Report).[1] The report, *Advancing Ohio's Innovation Economy*, was developed by the Regents' Technology Transfer and Commercialization Task Force, comprised of 32 state leaders in technology commercialization, venture capital, finance and higher education.

The Task Force identified a set of recommendations that collectively serves as a road map for how Ohio can position itself to compete and lead in a global innovation economy. The recommendations identified ways to more effectively and quickly move university research into commercial applications; to engage higher education in support of the commercialization of industry-based research; and to stimulate higher education-industry collaborations to develop breakthrough science, technologies and innovative new products and services – all with the express goal of driving and supporting technology-based economic growth and job creation.

1 Pursuant to the requirements of Ohio Revised Code section 3333.032

Focus on Implementation

The key to successful outcomes is effective implementation. With that in mind – and in acknowledgement of how critical technology transfer and commercialization success is to Ohio's economic future – the Ohio Board of Regents unanimously agreed to make the status of implementation of the Fifth Condition Report's recommendations the sole subject of the Regents' Sixth Report on The Condition of Higher Education (Sixth Condition Report).

This Sixth Condition Report represents a snapshot of a moment in time. It focuses on critical enabling conditions and initial implementation steps for a strategically chosen subset of the action steps embedded in the Task Force's full slate of recommendations. As such, this report serves four essential purposes:

1. **It identifies a selective set of high-impact priority goals and related activities** that represent the initial phase of implementation of the Fifth Condition Report recommendations.

2. **It highlights the results of a survey of Ohio higher education institutions and other organizations** regarding significant commercialization activities launched both before and after the publication of the Fifth Condition Report.

3. **It provides a status report on activities to date for a limited number of priority goals** critical to the initial stages of implementation of the Task Force recommendations.

4. **It proposes a number of additional strategies and priorities for consideration** as Ohio moves forward with subsequent stages of implementation of those recommendations.

Identification of Priority Goals

No one expected that implementation of the Fifth Condition Report recommendations would be complete by the time the Sixth Condition Report was published. The scope of the Task Force recommendations was far-reaching and the timeframe for immediate action was limited. For these reasons, Task Force leaders extracted from the Fifth Condition Report recommendations a set of strategically organized and prioritized activities designed to deliver significant near-term benefit and impact. These selected action steps became the Board of Regents' eleven **Priority Goals** for the initial phase of implementation of the Task Force recommendations.

ACTION GROUP 1: Building Capacity for Commercialization

- **Priority Goal #1: Agreements:** Develop, share and use a set of legally sufficient, higher education- and industry-vetted guidelines and templates that assist institutions in facilitating and executing license and sponsored research agreements.

- **Priority Goal #2: Promotion and Tenure Review Process:** Assess efforts under way at institutions of higher education to incorporate applied research and commercialization within the promotion and tenure review process.

- **Priority Goal #3: Incubators:** Assess the state's incubator capacity and document characteristics of successful incubator constructs and practices.

ACTION GROUP 2: Creating an Entrepreneurial/Innovation Ecosystem

- **Priority Goal #4: Regional Economic Development:** Support and encourage college/university research and entrepreneurial activities that connect regionally with other institutions of higher education, industry and economic development groups and initiatives.

- **Priority Goal #5: Statewide Research Portal:** Determine the financial feasibility of creating a statewide portal to showcase, share and promote university/college faculty, research strengths and assets, including equipment.

- **Priority Goal #6: Capital Continuum:** Assess the availability of capital in Ohio and develop strategies for attracting needed capital at all stages of the commercialization continuum.

ACTION GROUP 3: Fostering a Culture of Entrepreneurship

- **Priority Goal #7: Entrepreneurship:** Assess the current status of entrepreneurial curriculum and instruction at Ohio institutions of higher education and explore with institutions the development of a multidisciplinary approach to entrepreneurial instruction.

ACTION GROUP 4: Developing a Globally Competitive Workforce

- **Priority Goal #8: Workforce Forecasting:** Support the Governor's Office of Workforce Transformation to identify Ohio's most urgent workforce needs and to align education institutions to meet businesses' needs.

- **Priority Goal #9: Co-ops and Internships:** Encourage each Ohio institution of higher education to develop a co-op and internship program that includes a STEM focus, and have the Ohio Board of Regents and the Ohio Third Frontier Network collaboratively work to expand and broaden co-op and internship programs statewide.

- **Priority Goal #10: STEM Education:** Strengthen and create new STEM-focused partnerships between K-12 and higher education to ensure students begin postsecondary education ready to engage in STEM coursework and persist through graduation in STEM-related fields.

ACTION GROUP 5: Measuring Success Through Meaningful Metrics

- **Priority Goal #11: Metrics:** Identify measures and metrics for inputs, outputs and outcomes for Ohio that demonstrate the benefits and effectiveness of commercialization activities carried out by colleges/universities.

Task Force members believe that targeted activity in these areas will ensure the foundational components needed to improve commercialization throughout Ohio are intact and working to advance progress toward creating a vibrant and sustainable commercialization ecosystem in our state.

Survey of Task Force Member Institutions & Organizations

To gauge the range and depth of commercialization activity across Ohio, the Ohio Board of Regents **surveyed Task Force member institutions and organizations** about commercialization activities and policies launched both before and after the release of the Fifth Condition Report. Top-line findings from the survey include the following:

- **Collaborating with Industry.** Higher education and industry are engaged in numerous collaborations aimed at accelerating progress along the commercialization continuum and supporting regional economic development efforts.

- **Becoming More Market-Driven.** Universities and colleges are changing their philosophy and approach to technology transfer on their campuses to reflect a much deeper understanding of industry needs and market potential.

- **Engaging in Regional Planning Efforts.** Many universities and colleges are actively engaged in regional economic planning and development efforts, working closely with local and regional economic development entities to strategically and effectively leverage collective resources.

- **Promoting Entrepreneurship.** Task Force member institutions are engaging in a wide variety of creative activities to promote entrepreneurship among students, faculty and community and regional partners and to help build a more robust commercialization pipeline in Ohio.

Activity to Date

Ohio is headed in the right direction and making steady progress. Momentum is building and is evident across the landscape – in the entrepreneurial curricula and experiential learning experiences in our colleges and universities; in the incentives and support for faculty to commercialize their research; in the guidelines and templates being created to facilitate the growth and sharing of intellectual property; it remains in the partnerships being forged between higher education and industry to advance commercialization; and in the energy and excitement being generated by and among regional stakeholders who are coming together in new and creative ways to fuel economic growth and create jobs and wealth in all regions of the state.

The Sixth Condition report reaffirms that Ohio's colleges and universities are leading catalysts for and contributors to the statewide effort to promote Ohio's innovation economy. In many communities, institutions of higher education are principal architects and essential partners in building local and regional environments necessary to support innovation, commercialization and a culture of entrepreneurship. Colleges and universities are also providing the infrastructure and intellectual leadership needed to create Ohio's globally competitive workforce.

However, our journey is far from being complete.

We are making progress, but we have achieved nowhere near the magnitude of system change that is needed for Ohio to emerge as a robust, nation-leading state for technology transfer and commercialization. Sustained progress in the foundational areas highlighted in this Sixth Condition Report, combined with a marshalling of new and heightened activity in other critical areas identified by the Fifth Condition Report, is needed to fully implement the Task Force's recommendations.

The Bottom Line

Targeted areas for continued action and implementation will not change. We must continue to build the state's capacity for commercialization and encourage and support industry-higher education collaboration toward that end. We must redouble and accelerate efforts to create an ecosystem that supports innovation and commercialization. We must expand and sustain efforts to foster a culture of entrepreneurship. We must ramp up efforts to develop a globally competitive workforce ready for the jobs that increased innovation and commercialization create. And we must continue to measure progress and results through meaningful metrics.

As Ohio seeks to expand and accelerate efforts to be a leader in innovation, technology transfer and commercialization, the Board of Regents reasserts its commitment to support those efforts through continued collaboration with Ohio's institutions of higher education, private industry, local and regional economic development entities, and elected state officials.

Note: The Appendices to this report contain a wide range of valuable materials, including the following:

1. *University System of Ohio Overview*
2. *Indicators Used in National Benchmark Data*
3. *Research Expenditures at Ohio Public and Private Universities*
4. *Recipients of Ohio Means Internships & Co-ops Grants*
5. *Metrics Definitions*
6. *Ohio Woodrow Wilson Fellows Placement Information & Choose Ohio First Demographic Data*
7. *STEM Degrees Awarded at University System of Ohio Institutions*
8. *Work-Based Learning Data*

Kent State University

Ohio University

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SECTION 1

Introduction

University of Cincinnati

In June of 2012, the Ohio Board of Regents submitted to Governor John Kasich and the Ohio General Assembly the Fifth Report on The Condition of Higher Education in Ohio (Fifth Condition Report).[1] Entitled *Advancing Ohio's Innovation Economy*, the report was developed by the Regents' Technology Transfer and Commercialization Task Force, comprising 32 state leaders in technology commercialization, venture capital, finance and higher education.

The Task Force was convened in direct response to Governor Kasich's call for increased job creation and economic growth in Ohio by advancing the state's innovation economy. Specifically, the Task Force was charged with identifying ways to more effectively and quickly move university research into commercial applications; to engage higher education in support of the commercialization of industry-based research; and to stimulate higher education-industry collaborations to develop breakthrough science, technologies and innovative new products and services – all with the express goal of promoting statewide and regional economic development and creating new high-value, high-wage jobs for Ohioans.

1 Pursuant to the requirements of Ohio Revised Code section 3333.032

The rationale for this strategy was articulated in the Introduction to the Fifth Condition Report:

> *The Governor's economic policies are predicated on the recognition that communities compete globally in a world built on statewide and regional economies relying on a continual supply of educated people and new discoveries. As understood by many, both the nation's and Ohio's economic prosperity is derived from our ability to introduce new, value-added products and services into the marketplace. Technological innovation resulting from basic and applied research produces many of these value-added products. Success in this arena is increasingly dependent upon the ready availability of a vast infrastructure that includes a highly skilled workforce, state-of-the-art scientific expertise, manufacturing and fabricating capabilities, and the technological capabilities typically found on the campuses of our nation's great institutions of higher learning. Since the highly developed research platforms at Ohio's institutions of higher education represent an enormous state investment, the current challenge is how to engage Ohio's university and college faculty members in the pursuit of commercially directed research activities.*

The message could not be clearer. If Ohio is to thrive, we must stimulate the development of a more competitive, high-growth economy that will generate the high-value, high-wage jobs of the future and satisfy the market demand for an ever-increasing supply of new products and services. And a major focal point of that effort must be creating the conditions that will support enhanced levels of technology transfer and commercialization.

At the same time, we also must recognize the critical role higher education plays in supporting economic growth and job creation: talent development. Arguably, the most important "products" of Ohio's colleges and universities are educated students ready to succeed in the jobs that increased innovation and commercialization will create.

If Ohio is to thrive, we must stimulate the development of a more competitive, high-growth economy that will generate the high-value, high-wage jobs of the future.

The talent pool to fill those jobs must be robust, diverse and deep. Yes, Ohio needs to substantially increase the number of STEM workers capable of driving innovation and technological advancement. But we also must grow our supply of college graduates with the critical and creative thinking skills, communication skills, and abilities to synthesize and analyze information and ideas across disciplines, including the arts, humanities and social sciences and other non-STEM disciplines. It is this combination of skills from across colleges and universities that is most likely to lead a state with the capacities and capabilities to innovate and grow in the long-term.

Alignment of talent supply and employer demand will not occur naturally – it must be intentional. The same forces that drive Ohio's institutions of higher education to increase and accelerate college completion compel us all to help students make early and informed career choices – before selecting majors or establishing degree goals – based on sound insights into the dynamics of the labor market for college and university graduates. Ramped-up efforts by higher education to forge strong partnerships with industry and engage meaningfully in regional economic development activities must recognize and include talent development as a priority strategy.

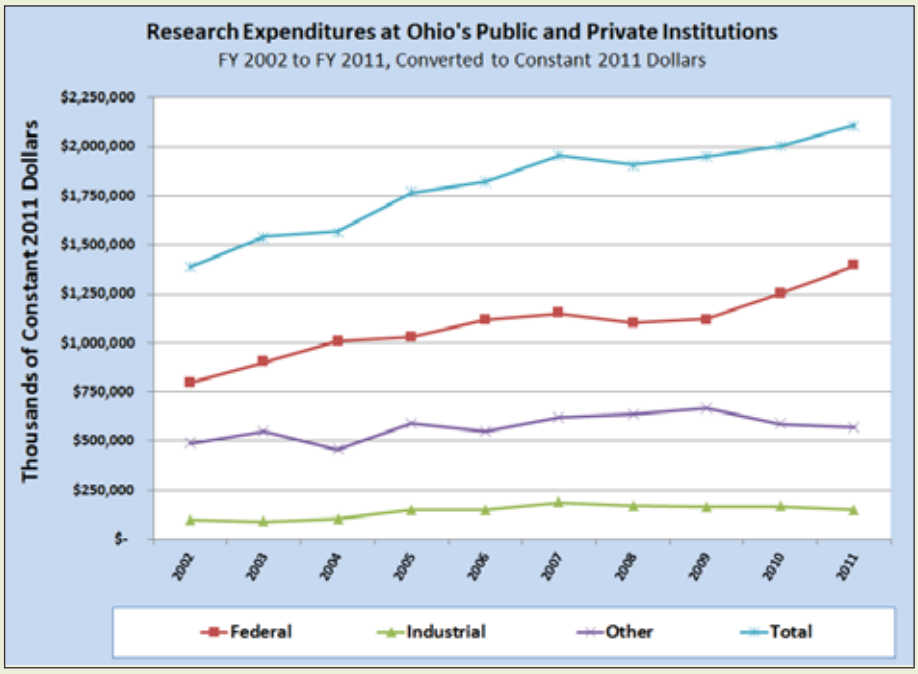
Much Important Work to Be Done

Broad agreement exists that Ohio's university-based research is not being sufficiently commercialized. According to the National Science Foundation, Ohio's public and private universities rank in the top 10 nationally for total research funding (2010 data); however, data from the Association of University Technology Managers clearly show that Ohio's universities rank *well below the average* for universities in other states for (a) gross return of commercialization revenue relative to the volume of research expenditures, and (b) the efficiency in which invention disclosures are converted into commercial applications. National benchmark data also clearly show that Ohio lags many of its peer states in promoting and supporting technology commercialization. For example:[2]

- The Milken Institute's 2012 State Technology and Science Index ranks Ohio 28th in research and development and 29th overall for state technology and science assets.

- The Information Technology & Innovation Foundation's 2012 State New Economy Index (funded by the Ewing Marion Kauffman Foundation), which evaluates the degree to which a state's economy is knowledge-based, globalized, entrepreneurial, IT-driven and innovation-based, ranks Ohio 32nd overall and 42nd for its "economic dynamism."

Ohio's response to the challenge of improving its position will take shape within the context of the broader,



Ohio's colleges and universities continued to increase the total level of research expenditures over the past three years. Our success is recognized through increased federal support and, even during the recession, support from industry and other organizations. As the economy emerges from the recession and we implement the Task Force recommendations, we expect to see continued growth in total expenditures fueled by industrial supported research. See Appendix 3 for the data supporting the line graph.

2 See Appendix 2 for a more detailed explanation of the indicators evaluated in the Milken Institute's and ITIF's state rankings.

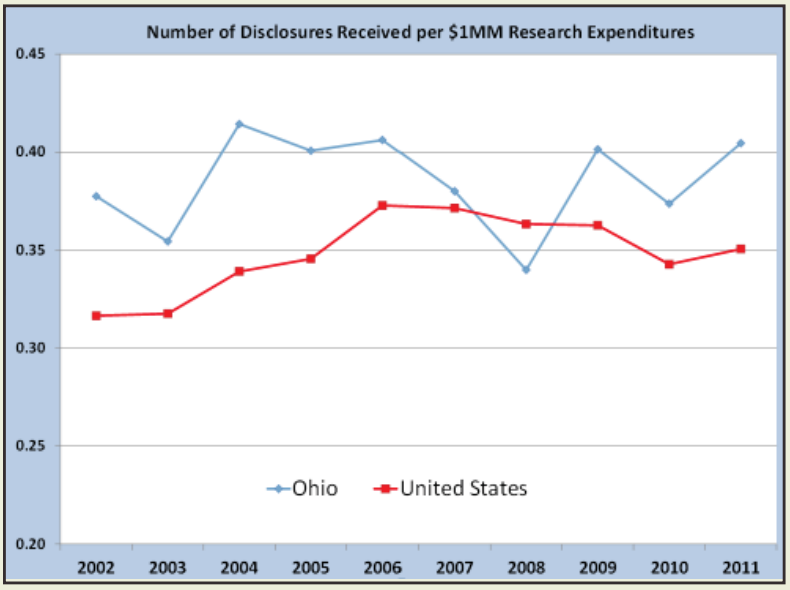
national dialogue and action to enhance and further leverage higher education's role as a catalyst for economic growth. The same imperatives driving the work of Ohio's Technology Transfer and Commercialization Task Force are driving similar efforts in many other states and across the globe. Efforts are intensifying to more systematically coordinate alignment between higher education and industry, as is activity to improve metrics for tracking and measuring the ways in which higher education contributes to economic development. Ongoing academic and policy research – including papers from the Federal Reserve System, the National Institute of Standards and Technology, the Brookings Institution and numerous individual researchers – demonstrates the benefits to communities and states of strengthening commercialization relationships.[3]

Momentum Is Building

Publication of the Fifth Condition Report generated much excitement and optimism among higher education and industry stakeholders. For some, the report served as a wake-up call, spurring conversation and jump-starting activity; for others, the report helped to accelerate or expand efforts already in motion. The report stimulated new partnerships and reinvigorated existing ones, bringing focus and new energy to those collaborations. Across Ohio, technology transfer and commercialization efforts are gaining momentum.

The Task Force acknowledged that our state is not starting from scratch in building a world-class com-

Number of Disclosures Received per $1MM Research Expenditures



Source: AUTM Survey

Year	Ohio	U.S.
2002	0.377	0.316
2003	0.354	0.318
2004	0.414	0.339
2005	0.401	0.345
2006	0.406	0.373
2007	0.380	0.371
2008	0.340	0.363
2009	0.401	0.363
2010	0.374	0.343
2011	0.408	0.351

NOTE: Ohio University is not included here because of missing data.

3 Jennifer L. Woolley, The Space Between: Building the Infrastructure for Entrepreneurship in Nascent Markets, The Federal Reserve, October 6, 2011; Gregory Tassey, Beyond the Business Cycle: The Need for a Technology-Based Growth Strategy, National Institute of Standards and Technology, February 2012; Darrell M. West, Improving University Technology Transfer and Commercialization, Brookings Institution, December 12, 2012; and Shiri M. Breznitz, Enhancing Economic Growth? University Technology Commercialization, Georgia Institute of Technology

mercialization infrastructure, noting that Ohio has the intellectual capacity, facilities, industrial and higher education leadership, and emerging growth industries necessary to compete on a global scale. For example, the Ohio Third Frontier is the centerpiece of Ohio's technology-based economic development efforts. A public-private partnership created in 2002, Third Frontier targets state investments to promising industries, technologies and entrepreneurs for the express purpose of establishing Ohio as an innovation leader by driving and supporting technology-based economic growth and job creation.

In addition to robust levels of funded academic research, Ohio has a solid foundation on which to build with respect to invention disclosures filed with university technology transfer offices; patent applications filed and U.S. patents issued to universities; and new business start-ups spun off of university intellectual property. The Fifth Condition Report identified the strategies for leveraging these assets to full advantage and issued a call for a unified vision across government, higher education and industry to act as the catalyst for creating the partnerships necessary to accelerate and enhance commercialization in Ohio.

No matter how sound the strategy, the key to successful outcomes is effective implementation. With that in mind – and in acknowledgement of how critical technology transfer and commercialization success is to Ohio's economic future – the Board of Regents unanimously agreed to make the status of implementation of the Fifth Condition Report's recommendations the sole subject of the Regents' Sixth Report on The Condition of Higher Education (Sixth Condition Report).

This document – the Sixth Condition Report – represents a snapshot of a moment in time. It focuses on critical enabling conditions and initial implementation steps for a strategically chosen subset of the action steps embedded in the Task Force's full slate of recommendations. As such, this report serves four essential purposes:

1. I**t identifies a selective set of high-impact priority goals and related activities** that represent the initial phase of implementation of the Fifth Condition Report recommendations.

2. **It highlights the results of a survey of Ohio higher education institutions and other organizations** regarding significant commercialization activities launched both before and after the publication of the Fifth Condition Report.

3. **It provides a status report on activities to date for a limited number of priority goals** critical to the initial stages of implementation of the Task Force recommendations.

4. **It proposes a number of additional strategies and priorities for consideration** as Ohio moves forward with subsequent stages of implementation of those recommendations.

To properly frame and realize these four objectives, the logical starting point is a review of the Fifth Condition Report recommendations.

Wright State University

SECTION 2

Review of Fifth Condition Report Recommendations

Miami University

In the Fifth Condition Report, the Task Force identified ten recommendations that encompass a broad span of strategies and actions. Collectively, the recommendations outlined in the Fifth Condition Report function as a road map for how Ohio can position itself to compete and lead in a global innovation economy. They were developed with input from hundreds of business and higher education leaders, researchers, entrepreneurs and finance and venture capital experts, and were previewed to the public in seven regional public meetings in Toledo, Columbus, Dayton, Akron, Lorain, Athens and Cincinnati. In addition to providing feedback to draft recommendations, the regional meetings provided a forum for soliciting ideas and assistance for implementation.

RECOMMENDATION 1: Capital Continuum

Ohio should support development of investment capital – from proof-of-concept, to pre-seed and seed-stage funds, to early stage (Series "A" and "B") venture funds – employing capital from both public and private sources. Concurrently, Ohio should promote statewide and regionally based "first institutional funds" to focus on institutions of higher education and industry technologies with commercial applications.

RECOMMENDATION #2: University Incentive Systems

Colleges and universities, in consultation with the Board of Regents, should develop strategies that promote a "culture of entrepreneurship" on university and college campuses by incentivizing and rewarding entrepreneurial activities by faculty and developing user-friendly approaches to commercialization of college/university-based technologies.

> The strategy recommendations outlined in the Fifth Condition Report function as a road map for how Ohio can position itself to compete and lead in a global innovation economy.

RECOMMENDATION #3: University Entrepreneurial Programs

Colleges and universities should allocate additional resources to expand entrepreneurial programming and curricular activities, including but not limited to providing rigorous STEM curricular options on campus and online and by providing more opportunities that can be accessed by students, staff and faculty who have an interest in entrepreneurship.

RECOMMENDATION 4: State Policy Support for Entrepreneurial Activities

To successfully leverage the broad-based diversity within Ohio's college- and university-level research platforms, the State should (a) encourage the development of statewide and regionally based strategies that are focused on the knowledge-based economy, and (b) support the adoption of policies and procedures that incentivize the recruitment and retention of high-tech businesses and the talent to run them. The State also should work with Ohio's Congressional delegation to organize federal support for commercialization and identify key representatives from industry, higher education and government, including the Ohio Board of Regents, to lead and champion this critical initiative at both the state and regional levels.

RECOMMENDATION #5: Workforce Development

The State of Ohio must better align Ohio's postsecondary and K-12 education with the emerging needs for both STEM and skilled workers with new competencies and attributes to support Ohio's economic recovery and growth through increased commercialization in targeted technology and industrial sectors.

RECOMMENDATION #6: Ecosystem Development

Working collaboratively, industry and higher education leadership – with the support of government – must develop a comprehensive profile of the resources required, including financial, managerial and technical resources, to sustain a statewide and regionally based ecosystem essential to supporting university and industry activities throughout Ohio.

RECOMMENDATION #7: Incubator Capacity

Institutions of higher education should provide incubator capacity where faculty and industry collaboration can occur and where start-up companies can find a nurturing environment.

RECOMMENDATION #8: Program Metrics

Annual data collection and publication of performance metrics should be central to the state agencies and universities that support and promote economic development and that make decisions regarding the application of critical resources, including human, facilities or capital resources.

RECOMMENDATION #9: Updated Industry Agreements

Ohio's institutions of higher education should seek long-term relationships with key corporate partners, governed by updated general umbrella agreements. These agreements should be sensitive to proprietary interests and emphasize strategic partnerships, goals, strategies, evaluation and timelines – not just licensing revenues and/or service agreements.

RECOMMENDATION #10: Portals and Enhanced Communications Materials

Ohio should develop institutional portals and communication networks to (a) advertise college/university faculty intellectual property, research strengths and activities, and (b) make it easier for industry to interact with faculty who have an interest in working with industrial partners. The State, in partnership with Ohio's institutions of higher education, should implement a strategic communication plan for defining state policies, procedures and support systems intended to advance the commercialization of university technology.

Bowling Green State University

SECTION 3

Identification of Priority Goals

The University of Akron

No one expected that implementation of the Fifth Condition Report recommendations would be complete by the time the Sixth Condition Report was published. The scope of the Task Force recommendations was far-reaching and the timeframe for immediate action was limited.

To advance and support implementation of the Fifth Condition Report recommendations, members of the Task Force Executive Committee and Advisory Committee worked closely with Task Force Chairman Vinny Gupta to extract from those recommendations a set of strategically organized and prioritized activities designed to deliver significant near-term benefit and impact. These selected action steps became the Board of Regents' eleven Priority Goals for the initial phase of implementation of the Task Force's recommendations:

ACTION GROUP 1: Building Capacity for Commercialization

- **Priority Goal #1: Agreements**: Develop, share and use a set of legally sufficient, higher education- and industry-vetted guidelines and templates that assist institutions in facilitating and executing license and sponsored research agreements.

- **Priority Goal #2: Promotion and Tenure Review Process**: Assess efforts under way at institutions of higher education to incorporate applied research and commercialization within the promotion and tenure review process.

- **Priority Goal #3: Incubators**: Assess the state's incubator capacity and document characteristics of successful incubator constructs and practices.

ACTION GROUP 2: Creating an Entrepreneurial/ Innovation Ecosystem

- **Priority Goal #4: Regional Economic Development**: Support and encourage college/university research and entrepreneurial activities that connect regionally with other institutions of higher education, industry and economic development groups and initiatives.

- **Priority Goal #5: Statewide Research Portal**: Determine the financial feasibility of creating a statewide portal to showcase, share and promote university/college faculty, research strengths and assets, including equipment.

- **Priority Goal #6: Capital Continuum**: Assess the availability of capital in Ohio and develop strategies for attracting needed capital at all stages of the commercialization continuum.

ACTION GROUP 3: Fostering a Culture of Entrepreneurship

- **Priority Goal #7: Entrepreneurship**: Assess the current status of entrepreneurial curriculum and instruction at Ohio institutions of higher education and explore with institutions the development of a multidisciplinary approach to entrepreneurial instruction.

The 11 Priority Goals

ACTION GROUP 1

1. Agreements
2. Promotion and Tenure Review Process
3. Incubators

ACTION GROUP 2

4. Regional Economic Development
5. Statewide Research Portal
6. Capital Continuum

ACTION GROUP 3

7. Entrepreneurship

ACTION GROUP 4

8. Workforce Forecasting
9. Co-ops and Internships
10. STEM Education

ACTION GROUP 5

11. Metrics

ACTION GROUP 4: Developing a Globally Competitive Workforce

- **Priority Goal #8: Workforce Forecasting**: Support the Governor's Office of Workforce Transformation to identify Ohio's most urgent workforce needs and to align education institutions to meet businesses' needs.

- **Priority Goal #9: Co-ops and Internships**: Encourage each Ohio institution of higher education to develop a co-op and internship program that includes a STEM focus, and have the Ohio Board of Regents and the Ohio Third Frontier Network collaboratively work to expand and broaden co-op and internship programs statewide.

- **Priority Goal #10: STEM Education**: Strengthen and create new STEM-focused partnerships between K-12 and higher education to ensure students begin postsecondary education ready to engage in STEM coursework and persist through graduation in STEM-related fields.

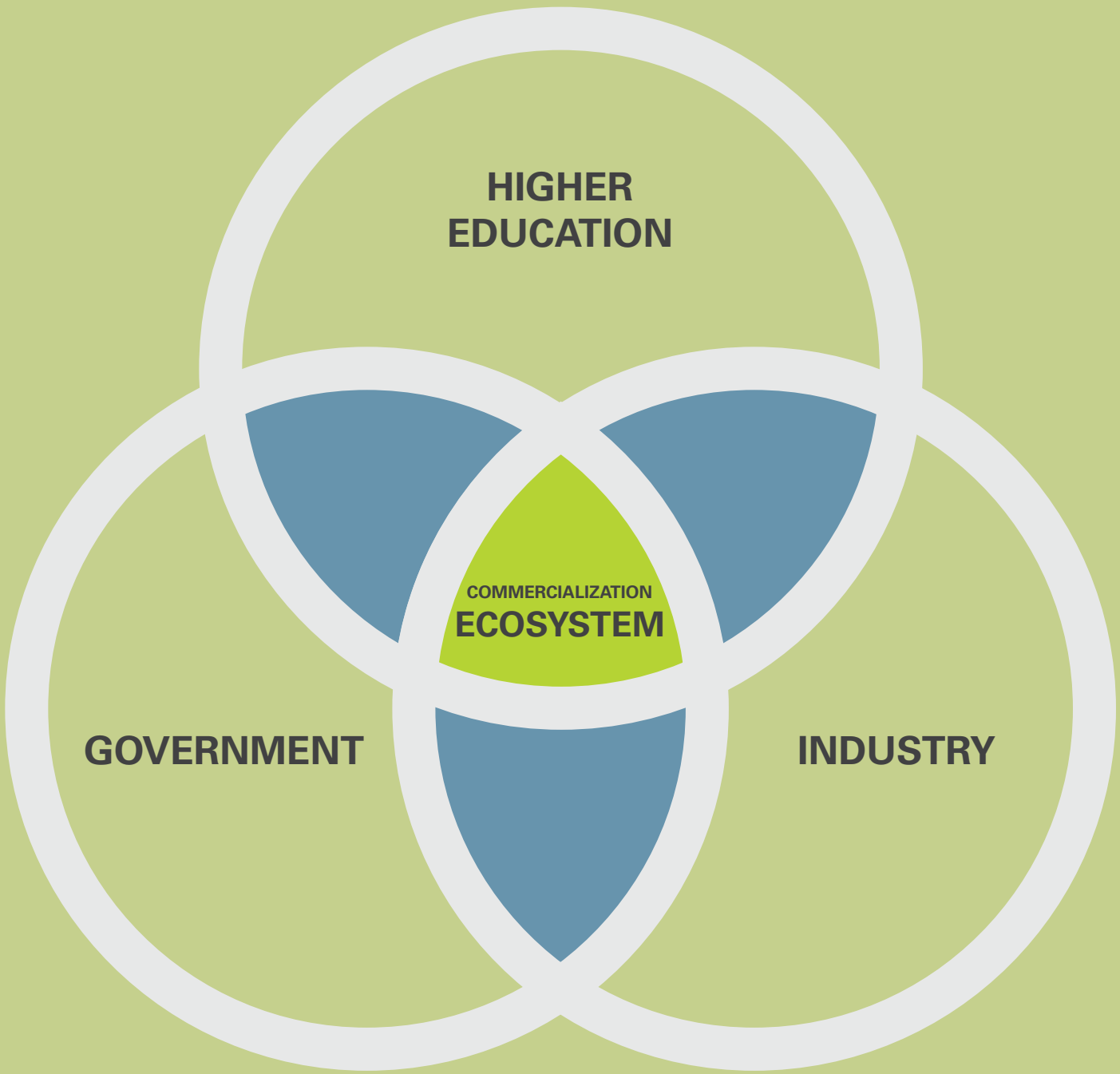
ACTION GROUP 5: Measuring Success Through Meaningful Metrics

- **Priority Goal #11: Metrics**: Identify measures and metrics for inputs, outputs and outcomes for Ohio that demonstrate the benefits and effectiveness of commercialization activities carried out by colleges/universities.

These eleven Priority Goals are the focal point for the Sixth Condition Report's update on the progress of implementation of the Fifth Condition Report's recommendations. Implementation of additional action steps embedded in the Fifth Condition Report recommendations is not addressed in this document but may be the subject of future status reports.

Commercialization Ecosystem

Ecosystems that support technology commercialization must be built collaboratively by industry, higher education, and government leaders.



SECTION 4

Survey of Task Force Member Institutions & Organizations

Central State University

The diversity of the Task Force recommendations provides individual colleges, universities and regional partners with the flexibility to implement strategically focused activities they deem likely to promote and support commercialization. To gauge the range and depth of commercialization activity across Ohio, the Ohio Board of Regents surveyed Task Force member institutions and organizations about commercialization activities and policies launched both before and after the release of the Fifth Condition Report. The survey focused particularly on strategic industry-university partnerships, university engagement with regional economic development initiatives, support for entrepreneurship, and metrics used to measure commercialization productivity and impact. Input from the survey has helped the Board of Regents better understand how institutions of higher education and other organizations are supporting commercialization, and has informed Regents' thinking about how to better support these efforts.

The following are top-line findings from the Task Force Survey, along with specific examples from institutions represented on the Task Force.[4] Please note that these examples do not represent everything that is happening on college campuses and in regions across Ohio; rather, the examples are intended to serve as illustrations that reflect the range and reach of efforts to promote entrepreneurship and commercialization in our state collectively.

Following the Fifth Condition Report, the Task Force conducted a thorough survey of member institutions and organizations to provide a general idea of current and past commercialization activities.

Collaborating with Industry

Higher education and industry are engaged in numerous collaborations aimed at accelerating progress along the commercialization continuum and supporting regional economic development efforts. These collaborations are providing a wide range of services and resources, including access to capital and potential funders, grant proposal support, laboratory and office space, market opportunity assessments, product development support, scaling-up of manufacturing, talent acquisition, business planning, administrative and budgeting management, and other consultative services. These efforts are serving a wide range of industries representing Ohio's diverse areas of economic strength, including aerospace, medical, advanced energy, electronics, advanced materials, polymers, photovoltaic technologies, water technologies and more. For example:

- **University of Cincinnati Research Institute (UCRI)**: UCRI, which became operational in the summer of 2012, is an independent not-for-profit 501(c)(3) that serves three primary needs of the UC community: (1) to serve industrial clients who need the services of internationally recognized technical experts at UC in a timely and efficient manner; (2) to provide an efficient mechanism for commercialization of a wide range of intellectual property developed by UC faculty and students from all colleges and units through industry/commercial partnerships; and (3) to provide cooperative learning experiences and opportunities for UC students with industry partners. UCRI initially will concentrate on developing the next generation of jet engines with GE Aviation (GE) as its first industrial partner. The GE/UCRI partnership received a $5 million "Research and Development Capital Attraction Program" grant from the State of Ohio to advance commercialization of research in three main areas: lean combustion, thermal management and ceramic matrix composites. This resulted in a three-year, $2 million-per-year contract between GE and UC's College of Engineering and Applied Sciences to develop the three focus areas, with the possibility of expanding the project into two additional areas, aeromechanics and high temperature testing and analysis.

4 This survey was administered only to Task Force Members' respective institutions and organizations. Many other similar activities aimed at driving collaboration, entrepreneurship, technology transfer and commercialization are under way at other colleges, universities and organizations across Ohio. Some of these are noted in the Activity to Date section of this report.

- **Electric Power Integrated Systems Center (EPISCenter):** The University of Dayton (UD) and GE Aviation (GEA) have collaborated to locate the new Electric Power Integrated Systems Center (EPISCenter) on the UD campus. Scheduled to open in the summer of 2013, the EPISCenter will house research labs for GEA's Electric Power Systems Group and will be operated jointly by GEA and UD. The campus location offers GEA many value-added benefits, including a pipeline of students for internships, qualified graduates who can step into the GEA workforce, a cadre of researchers to supplement GEA's own research staff, a world-class School of Engineering and an intellectually stimulating environment. University students, faculty and researchers assist in R&D programs enabled by GEA research funding of about $1 million annually. UD also is customizing curricula for GEA in electric power engineering. GEA estimates more than 200 high-paying jobs will be created in five years.

- **Ohio Clinical Trials Collaborative**: In April 2013, the Governor's Industrial Technology and Enterprise Advisory Council awarded Case Western Reserve University leadership of a $2.3 million investment in the Ohio Clinical Trials Collaborative (OTC), a partnership with the state's three Clinical and Translational Science Award (CTSA) institutions: Case Western Reserve University, The Ohio State University and the University of Cincinnati. The collaboration will accelerate cures and create jobs by enhancing the institutions' ability to expand the number of clinical trials in Ohio. This will also create access to a larger pool of patients for enrollment in the clinical trials, increasing the likelihood of completion and providing critical information to biomedical companies sooner so they can move forward with the development and validation of their products. A unified Institutional Review Board (IRB) agreement, enacted in August 2012, laid the foundation for the Governor's investment by establishing a statewide network for clinical trials predicated on the network's ability to expedite facilitated review approval process for clinical trials in Ohio from 75 days to 4 days. The Medical Corridor promotes Ohio's significant medical research assets and leverages them for job growth. The initiative supports collaboration among medical research institutions and the healthcare industry across Ohio's regions to help lower costs, improve patient care and increase the competitiveness of the state's biohealth industry.

- **Embedded Faculty Members**: Wright State University (WSU) has initiated a novel partnership model in which the university joins with an industry partner to hire a faculty member whose salary costs will be shared between the company and the institution and whose efforts include time on campus and time actually working at the company. In January 2013, the first such hire was made, through the university's collaboration with Mound Laser and Photonics Center, a local advanced manufacturing and machining company. The new faculty member has been appointed in the Department of Mechanical and Materials Engineering. This agreement has also resulted in significant acquisitions of critical laser equipment in support of research and development activity located on the Wright State campus.

- **Collaboration with AlphaMicron**: Kent State University (KSU) has worked closely with Ohio-based start-up AlphaMicron to advance its liquid crystal display technology and commercialize its applications. A recent collaboration, for example, focused on improving the quality and functionality of the housing for a new motorcycle helmet visor that uses AlphaMicron's technology for instantaneous film tinting. This enabled the company to transition its target market strategy from pursuing development of an aftermarket product to active discussion with a number of OEM helmet manufacturers interested in incorporating the technology into their helmets. As a result, AlphaMicron now has 10 helmet manufacturers interested in selling and distributing its product.

- **Center for Surface Engineering and Lubrication Research:** In August 2011, The University of Akron (UA) and the University of Akron Research Foundation entered into a novel open-innovation agreement with long-time university partner, The Timken Company, a world leader in innovative friction

management and power transmission products. This newest partnership between UA and Timken will combine selected technologies, expertise and equipment at a new university research facility, the Center for Surface Engineering and Lubrication Research, scheduled to open in August 2013. The Timken Endowed Chair and Director of the Timken Engineered Surfaces Laboratory, working with university faculty and graduate students, will be responsible for surface engineering research for an entire company product line. The Timken Company, which thus far has provided $5 million to support this initiative, expects the partnership will accelerate technology research, development and commercialization. To date, the initiative has attracted more than $600,000 in follow-on research funding; ten undergraduate and graduate students are employed in the new research facility laboratories; Timken has realized savings of more than $1.5 million; new intellectual property has been created; and a new start-up company for non-Timken spin-out products is close to operational.

- **Advanced Analytics Center**: The Ohio State University (OSU) is a key player in a regional collaboration that led to IBM establishing a new, first-of-kind advanced analytics center in Columbus. According to an IBM news release, the center is "dedicated to advancing research, development, client services and skills training in the areas of analytics, big data and cognitive computing" [5] and will "draw on the expertise of education institutions and industry partners to create a world-class ecosystem serving industries' fastest-growing technical disciplines aligned to business analytics." Related to this initiative, OSU is collaborating with IBM to create new business and technology curricula – at undergraduate, graduate and executive education levels – to help students and mid-career professionals acquire the high-demand analytics skills needed to drive the emerging and future economy. To accelerate program development, IBM is providing OSU with curriculum materials, case studies, software, guest speakers and faculty awards. Other partners in the initiative include JobsOhio, Columbus 2020, ICC (Information Control Corporation) and other Columbus-based businesses. IBM expects the initiative to create up to 500 new analytics consultants and research and development professionals over three years, while nurturing economic development in the region.

- **TechGROWTH Ohio**: A public/private partnership sponsored by Ohio University (OU) and the Ohio Third Frontier program and administered by OU's Voinovich School of Leadership and Public Affairs, TechGROWTH Ohio provides access to professional business services and capital for technology-based start-ups in southeast Ohio. TechGROWTH Ohio delivers intensive operational assistance to entrepreneurs through "Executives in Residence" who validate opportunities and prepare companies for investment. The partnership also provides competitive "Growth Grants" to qualifying companies to overcome targeted commercialization obstacles, as well as access to pre-seed investments, angel investors for follow-on capital, and venture capital for scaling up production, sales and marketing. In its first four years, TechGROWTH Ohio has acquired nearly $100 million in operational assistance and resources to support the growth and sustainability of client companies, leveraging state funding support at a 10.5 to 1 ratio. TechGROWTH's investment portfolio now numbers ten companies, including one student start-up in digital media, three Ohio University faculty-led start-ups and multiple regional start-ups from Athens and around a 20-county service region. In addition to the Voinovich School of Leadership and Public Affairs, TechGROWTH Ohio partners include Ohio University's Edison Biotechnology Institute, Ohio University's Innovation Center, Ohio State University South Centers, WesBanco, Adena Ventures and the Muskingum County Business Incubator.

5 "IBM Opens Advanced Analytics Center in Columbus, Ohio," Nov 29, 2012 (http://www-03.ibm.com/press/us/en/pressrelease/39548.wss)

Becoming More Market-Driven

Universities and colleges are changing their philosophy and approach to technology transfer on their campuses to reflect a much deeper understanding of industry needs and market potential. Universities are redefining and refocusing their Technology Transfer Offices in ways that reflect a sharper focus on industry engagement and collaboration and that support meaningful research that drives regional economic development and job creation. This reimagining of technology transfer on university campuses is opening up a range of new ways for university faculty and staff entrepreneurs to commercialize their research in the marketplace. For example:

- **NEOMED's REDIzone[SM]**: The Northeast Ohio Medical University's Research, Entrepreneurship, Discovery and Innovation Zone (REDIzone[SM]) program connects resources from the university with entrepreneurs and early-stage companies in support of regional economic development. One of several university-wide initiatives to foster innovation and technology commercialization at NEOMED, REDIzone[SM] offers physical incubator space for early-stage biomedical companies as well as a portal to many other valuable resources, including a robust regional entrepreneurial network. REDIzone[SM] has the capacity to incubate 10 start-up companies within the incubator's physical space. REDIzone[SM] also can support companies that need access to clinical and scientific experts and are seeking federal grants to fund commercialization. Since its incorporation in January of 2013, REDIZone[SM] has provided incubator services for five company clients, including Crystal Diagnostics, LLC. and Dragon ID, LLC. Crystal Diagnostics has developed a pathogen detection product and leveraged an initial $3 million State investment into more than $15 million of follow-on funding. The company is preparing for market entry in the food safety sector. Dragon ID, LLC has developed a filtering device to prevent strokes associated with heart valve replacement procedures and recently received an "A" grant from the Lorain County Community College Innovation Fund to carry out preclinical testing, which will occur within REDIzone[SM]. Two other companies are under development as spin-outs from university faculty entrepreneurial activities.

- **Office of Corporate Engagement and Commercialization (OCEC)**: In August 2012, Kent State University (KSU) closed its Office of Technology Transfer and Economic Development and established a new Office of Corporate Engagement and Commercialization (OCEC). The rationale for this change was a heightened understanding that in order to effectively serve the needs of local and regional industry through the university's research expertise and facilities, and to further develop and position Kent State as an important economic development engine in the region, it is necessary for the university to more fully understand industrial needs and work in partnership with industry to define and fund research and development activities. In the past eight months, the OCEC has developed contacts and networked with 200-plus companies/organizations in the region, state and nation.

- **New Processes for Customer Validation**: All invention disclosures that the University of Toledo's (UT) Technology Transfer Office moves onto patent applications are reviewed by key members of an Innovation Ecosystem team to determine if there is an opportunity to commercialize, as opposed to simply license. As recommended in the Fifth Condition Report, the team set up a proof-of-concept component to its fund to address funding gaps at that very early stage. The Task Force report also noted that start-ups often overstate the value of their technology in the eyes of the customer. To address this disconnect, the university has implemented new processes emphasizing customer validation at the earliest stages, similar to what is used in the National Science Foundation's Lean LaunchPad process.

- **Speed-to-Market Accelerator**: Lorain County Community College (LCCC) is the educational partner to NorTech (project lead), Magnet and JumpStart on a Speed-to-Market Accelerator project that seeks to accelerate commercialization opportunities in the Advanced Energy and Flexible Electronics clusters by providing market development services, manufacturing scale-up services and workforce development services to companies creating, producing or adopting these emerging technologies. LCCC also is leading a consortium of Northeast Ohio colleges and universities to work with industry partners to (a) identify current and future job requirements in these two technology clusters, and (b) help prepare employers, students and other job seekers for these jobs as they become available. To date, LCCC has assisted six companies in filling positions ranging from electrical, mechanical, process and foundry engineers to part-time assemblers and interns. Additionally, one company in the cluster has announced plans to hire as many as 46 production technicians in the coming year.

- **Additive Manufacturing Innovation Institute**: Case Western Reserve University and The University of Akron are among the leaders of a $70 million consortium to demonstrate ways to improve and expand manufacturing in the United States. The first major investment came from a $30 million federal grant to establish the National Additive Manufacturing Innovation Institute (NAMII). An additional $40 million will come from the more than five dozen research universities, community colleges, businesses and non-profit organizations from across Ohio, Pennsylvania and West Virginia. NAMII will focus on innovations in additive manufacturing – an approach to making products that involves layering materials, sometimes referred to as 3D printing. Among its potential advantages are energy reductions of more than 50 percent and cost savings of at least 10 percent. Initial promising projects include printing cranial replacements, integrating electronics and sensors on printed airplane parts and integrating additive processes into traditional industry sectors.

Engaging in Regional Planning Efforts

Many universities and colleges are actively engaged in regional economic planning and development efforts. In addition to working closely with local and regional economic development entities to strategically and effectively leverage collective resources, universities are playing a leadership role in stimulating local and regional conversations about the value of research, innovation, commercialization and collaboration among higher education and industry. For example:

- The Ohio State University's Technology Commercialization Office (TCO) and Columbus 2020, the economic development organization representing the eleven-county central Ohio region, are partners in fostering central Ohio's entrepreneurial ecosystem. The TCO and Columbus 2020 also partner regularly with TechColumbus, a public-private partnership focused on accelerating central Ohio's innovation economy, to harness the region's tremendous research and technology resources. The TCO/Columbus 2020 partnership also includes strategic planning on workforce development initiatives. Young entrepreneurs from both OSU and the community engage with the TCO through various programs, internships and start-ups; these programs and initiatives help develop the potential of the university's creative and entrepreneurial student body and incentivize them to stay in Columbus. In addition to spearheading regional economic development efforts, Columbus 2020 and TCO work closely with the region's vibrant and active angel community known as the Ohio Tech Angels Fund, which currently is the second-largest angel group in the nation. From identifying specific needs of a start-up company to partnering on mentoring and networking events and workshops, TCO and Columbus 2020 are implementing their shared vision of creating one of the most dynamic and entrepreneurial regions in the nation and becoming a nationally recognized leader in economic development.

- The University of Cincinnati (UC) is transitioning to a more commercialization-driven model of technology transfer. As a major strategy, the university's Office of Entrepreneurial Affairs and Technology Commercialization has recently launched its Technology Commercialization Accelerator to serve as a vehicle for significantly ramping up the university's commercialization activity. Formed in early 2012, the Accelerator has received funding support from the Ohio Third Frontier through a strong partnership with CincyTech's Entrepreneur Signature Program. The Accelerator's primary focus is on identifying promising, early-stage technologies; assessing those technologies to determine viable start-up company opportunities; developing a commercialization strategy; and facilitating the work necessary to move the technology toward commercialization. The Accelerator offers services by accomplished entrepreneurs-in-residence, gap funding grants and connections to external resources. It also extends the capabilities of the university through partnerships with CincyTech, a Community Redevelopment Group and an external Commercialization Advisory Committee (CAC) for recommending the most promising projects. The involvement of industry representatives on the CAC has led to a request to connect the Accelerator with UC's Ohio Center for Microfluidic Innovation to solve a major industry problem. Two companies working with UC are currently seeking to co-locate with the Accelerator in an off-campus area, which has potential to create additional positive economic impact.

- The University of Dayton (UD) works in a strategic way with the Dayton Development Coalition (DDC), the Miami Valley's primary economic development organization, to realize technology-based economic development. This work supports the "retain and attract" activities of the DDC and has created more than six new start-up companies in the last four years. UD also works with CityWide Corporation, the economic development arm of the City of Dayton, on a variety of economic development activities. One of this partnership's success stories is the development of Tech Town, a brownfield development just east of the Dayton Dragon's Fifth Third Stadium. Tech Town is a development of new buildings that house new start-up companies and established small companies with a science, engineering or technology focus to their business. UD has helped CityWide attract companies to Tech Town and has placed several start-up companies in the complex. The university continues to work with these companies to grow their businesses and assist in addressing their technical challenges.

- Wright State University (WSU) also has unique ties to the Dayton Development Coalition (DDC). Through sponsorship of an annual Regional Summit and in-depth participation in regional aerospace initiatives, legislative activity and outreach (both state and national), and other significant public-private partnerships, WSU is a major magnet and driver for commercialization and economic development activity and collaborations. The Regional Summit (and its counterpart at the Wright State Lake Campus) bring together a broad group of industry and government leaders to discuss economic advancement in the region. The DDC has been involved in some capacity as a partner with WSU in its many public-private partnerships. In addition, the Wright State Research Institute provides key business and contracting mechanisms and networks with a strategic focus on capturing research dollars and interactions with the Air Force Research Laboratories at Wright-Patterson Air Force Base. Like the DDC, the Research Institute is heavily engaged in multiple projects and collaborations within the university and throughout the region.

- Kent State University (KSU) maintains strong relationships with economic development organizations across the region, including BioEnterprise, JumpStart, NorTech, the SMART Center at Lorain County Community College, and TBEIC (Tech Belt Energy Innovation Center). Within the past year, these relationships have resulted in co-sponsored research events, master research agreements, mutual corporate engagement and advocacy efforts, and partnerships in state and federal research funding proposals.

- The University of Toledo (UT) is deeply involved in regional economic development efforts. For example, UT's Innovation Enterprises team, a not-for-profit support organization for university-related technology commercial development, facilitates a monthly meeting of the most influential leaders in northwest Ohio, to discuss opportunities in the region. Key members of the group include Lucas County Port Authority, Regional Growth Partnership, Toledo Community Foundation, Toledo Regional Chamber of Commerce and Lucas County Economic Development Corporation. Examples of regional initiatives include the Toledo Regional Comprehensive Economic Development Strategy; Future of Toledo, a 15-part regional development initiative; and the Northwest Ohio Regional Economic Development Association. Additionally, Innovation Enterprises partners with the Regional Growth Partnership, the local economic development enterprise, to co-fund and manage Rocket Ventures, LLC, to assist entrepreneurs and companies in the 18-county northwest Ohio region with business development and commercialization of innovative technologies and novel business concepts. This partnership has helped Rocket Ventures' clients achieve more than $175 million in investments, sales revenue and other income.

- The presidents or provosts of all of Northeast Ohio's public four-year universities – Cleveland State University, Kent State University, Northeast Ohio Medical University, The University of Akron, and Youngstown State University – sit on the board of NorTech, the region's business-led, technology-based economic development organization. This provides an opportunity for higher education leaders to help shape the region's economic development strategy, build connections for faculty and students and more effectively leverage their institutions' assets to support the growth of the region's innovation economy.

Promoting Entrepreneurship

Task Force member institutions are engaging in a wide variety of creative activities to promote entrepreneurship among students, faculty and community and regional partners and to help build a more robust commercialization pipeline in Ohio. These events range from sponsoring and/or participating in business competitions, to hosting community/regional roundtable discussions, to sponsoring high-level networking activities. Collectively, the activities provide participants with valuable opportunities for hands-on, practical problem-solving and enhanced entrepreneurial learning experiences, while also providing important networking and idea sharing. For example:

- **Akron Innovation through Convergence and Entrepreneurship (Akron ICE)**: The Akron ICE program seeks to create spin-out companies, based on The University of Akron's existing strength in biomedical research, by pairing core teams of engineering and science graduate students with medical residents and fellows to pursue research projects over three- to four-year periods. The teams also are supported by business students, law students specializing in intellectual property and contract law, and mentoring faculty members, physicians, industry executives, entrepreneurs, practicing lawyers and area investors. The program also promises to produce graduates with extensive experience in innovation, entrepreneurship and participation on high-performance teams. To date, nearly a dozen students are working on technologies that are on the path to commercialization and one start-up company has been launched.

- **Technology Roundtables and Customer Days**: In the spring of 2013, Wright State University (WSU) launched a series of Technology Roundtables that focus on assessing the maturity and commercial potential of faculty-generated technologies and ideas. These campus-wide events involve panels of busi-

ness and technology leaders who provide feedback to help push technologies and ideas to the next step in the commercialization process. These Roundtables will be followed by a series of "Customer Days" in which leaders from key market segments will be formally introduced to university-based research, at various stages of maturity, that might be a solution to their challenges. These events will inform subsequent phases of research, expose customers to university research capabilities, and vice versa, and also generate new partnerships. WSU's plan is that mature technologies identified in these events will be licensed or presented at an Investor Roadshow currently in the planning stages.

- **Regional Competitions**: The University of Toledo's Innovation Enterprises team engages in a number of regional competitions that promote entrepreneurship and help grow the pipeline for commercialization. One example is **Start-Up Weekend**, a weekend-long hands-on experience in which established and aspiring entrepreneurs can find out if their ideas are viable, and which includes open business pitches, customer development, idea validation, LEAN start-up methodologies, and prototype development and demos. Another example is **Pitch and Pour**, a platform providing technology-based start-ups access to potential partners and funders and an opportunity to network with those people in an upbeat and supportive environment.

- **Redefining Investment Strategy Education (RISE)**: The RISE Program at the University of Dayton (UD) is an annual conference that brings some of the greatest minds in investment and finance research to the Dayton region. This year, RISE 13 will feature presidents and CEOs from some of the most prominent firms in the industry, such as Ariel Investments, BlackRock, TD Ameritrade and TIAA-CREF. The chief investment strategists and chief economists from firms such as Barclays, Charles Schwab, Federated Investors, Mesirow Financial, Oppenheimer and TheStreet will make up a list of industry-renowned panelists for the conference. Representatives from Barron's, Bloomberg, CNBC, FOX Business and other financial media will also participate. RISE 13 will feature a "Federal Reserve Presidents Panel," a first for the conference. The panel will provide dual perspectives on Federal Reserve policy, which has become such an important force in today's markets, investment and research.

- **Think[box] Institute for Innovation and Collaboration**: Think[box] is Case Western Reserve University's new invention center – designed to create a distinct, on-campus environment where hands-on education, design and development, and product commercialization can take place, and where these activities can interact and cross fertilize. More than a meeting place or world-class fabrication laboratory, think[box] is home to educators, advisors, mentors and facilitators who can assist students and faculty in becoming tomorrow's entrepreneurs and technology leaders. The vision of Think[box] is to change the economic and social culture of the university and region by emphasizing cross-discipline and cross-institution collaborations that push creativity and innovation to their limits. Think[box] will provide a project-based learning environment where students from all courses of study have an opportunity to understand how innovation and creativity can lead to economic and social advancement. This exposure will encourage entrepreneurial thinking among students who will become the leaders and innovators of the future. Simultaneously, think[box] creates an entrepreneurial environment where innovative ideas can be nurtured, developed, funded and commercialized. By providing a place where members of the engineering, design, arts, science, medical and business communities can interact, think[box] will help overcome the intellectual and physical boundaries that often prevent the spread of ideas and limit cross-discipline innovation.

- **Simulation Center:** The University of Cincinnati (UC) Simulation Center is an innovative model for university-industry collaboration designed to meet specific industry technology and workforce needs. UC and Procter & Gamble jointly developed the cutting-edge Center, which provides sophisticated computer modeling and simulation, an area in which UC faculty and students have considerable expertise. Since the Center's inception, eleven UC students, ranging from undergraduate to post-doctoral levels, have been employed as research assistants and trained jointly by UC faculty and P&G engineers and scientists. The Center has been supported by more than $4.2 million in funding from P&G over a five-year period to support collaborative projects in a broad range of engineering, science, design, business and medical fields. An internal P&G audit reports a 7:1 return on the company's investment in the Center, making it one of P&G's most profitable business partnership. The UC Simulation Center received P&G's prestigious Connect + Develop Private/Public Partnership Award in 2012.

- **Support for College Entrepreneurs:** The Burton D. Morgan Foundation reports that the Fifth Condition Report recommendations are informing the decisions the Foundation makes and the discussions it has with its partners – and that the Foundation is weaving the recommendations into its grant considerations and grant plans for the future. The Fifth Condition Report specifically has informed the Foundation's grant recommendations to support collegiate entrepreneurship on liberal arts campuses, Blackstone LaunchPad campuses and other institutions, including John Carroll University, Ashland University and Denison University.

Supporting Entrepreneurs & Companies from Idea to Expansion Stages

Lorain County Community College

Located in the Entrepreneurship Innovation Center on the Lorain County Community College campus, GLIDE is a unique public-private partnership between LLLC, the Lorain County Chamber of Commerce and the Lorain County Commissioners. GLIDE provides support for entrepreneurs and companies from the idea stage to the expansion stage. Services include business/idea assessments, technology and staffing support, access to legal counsel, educational resources, business management mentoring, strategic business guidance and access to capital.

To date, GLIDE has assisted more than 2,800 entrepreneurs and 150 companies; provided on-site incubation for 48 companies; helped generate sales revenue growth in excess of $89 million and follow-on investments in excess of $88 million; and supported the creation of 700 jobs with average salaries ranging from $45,000 to $60,000. In the fall of 2012, GLIDE partnered with the Regional Incubator for Sustainability and Entrepreneurship (RISE) to conduct an 8-hour Entrepreneurial Boot Camp course on the Bowling Green State University Firelands campus. The course attracted 17 new or experienced entrepreneurs from the Sandusky County and Erie County area, all of whom also received follow-up mentoring.

- **The Ohio State University-Cleveland Clinic Innovations Partnership:** The Ohio State University (OSU) and Cleveland Clinic Innovations (CCI), the technology commercialization arm of the Cleveland Clinic Foundation, will be sharing their comprehensive technology and commercialization service infrastructures to develop and deploy new medical innovations generated by the institutions' researchers, physicians, faculty and administrative staff. The innovations come in many forms such as medical devices, patient services, new medical software systems, consumer products and start-up companies. The collaboration plans to assess each institution's technologies and needs to identify resources and unique programs that potentially can be harnessed to quickly scale and commercialize technologies. Resources previously limited by geographical restrictions will be made accessible to both institutions. A jointly compiled list of the institutions' top twenty medical technologies serves as the initial commercialization priorities for the partnership. Two promising commercialization project areas already have been identified: bariatric medical devices and Health Information Technology (HIT). The partnership is looking at several possibilities including joint licensing, new company formation and joint entrepreneurial events in the HIT space. Combining these two Ohio-based commercialization powerhouses will improve patient care and quality of life for Ohio citizens through pioneering research, while the spin-off companies and subsequent jobs resulting from the partnership will contribute to Ohio's economic vitality.

Youngstown State University

SECTION 5

Activity to Date

The University of Toledo

In crafting the recommendations contained in the Fifth Condition Report, the Task Force incorporated input gathered from seven regional stakeholder forums. Analysis of the input from those conversations revealed a number of recurring themes. The eleven Priority Goals identified by the Task Force for initial action reflect the strongest themes contained in the Fifth Condition Report's recommendations. Task Force members believe that targeted activity in these areas will ensure the foundational components needed to improve commercialization throughout Ohio are intact and working to advance progress toward creating a vibrant and sustainable commercialization ecosystem in our state.

In determining specific implementation activities for each Priority Goal, the Board of Regents was guided by the following principles:

- Leverage existing commercialization and entrepreneurial initiatives
- Expand the knowledge base of commercialization activities occurring through the state
- Be impactful and have state and regional relevance

- Ensure goals and implementation strategies do not impede or obstruct current institutional and regional initiatives
- Ensure goals are capable of being measured with clearly defined metrics
- Forge synergistic relationships among higher education, industry and government

The following review of implementation progress for each of the eleven Priority Goals includes information about activities and accomplishments to date, as well as observations about near-term and/or long-term considerations, additional implementation strategies and general thoughts on next-step priorities.

ACTION GROUP 1: Building Capacity for Commercialization

Priority Goal #1: Agreements

In the past, industry has voiced concerns about variations in formal license, sponsored research and testing agreements from one higher education institution to another, as well as about the length of time often required to secure agreements. To the extent that agreement templates have existed in the past, their use has been inconsistent. In some cases, stakeholders have identified a need for greater clarity; in other cases, institutions simply need to be reminded that such tools exist and encouraged to use them.

Consequently, the Fifth Condition Report recommended that Ohio seek to "harmonize" – as distinct from "standardize" – license and sponsored research agreements to make them more user-friendly and to minimize unnecessary delays in executing agreements. University Offices of Technology Transfer were encouraged to identify and foster strategic partnerships with industry and promote the development of consistent, comprehensive relationship agreements that facilitate faculty-industry interactions and accelerate commercialization.

- **Goal**: Develop, share and use a set of legally sufficient, higher education- and industry-vetted guidelines and templates that assist institutions in facilitating and executing license and sponsored research agreements.

Activity to Date

In conjunction with the Board of Regents, an Industry Agreements Committee comprising university technology transfer officers and private-sector industry experts was convened by Isaac Molnar, a patent attorney in the Ohio Attorney General's Office (AG), to (a) conduct a review of existing agreements and the constitutional and statutory rules and regulations that guide them, and (b) collect input from higher education and industry stakeholders regarding ideas for how the agreement templates could be improved to further advance and accelerate commercialization.

Feedback obtained from these conversations and research indicated that while some agreement templates exist, they are used sporadically, and that the following initiatives relating to the agreements and other

aspects of the negotiation process could be beneficial:

- **Clarify the State's position on certain contract terms and provisions** contained in existing agreements, including but not limited to indemnification, conflict of interest, controlling law and limitations on IP ownership – specifically, to identify which terms are negotiable and which are not
- **Conduct an education campaign** to ensure that colleges and universities are aware of the work that previously has taken place on nondisclosure agreements, material transfer agreements and sponsored research agreements
- **Develop a Licensure Agreement template**
- **Develop peer-reviewed guidelines and best practices** for streamlining negotiations with industry

In response to this feedback, the AG took these actions:[6]

- Reviewed state law regarding conflict of interest and controlling law
- Developed a white paper that clarifies the State's position regarding certain nonnegotiable terms and provisions of higher education-industry agreements
- Created a "guidance document" identifying promising practices for streamlining the initial stages of the negotiation process
- Developed a new Licensure Agreement template
- Created a one-stop commercialization practices website for industry and colleges/universities

Summary/Next Steps

The initial actions taken in this area address concerns, as expressed by Ohio institutions of higher education and industry representatives, about formalizing university-industry partnerships through negotiation and, ultimately, contractual agreement. While the Board of Regents is confident that the new products being produced will be useful to both industry and higher education as they partner through license and sponsored research agreements, there is still much more that can be done. Immediate follow-up will consist of educating our higher education institutions on the products produced by the AG and working with other state agencies to develop strategies for creating industry awareness.

The Ohio Board of Regents will continue to work with AG staff as they continue their outreach to higher education officials and industry leaders to better understand additional steps that could be taken to improve and accelerate the agreements process. These efforts will include a review of recent revisions to intellectual property laws in other states.

Another upcoming project will include supplementing the information on the AG's newly created commercialization website with the development of "agreement process" training sessions for industry personnel.

6 The following draft documents produced by the Industry Agreements Committee: Essential & Negotiable Terms; Expediting the Negotiation Process; Anatomy of a Patent License and Template License Agreement; Template License Agreement; Technology Transfer and Commercialization Resources; Summary of Parties "Interviewed" are available at http://ohioattorneygeneral.gov/Business/Commercialization.

The sessions will cover pertinent information regarding license and sponsored research agreements specific to all Ohio institutions. The sessions will be available online and will take the form of a webinar or video. The Board of Regents will also be continuing its work with the AG to develop a centralized, online directory of initial points of contact for each higher education institution to be used by individuals and entities interested in engaging institutions in commercialization conversations.

An additional focus of the Board of Regents over the next year will be to work with higher education institutions and industry to develop strategies for establishing productive working relationships with each other before engaging in formal negotiations. Identifying certain parameters up front – e.g., a specific timeline within which a deal must be completed, or a specific number of redlined versions of the agreement that will be permitted, or identification of all individuals from both parties who need to be involved – can help facilitate discussion and progress by managing expectations regarding processes, schedules and resources. This in turn will enable partners to more effectively plan and time their efforts and investment.

Priority Goal #2: Promotion and Tenure Review Process

The transfer and commercialization of faculty research will flourish most and produce optimal results in a campus culture that encourages and celebrates entrepreneurial activity. In such an environment, faculty may be systematically incentivized to engage in commercialization activities and appropriately rewarded for those efforts.

One strategy for helping to create this kind of entrepreneurial culture is to include applied research and commercialization in the promotion and tenure review process. Typically, promotion and tenure are internal institutional matters – fundamental to academic freedom and faculty governance – that fall outside the purview of the Board of Regents. Nonetheless, Task Force members envision a future in which faculty have greater incentives to pursue commercialization than currently exist at many of Ohio's institutions of higher education. To realize that vision, the Fifth Condition Report encouraged college and university leadership to engage faculty in constructive conversations about how to expand current tenure and promotion review processes to include appropriate recognition of applied research, the creation of intellectual property, and commercialization activities.

- **Goal**: Assess efforts under way at institutions of higher education to incorporate applied research and commercialization within the promotion and tenure review process.

Activity to Date

The presidents of Ohio's public four-year universities are engaged in a continuing constructive dialogue about potential expansion of tenure and promotion review processes to include consideration of participation in commercialization activities. To capitalize on these conversations, the Task Force in March 2013 asked each university president to respond to the following: Do your tenure and promotion review committees currently consider participation in licensing and commercialization activities when weighing the merits of a faculty member's nomination for tenure and/or promotion? And, if faculty participation in licensing and commercialization activities is not currently part of a tenure and promotion review process on your campus, please describe any short- or long-term plans that you currently are working on to include a consideration of licensing and commercialization activities within the faculty tenure and promotion review process.

Below is a summary of the university presidents' responses:

- **All but three of Ohio's public four-year universities currently permit, to some degree, consideration of licensing and/or commercialization activities as part of the tenure and promotion review process.** The exceptions are Kent State University, which allows patents to be considered, but not licensing and commercialization; and Bowling Green State University and Central State University, where no department/school guidelines for promotion and tenure consider licensing and commercialization.

- **The decision to permit or not permit, or to require or not require, licensing and commercialization activities to be considered as part of tenure and promotion decisions is in virtually all cases a college/school, department or other academic unit decision.** It appears that The Ohio State University is the only institution that has a university-level policy on this subject. The OSU Office of Academic Affairs asks candidates being considered for promotion and tenure to list work in licensing and commercialization activities as part of the core dossier of their professional activities. The specific language ("inventions and patents, including disclosures, options and commercial licenses") is then incorporated into the relevant governance documents for all colleges and departments.

- **In some cases, policy documents, departmental or college/school bylaws, and tenure and promotion review process guidelines contain explicit language about what kinds of activities may or may not be considered. In other cases, the language is broad and general but also flexible enough to allow participation in licensing and commercialization activities.** At Youngstown State University, for example, participation in licensing and commercialization activities is not currently a designated criteria item in tenure and promotion review guidelines. Because these criteria vary widely across different academic departments, the university provides "broad parameters" rather than a uniform policy. Within those parameters, participation in licensing and commercialization activities would be considered a noteworthy achievement in the candidate's "scholarship" requirements for tenure and/or promotion. Similarly, at The University of Akron, the Collective Bargaining Agreement does not explicitly state that licensing and commercialization activities are to be considered; however, the agreement is augmented by individual department/school guidelines that are discipline-specific. In some cases, patents and other activities related to licensing and commercialization have been considered by reviewing bodies to be positive contributions to the university and the profession. Several institutions noted that in all cases, the activities need to be fully documented and reflect legitimate scholarship and academic pursuits relevant to the scholarly and professional development of the faculty member.

- **In several cases, criteria for promotion and tenure are defined within the context of Collective Bargaining Agreements.** At Wright State University, for example, the criteria for tenure and promotion are defined by the bylaws of each department as part of the university's Collective Bargaining Agreement. Some departments in the College of Engineering and Computer Science and the College of Science and Mathematics include patents and license agreements as contributing to satisfying research and scholarship requirements for tenure, but departmental bylaws as they currently exist do not specifically consider commercialization.

- **Several universities are engaging faculty in new and/or expanded conversations about the potential merits of consideration of licensing and commercialization activities as part of the tenure and promotion review process.** For example:

    - » Bowling Green is in the process of reevaluating its institutional strategy pertaining to licensing and commercialization activities, including the possibility of incorporating those activities into the tenure and promotion review process.

  - » At Kent State, the Vice President for Academic Affairs and Provost is discussing the issue with university deans, and the Vice President for Research is engaged in several efforts "to boost licensing and commercialization."

  - » Ohio University is analyzing existing promotion and tenure review documents to determine what relevant language on this subject already exists; examining relevant policies and documents at other universities that may be appropriate to consider incorporating into Ohio University's promotion and tenure policies and documents; and offering department chairs various options for possible language to share with department members for their consideration and input.

  - » While noting that there is "developing interest" in licensing and commercialization among faculty, Central State University also reports that because the university is not a designated "research institution," faculty are in early-phase discussions about whether incorporation of licensing and commercialization activities in tenure and promotion criteria (required or optional) would be appropriate.

- Other universities currently have no plans to expand current levels of consideration of licensing and commercialization in the promotion and tenure review process. For example, Youngstown State and The University of Akron currently have no plans to include explicit licensing and commercialization language into their tenure and promotion review process guidelines. Similarly, Miami University currently has no plan to change its current practice in which a limited number of disciplines where licensing and commercialization activities exist and are appropriate are considered to be positive in weighing a candidate's nomination for tenure and promotion.

Faculty at community colleges typically do not have research as part of their responsibilities; however, the Task Force believes there is value for community colleges to identify ways to incentivize their faculty to engage in commercialization activities. Currently, about one-third of Ohio's 23 community colleges have faculty engaged in research commercialization activities of some type. It is hoped that the information collected from the survey of public four-year institutions will prove useful to community colleges seeking ideas for how to ramp up faculty engagement in such activities.

Summary/Next Steps

There is an awareness across Ohio college and university campuses of the value of strengthening incentives, system-wide, for college and university faculty to engage in commercialization activities. Some institutions have stronger foundations on which to build such incentives, but enhanced dialogue clearly is under way in all regions of the state. Importantly, faculty are being engaged directly in those conversations and must necessarily play a vital role in thinking through and identifying appropriate ways for commercialization activities to be considered as part of the promotion and tenure review process in their departments and disciplines.

University presidents represented on the Task Force are encouraged by the level and depth of the dialogue occurring among their colleagues and at their institutions regarding this topic, and are generally optimistic that continued dialogue will lead to the identification of new strategies, actions and resources that can be used to further incentivize faculty involvement in commercialization activities.

Priority Goal #3: Incubators

Business and technology incubators are a critical part of the commercialization infrastructure. They support commercialization activity and catalyze business success by connecting ideas, resources, expertise and energy to facilitate the creation and growth of new companies and opportunities. Changes under way in the economy are impacting incubators' roles, their relationships with higher education and entrepreneurs, and the types of services they provide. Most notably, the emergence of business accelerators and resource centers is adding new models to the business development and support ecosystem.

- **Business Accelerators** are emerging with services directed to help launch companies and attract financing. The financial model is more broad-based, with a greater number of for-profit and goal-oriented nonprofits involved. A participating company in an accelerator receives space and assistance for a defined period of time, normally 10-12 weeks, with an opportunity to present its business to possible investors.

- **Resource Centers** complement the benefits of incubators by providing access to cutting-edge equipment during a business's early growth period. The centers are locations at which entrepreneurs are able to use specialized and often expensive equipment to further develop their products and improve

Innovation Gateway: Supporting Entrepreneurs & Companies

With the goal of making The Ohio State University (OSU) an internationally recognized leader in commercialization, the university's Technology Commercialization Office (TCO) has joined forces with TechColumbus, a public-private partnership focused on accelerating central Ohio's innovation economy, to create a new program called Innovation Gateway. The objective of the program is to increase the deal flow and new start-ups generated from OSU's research enterprise. The Innovation Gateway vision, which was made possible by a sub-award through the Ohio Third Frontier's Entrepreneurial Signature Program, is to aid university-based innovators and entrepreneurs looking to advance their vision through first-in-class commercialization services in areas such as idea assessment, business model generation, identification of customer need prior to starting a company, prototyping, project management and business scaling. TechColumbus manages concept and catalyst funds designed to move ideas through proof-of-concept to market introduction. New funds should be available in the third quarter of 2013. The catalyst fund could be as much as $8 million to be invested through Fiscal Year 2017. Since the inception of Innovation Gateway in January 2013, six companies have formed and one license has been executed with the university. There program's portfolio currently includes 42 pre-company projects with start-up potential. The program also has received 186 invention disclosures and attracted more than $1 million of follow-on investment. Student entrepreneurs also are being served by the program: 15 student companies have worked with Innovation Gateway and 50 student entrepreneurs with new business ideas have consulted the program's New Ventures Business Strategists.

THE OHIO STATE UNIVERSITY

their processes, enhancing the likelihood of commercial success. In these cases, the resource center does not actually house companies; rather, it allocates time on equipment.

Ohio's institutions of higher education can partner in developing collaborative strategies to support early stage start-ups and joint ventures by providing incubator capacity where faculty and industry collaboration can occur and where start-up companies can find a nurturing environment. The Fifth Report recommended that Ohio's universities and colleges identify constructs for working together to develop and expand the state's incubator capacity.

- **Goal**: Assess the state's incubator capacity and document characteristics of successful incubator constructs and practices.

Activity to Date

In March 2013, Board of Regents staff met with National Business Incubator Association (NBIA) to obtain information about the nature of incubators and their current roles in the commercialization process and also to better understand the size and scope of the incubator landscape in Ohio. One outcome of that conversation was a subsequent staff review of a 2008 survey conducted by NBIA on behalf of the Ohio Department of Development, which found that there were 33 incubation programs operating the state. The report offered a perspective on the level of activity and characteristics of the incubator community at that time. This information helped guide the development of next steps as well as recognition of the benefits of increased collaboration among entrepreneurs, higher education, state government and other stakeholders. Among the findings were the following:[7]

- Ohio incubators were similar to other North American incubation programs in several ways, including the average number of in-house clients they serve (17), the average length of time they serve their clients before graduation (about three years), and average facility size.
- The average start date of Ohio incubators was 1997 and they were located primarily in metropolitan areas, either urban or suburban, with 35 percent located in rural locales.

- On average, 22 companies graduated per incubator, of which 18 were still in business, for an 82 percent graduate survival rate. NBIA members at that time reported graduate survival rates of 87 percent.

- NBIA also reviewed business incubator operating practices, finding that Ohio incubators adhered to many best practices, although too few incubators collected graduate impact data on an annual basis even though doing so represents an incubator best practice.

Regents staff has compiled a set of incubator governance and administration observations drawn from a review of a 2011 U.S. Department of Commerce study of the relationship between incubator best practices and client outcomes and a discussion with Lawrence Molnar of the University of Michigan, which was a partner in the study.[8] The following were identified as key characteristics and attributes of strong incubator programs in the report:

- The vast majority of successful incubators are nonprofits.

7 Dinah Adkins, David Cattey and Tracy Kitts, *2008 Report on Ohio Business Incubation*, The National Business Incubation Association, 2008, pages 3-4

8 David A. Lewis, Elsie Harper-Anderson and Lawrence A. Molnar, Incubating Success: Incubation Best Practices That Lead to Successful New Ventures, U.S. Department of Commerce, Economic Development Administration, 2011

- Subsidy support for incubators is the norm, with only three of 49 top-performing incubators nationally being financially self-sufficient.

- The two groups most likely to lead an incubator initiative are higher education and local economic development nonprofits.

- Successful incubators take time to generate success and build momentum. For example, the youngest of the top 49 performers has been in operation seven years.

- Strong management teams with experience and expertise are in place.
- Data collection occurs on a regular basis and includes company status, employment, revenues, job creation, graduation rates, graduation survival rates and firm location.

- Higher education's active involvement in the incubation ecosystem role leads to greater success for firms and growth in a region. Additionally, there is a growing interest in expanded roles for community college involvement with incubators to complement university-led entities.

The Ohio Development Services Agency (DSA) funds eleven Edison Technology incubators. Among the eleven are three located on college and university campuses: (1) Ohio University Innovation Center, (2) The University of Toledo-Business Incubation and (3) Great Lakes Innovation and Development Enterprise (GLIDE) at Lorain County Community College. The other eight engage and collaborate with higher education in less formal ways. Funding for Edison Technology incubators is proposed to transition to the Third Frontier Commission beginning in July 2013, and expectations and goals for the Third Frontier incubator program are under discussion.

The Third Frontier Commission is providing funding to business accelerators as a part of its mission to enhance and grow the technology development ecosystem.

Summary/Next Steps

Higher education's role in the incubator space is evolving as initiatives by Ohio's colleges and universities, changes in funding and the addition of accelerators and resource centers transform the landscape. These conditions provide institutions of higher education with new opportunities to grow and support local and regional businesses. The proposed next steps will support these efforts through collaborative leadership.

The Board of Regents will facilitate a collaborative effort involving the agency, the Third Frontier Commission and DSA to conduct a statewide survey of incubators, accelerators and resource centers to update the data and information collected by NBIA in 2008. The launch of a new incubator program led by the Third Frontier Commission, together with the ramped-up commercialization activities under way at Ohio's college and university campuses, makes the near term an auspicious time for an updated incubator survey.

The Board of Regents supports the development of a best practices guide for the operation of incubators by DSA and the Third Frontier Commission. The guide would serve as a resource for parties funded by the Third Frontier Commission and help set clear expectations for other incubators in the state. More broadly, the Board of Regents believes sharing ideas and developing policies in collaboration with the Third Frontier Commission and colleges and universities will expand and enhance incubator activities supporting business and technology growth and success.

ACTION GROUP 2: Creating an Entrepreneurial/Innovation Ecosystem

Priority Goal #4: Regional Economic Development

Strong connections between colleges, universities and regional economic development strategies and initiatives are foundational elements of economically vibrant and growing regions. The Fifth Condition report recognized the importance of regional stakeholders sharing resources, knowledge and commitment to advance the economy. The value of these connections is increasingly clear in the emerging activities and data from Ohio and the nation. The Milken Institute's State Technology and Science Index, for example, demonstrates that places with strong relationships between higher education and private markets are seeing per capita income growth, increasing business activity and improved productivity.

Ohio's institutions of higher education historically have been involved in advancing economic development through their research and commercialization activities. In today's fast-paced global economy, a region requires an adaptive and flexible economic development strategy with the commitment and involvement of public, private, nonprofit and higher education leaders. These types of relationships are an integral part of the fabric of high-growth regional economies such as the Research Triangle in North Carolina and Silicon Valley.

The strongest regions incorporate the strengths of colleges and universities in their regional planning process and strategic goals and objectives. Leveraging higher education's strengths requires identifying how their best research, programs and curriculum support regional clusters and emerging markets. Leverage points may include, for example, targeted sponsored industrial research, technical assistance and supply and development of human capital.

- **Goal**: Support and encourage college/university research or entrepreneurial activities that connect regionally with other institutions of higher education, industry and economic development groups and initiatives.

Activity to Date

A Task Force survey identified numerous examples of collaborative regional economic development efforts under way in Ohio, the details of which are elaborated on in the "Engaging in Regional Planning Efforts" section of this report beginning on page 39.

Generally, respondents described a wide range of initiatives from strategic planning, to co-sponsored research projects, to operating technology centers, to co-funding and managing venture capital funds. A common feature across all regions is the active participation of college and university leadership in helping to identify regional economic priorities and specific ways higher education can support attainment of those priorities through education, research and commercialization.

Summary/Next Steps

Many higher education institutions are becoming more involved with regional stakeholders at the initial stages of the strategic planning process for enhancing economic development. What is most encouraging is that this activity appears to be more than project-based. And, there is a widening recognition of the value that higher education institutions bring to economic development planning, execution and implementation.

Activities currently under way have established a strong foundation for the development of a systematic process for regular, open discussions between institutions of higher education and industry-sector leaders and managers to discuss the short-, medium- and long-term economic needs of the region. Additionally, regular open discussions with industry can serve as a platform for systemically exploring potential opportunities to create commercialization partnerships.

The Board of Regents will work with institutions of higher education that currently have modest or beginning levels of involvement in regional economic development planning and activity to assist those institutions in showcasing to regional stakeholders the value of the workforce development programs, career training resources, research and administrative support that institutions of higher education can bring to existing and emerging regional initiatives.

Priority Goal #5: Statewide Research Portal

Ohio is fortunate to have robust university-based research capabilities and assets. Enhancing the state's ability to promote and market its collective intellectual property, technology assets and research strengths and activities could play a major facilitating role in connecting Ohio institutions of higher education with potential industry partners/clients and advancing technology transfer and commercialization across the state.

Most of Ohio's public four-year research institutions currently have some kind of proprietary or commercial research-faculty portal product (or both) that serves such a function for their institution. There is, however, a developing national trend in which states are examining ways to leverage research portal capabilities across the entirety of their higher education systems. For example, North Carolina implemented a statewide portal called Reach NC that connects users to experts and assets within the state's higher education and research institutions. Efforts also are under way in Michigan and Arizona to pilot research portals populated with information from multiple research institutions within their states.

For a research portal to fully deliver its intended benefits, it would be imperative to have a strong and clearly defined and supported "engine" to drive both inventors and industry to the portal. Ideally, the portal would facilitate both a "push" strategy, in which universities push faculty research out to prospective industry partners and investors, while also facilitating a "pull" strategy in which industry seeks system research and technology support from the state's collective higher education resources. The ability to identify major analytical instrumentation tools located throughout the state would be of particular value for the latter. As a web-based "highway" for collaboration, a statewide portal also could make it easier to identify new opportunities for institutions of higher education to connect and collaborate with each other.

To facilitate broader collaboration, universities in a number of states are exploring "crowdsourcing" opportunities to raise funds to finance research. A statewide research portal could be used to expand the crowdsourcing concept even further. Over time, a portal could serve not only to link innovators with prospective industry partners and investors to support industry research and commercialize technology, but also to solve complex business problems and drive innovation. By identifying existing critical technology gaps or business needs and then pulling together multiple parties from across the state, nation and globe to collaborate, on a large scale, to address those challenges, a statewide portal could facilitate a value-added crowdsourcing function for business problem solving.

- **Goal**: Determine the financial feasibility of creating a statewide portal to showcase, share and promote university/college faculty, research strengths and assets, including equipment.

Activity to Date

The Ohio Board of Regents has convened research and technical personnel from several higher education institutions to undertake a due diligence process to determine the technical and financial feasibility of creating a single, shared statewide portal that will leverage existing systems currently being utilized. Conversations with this group have revealed a broad level of interest in a statewide research portal, including the potential financial benefits to be gained through a collective purchasing decision.

The work group has collaborated to outline the following multi-step process for determining the feasibility of such an investment:

- Compile an inventory of existing portal resources that Ohio colleges/universities currently are using for this purpose
- Conduct focus groups and possibly also a survey of college/university faculty and other stakeholders to determine (a) if they using their institution's existing resources; (b) if yes, how they are being used; and (c) if not, why not?
- Develop a set of nonnegotiable functional requirements, standards and specifications to guide evaluation of current resources available in the marketplace
- Conduct online demonstrations of resources currently in use at Ohio colleges/universities as well as other resources currently (or soon to be) available in the marketplace
- Reach out to the Ohio Technology Consortium[9] for advice and counsel on how to construct an efficient due diligence process

The Ohio State University, University of Cincinnati, Case Western University and Ohio University have agreed to take the lead on coordinating specific aspects of the due diligence process.

Summary/Next Steps

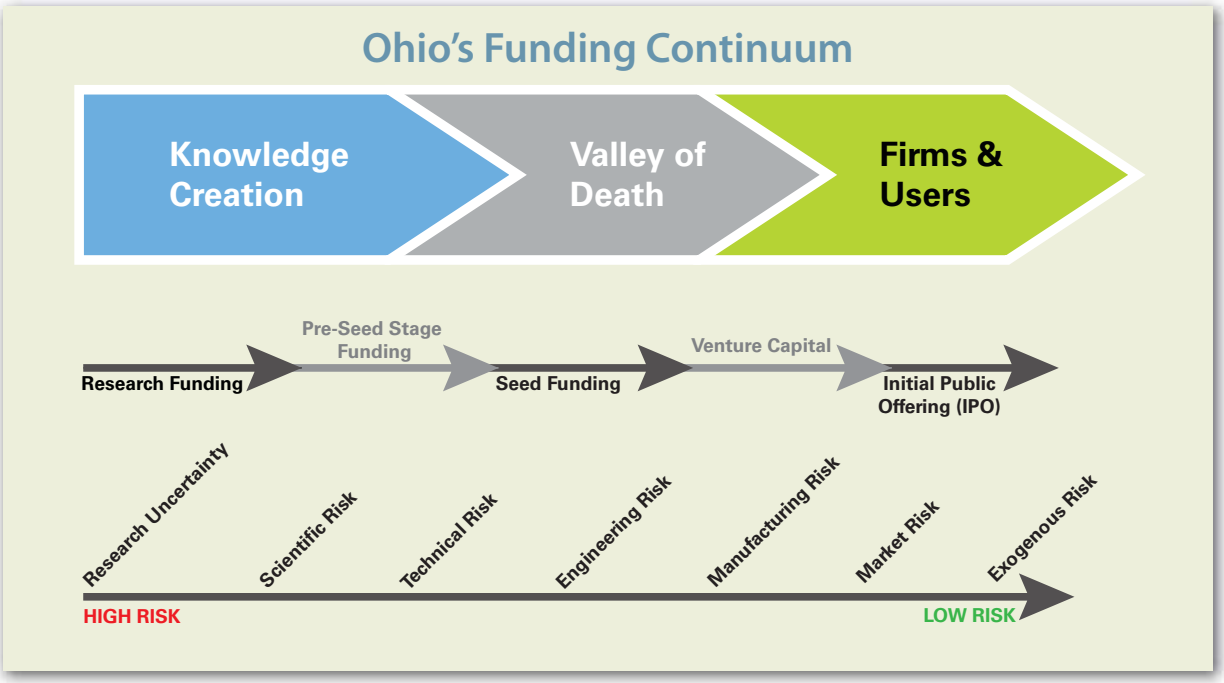
The Ohio Board of Regents will continue to work with institutions of higher education to facilitate the ongoing due diligence process to determine the feasibility and value of a statewide research portal. Specific next steps will depend on when various stages of the process outlined above are completed, but are likely to include discussion of (a) how to bring more institutions into the conversation, (b) how to encourage faculty to use the portal, (c) how to drive industry to the portal, (d) how to maintain a shared portal (i.e., who will be responsible for its operation and promotion), and (e) what financial resources will be needed and where they may come from.

Priority Goal #6: Capital Continuum

Timely access to capital at all stages of the commercialization continuum is vital to ensuring the continuous innovation needed to sustain long-term economic growth and global competiveness. The Fifth Condition Report examined whether Ohio had the necessary capital investment initiatives and resources needed to

9 The Ohio Technology Consortium (OH-TECH) functions as an umbrella organization for Ohio's statewide technology infrastructure, the Ohio Academic Resources Network (OARnet), the Ohio Supercomputer Center (OSC), OhioLINK, eStudent Services and the newly established Research and Innovation Center.

support start-ups and attract venture and late-stage funding to advance innovation in Ohio. For the early stages of commercialization, adequate pre-seed and seed-funding support in Ohio was apparent. Since its inception in 2003 and through June 30, 2012, the voter-approved Ohio Third Frontier program has invested more than $1.17 billion in public funds for projects and activities to further technology development and economic growth. Third Frontier investments have resulted in the creation, capitalization and attraction to Ohio of 882 companies and nearly 96,000 direct and indirect jobs. Third Frontier dollars have supported an array of initiatives across the technology commercialization framework, from incubation and early development services to angel, pre-seed and seed funding to venture capital investment. The Third Frontier Commission is now working to accelerate the pace of commercialization and private-sector growth and further Ohio's strengths in technology. The Fifth Condition Report also concluded that there is sufficient access in Ohio to private sources for pre-seed and seed funding.



Information regarding the availability of funding at subsequent stages of the commercialization process was not as clear. Although there was insufficient time for the Task Force to conduct a thorough analysis of funding needs and availability at these stages of the commercialization process, Task Force members nonetheless concluded that the venture capital infrastructure, which is usually relied upon to provide follow-on capital after the seed stage, was not as robust as it needs to be to advance commercialization. The Fifth Condition Report recommended that a quantitative analysis of ongoing capital needs – by stage and deal type – of Ohio technology start-up companies be conducted and updated on an annual basis. The Report also noted the need for colleges and universities to take a more active role in expanding the pool of venture capital investors by establishing venture funds and working with industry to promote Ohio opportunities to professional investors.

- **Goal**: Continue the assessment of the availability of investment capital in Ohio and develop strategies for attracting needed capital at all stages of the commercialization continuum.

Activity to Date

Ohio Institutions of higher education have stepped up their efforts to expand the capital investor pool through establishment of venture capital funds. Examples of fund creation from around the state are clear

evidence of the growing realization by Ohio colleges and universities of the significant leadership capacity they have for not only supplying the intellectual capital that drives innovation but also the ability to leverage resources that can assist industry in creating products and bringing them to market. Following are examples of forward-thinking higher education initiatives that are helping to create a more robust pipeline for investment capital in regions across Ohio:

- **OSU/OU Venture Capital Fund:** In April of 2012, The Ohio State University and Ohio University announced the establishment of a $35 million venture capital fund aimed at commercializing university-based research. The fund will focus on innovations aimed at curing disease, producing healthier food and advancing alternative energy solutions.

- **Case Technology and University Hospital's Venture Fund:** In 2012, leaders of Case Western Reserve University (CWRU) and University Hospitals of Cleveland (UHC) established the Case Technology and University Hospital's Venture Fund (CTUHVF) to invest in early-stage enterprises that are predicated on opportunities emerging from the research-based and operational activities of these globally recognized institutions. The goal of this not-for-profit fund is to provide a new, professionally managed, pre-seed fund that will capitalize on the institutions' immense investments and emerging activities in medical technology, business software, advanced materials, fuel cells and energy storage. Investments will be made in new companies as well as companies recruited to Ohio that have strong ties to the institutions and/or have forged formal relationships with the Fund's Ohio Third Frontier Entrepreneurial Signature Program and/or Pre-Seed Fund award collaborators JumpStart, BioEnterprise and North Coast Angel Fund. The CTUHVF will be administered utilizing best-of-class, pre-seed investment mechanisms and will benefit from an impressive team of organizations and leaders.

- **Cintrifuse:** The University of Cincinnati (UC) in partnership with regional stakeholders has raised $51 million to date to invest in innovation in the region. The University is an engaged partner and investor in Cintrifuse, a start-up business accelerator that has a goal of raising up to $100 million to boost the growth of an innovation economy in the tri-state area by increasing venture capital offerings for local technology start-ups. An initiative of the Cincinnati Business Committee, Cintrifuse will invest in early-stage venture funds that focus on life sciences, consumer goods, technology and energy to generate the dollars needed to accelerate technology transfer and commercialization in the greater Cincinnati area. The new University of Cincinnati Research Institute (UCRI), a nonprofit affiliate of the university, is expected to play a vital role in Cintrifuse by connecting UC faculty and researchers to industry partners, facilitating the commercialization of research and enhancing cooperative and experiential learning experiences for UC students. For example, GE Aviation will partner with UCRI to develop new engine technologies that increase fuel efficiency and reliability while reducing emissions and operating costs.

- **Impact Angel Fund:** Working in collaboration with the Stark Development Board, Innovation Forward LLC, TechGROWTH Ohio and Jumpstart, Inc., Stark State College is supporting economic development in the Ohio shale play region through development of a pre-seed venture capital fund known as the Impact Angel Fund (IAF). In development since fall of 2012, this fund has attracted $1.2 million in individual commitments and targets early-stage technology-based companies to assist them in accelerating their business growth. The purpose of the IAF is to promote economic growth by grooming companies for investment and providing public-private seed funds to innovative entrepreneurs in the imagination, incubation and early-demonstration phases of product development and commercialization. The IAF is a spin-out of the East Central Ohio Tech Angel Fund (ECOTAF) and takes advantage of ECOTAF's prior experience. The IAF also utilizes the successful Rural Acceleration Model™, developed by TechGROWTH with input from ECOTAF, which is engineered for early-stage rural technology companies. The IAF was established with the long-term goals of attracting $20 million in co-investment and

follow-on investment; creating 100 to 150 jobs at twice the average pay for the region; obtaining $1 million to $2.5 million in loans and $1 million in state and federal grant funding; and generating $15 million in incremental revenue. Two companies are currently under review for "sidecar investments" by the fund.

- **Lorain County Community College Innovation Fund:** The Lorain County Community College (LCCC) Innovation Fund provides financial support to entrepreneurs and emerging businesses in a 21-county northeastern Ohio region to assist them in converting promising technology ideas into viable businesses while also creating entrepreneurial educational experiences for students and faculty. Funds are targeted to new technology development in high-growth industries, and funding levels range from up to $25,000 for imagining stage projects and up to $100,000 for incubating stage enterprises. Funded entrepreneurs receive professional mentoring and are required to provide work-based learning experiences for students. Initially an LCCC initiative with no other partners, the Innovation Fund has grown to include universities and foundations across northeast Ohio. To date, the fund has produced the following results:

  - » More than 5,200 online inquiries, 736 accepted applications, 121 awards to 101 companies, and total grants of $6.735 million

  - » $79.63 million in follow-on funding (10:1 ratio), $22.76 million in sales, more than 355 jobs created with annual salaries ranging from $31,000 to $120,000, and 128 internships

- **Student Venture Fund at the University of Akron:** The University of Akron (UA) oversees a genuinely student-run student venture fund. Cross-disciplinary teams of students vet early-stage companies and vote to award funding of up to $25,000. In addition to providing students hands-on experience with the entrepreneurial process, the Student Venture Fund at The University of Akron (SVFUA) seeks to provide funding for local entrepreneurs while creating opportunities for organizations, foundations and individuals to participate in the educational process. Of the 18 students who participated in the SVFUA's inaugural round of awards, two have started their own businesses, one has sold a company and seven work in emerging and start-up enterprises. Additionally, UA is working with other institutions of higher education in the region to create their own local student venture funds.

While the preceding initiatives represent positive examples of efforts to create expanded investment opportunities for Ohio technology innovators, more comprehensive and systemic strategies are needed to meet the long-term capital needs of Ohio start-up companies. Toward this end, initial multi-state agency and stakeholder conversations have begun with the goal of identifying collective strategies for meeting Ohio's investment capital needs.

Capital Continuum Funding at Ohio Institutions

Institution(s)	Name of Fund	Initial Capitalization Goal
Ohio State University/Ohio University	Capital Fund	$35,000,000
Case Western Reserve University	Case Tecnology and Universtiy Hospital's Venture Fund	$6,000,000
University of Cincinnati	Cintrifuse	$100,000,000
Stark State College	Impact Angel Fund	$20,000,000
Lorain County Community College	Lorain Community College Innovation Fund	$6,735,000
University of Akron	Student Venture Fund	$175,000
Total		**$167,735,000**

Summary/Next Steps

The Board of Regents will provide support to the emerging capital continuum conversations across Ohio and to the State's strategic planning efforts related to this issue. Regents will draw on the expertise and research capacity of Ohio colleges and universities to contribute to data gathering and analysis. Additionally, the higher education institutions' investment strategies offer a continuing laboratory in which to review and identify elements of successful capital continuum initiatives.

ACTION GROUP 3: Fostering a Culture of Entrepreneurship

Priority Goal #7: Entrepreneurship

In the Fifth Condition Report, The Task Force acknowledged that "a prerequisite for Ohio institutions to become leaders in technology commercialization is the creation of a strong culture of entrepreneurship on and around campuses." Among the critical characteristics of a culture of entrepreneurship are robust opportunities for students and faculty to engage in entrepreneurial activities – and for colleges/universities to support them in those pursuits.

- **Goal**: Assess the current status of entrepreneurial curriculum and instruction at Ohio institutions of higher education and explore with institutions the development of a multidisciplinary approach to entrepreneurial instruction.

Activity to Date

Provosts and chief academic officers at Ohio universities and colleges were surveyed to obtain information about entrepreneurial programming and curricular offerings currently available on, or planned for, their campuses. Specifically, those surveyed were asked to respond to these two questions:

1. Does your institution have an entrepreneurial curriculum? If so, please indicate which colleges or divisions within your institution provide entrepreneurial instruction.

2. Has your institution engaged in, or would your institution be open to engaging in, conversations regarding the development or expansion of your entrepreneurial curriculum across other academic disciplines?

Twelve of Ohio's 14 public four-year universities and 20 of the state's 23 public two-year community colleges respondent to the survey. Key findings include the following:

- **All of Ohio's four-year universities have some level of entrepreneurial curriculum.**
    - » Three universities offer individual elective courses.
    - » Five universities offer certificates in entrepreneurship.

  - » Five universities offer undergraduate minors in entrepreneurship.
  - » Two universities offer undergraduate majors in entrepreneurship.
  - » Seven universities offer graduate-level entrepreneurial coursework, including MBA electives, MBA concentration, graduate-level certificate, Master's degree in Engineering Innovation and Entrepreneurship, and Master's degree in Technology Innovation.
  - » Three universities offer professional school courses in entrepreneurship (e.g., School of Law, College of Pharmacy).
  - » Universities offer a range of entrepreneurial resources and experiences, ranging from a student-run Legal Entrepreneurial Association (Cleveland State) to a Student Venture Fund providing funding for local entrepreneurs (University of Akron) to a Center for Advanced Functional Food Research and Entrepreneurship (Ohio State), and many others.

- **About two-thirds of Ohio's two-year colleges have some level of entrepreneurial curriculum.**
  - » Almost all of the entrepreneurship course offerings at the community college level are part of Business Administration or Business Management programs.
  - » Four community colleges offer individual elective courses in entrepreneurship.
  - » Eight community colleges offer Associate's degrees in entrepreneurship.
  - » Six community colleges offer certificates in entrepreneurship.
  - » Rio Grande Community College offers an MBA in Entrepreneurship through the University of Rio Grande, and Lorain County Community College will soon be offering a Bachelor's degree in Entrepreneurship from the University of Toledo through LCCC's University Partnership program.
  - » Many of Ohio's public two-year community college campuses indicated that they extend and enhance their entrepreneurial curricula through a range of experiential learning experiences.

- **Nearly all of the public four-year universities and most of the public two-year community colleges expressed an interest in talking about expansion of their existing entrepreneurship offerings into other disciplines – and many of those conversations are well under way.** Some examples include:
  - The University of Akron is revising its General Education requirements to include innovation and entrepreneurship.
  - Central State is exploring expansion of its Business School entrepreneurial major to other STEM academic disciplines.
  - At Cleveland State, preliminary planning is under way for a six-credit interdisciplinary entrepreneurship course for engineering students.
  - Lakeland Community College has explored and proposed expanding its entrepreneurship certificate program into a concentration or new major to meet growing interest in entrepreneurial studies. Enrollment in entrepreneurship courses at Lakeland has increased 100 percent since the 2009-2010 academic year.

- Zane State College is actively engaged in increasing entrepreneurship and commercialization within its programming, particularly in the areas of information technology, digital media, culinary arts and alternative energy.[10]

- Lorain County Community College, one of four Ohio campuses hosting the Blackstone LaunchPad program (see "Third-Party Collaborators" section that follows), a national model for fostering entrepreneurship through higher education, reports that students in diverse programs throughout the college are submitting business plans and seeking mentoring and coaching for business start-ups.

The input collected from these surveys will be used to formulate plans for next steps and future strategy development for further strengthening and expanding entrepreneurial education on Ohio's college and university campuses.

Interdisciplinary Approach to Entrepreneurship

The University of Akron's Achieving Distinction Initiative is a multi-million dollar program responsive to the Board of Regents' Fifth Condition Report. Faculty across the university submit proposals for distinctive programs that (a) encourage collaboration across disciplines and departments and (b) provide innovative solutions to regional and global problems.

The first two projects identified for funding are the following:

- **A Biomimicry[10] program** brings together resources from the Departments of Biology, Polymer Science and Mechanical Engineering, along with the School of Art, to lead the region in "sustainable innovation, both economically and educationally, powered by technologies inspired from the natural world around us." With a unique platform in the integrated bioscience PhD program from which to launch this concept, innovation is inspired by Nature. This emerging discipline blurs the traditional boundaries between the arts, business, design, architecture, social sciences, nursing, engineering and science.

- **An Entrepreneurship, Commercialization and Proof-of-Concept program** is a combination of two proposals focused on innovation and entrepreneurship in support of patentable creativity that will act synergistically to accelerate the pace of commercialization of university-based technologies and enhance regional innovation and economic development.

These projects bring together 45 faculty across five colleges and connect them with 18 community partners. It is anticipated these two projects will pave the way for the creation of even more interdisciplinary programs at UA.

10 Biomimicry applies natural mechanisms or properties to another biological or non-biological system . For example, graduate student research on the color of bird feathers spiders that is supported by Sherwin-Williams, a leading paint manufacturer"

Third-Party Collaborators

A proliferation of third-party collaborators is helping to design and deliver new models for entrepreneurial teaching and learning in Ohio. One successful example is the Blackstone LaunchPad program, a national model for fostering entrepreneurship through higher education. Modeled after a program developed by the University of Miami in 2008, Blackstone LaunchPad is a college- and university-based program that views entrepreneurship as "a mainstream career path" and prepares students "to create jobs, not just find jobs."[11]

Budding entrepreneurs develop business ventures and are coached by seasoned business and community leaders who provide industry-specific expertise, guidance and encouragement. Additionally, the program sponsors workshops, seminars and networking events.

In November 2011, The Blackstone Charitable Foundation announced a $3.2 million partnership with the Ohio-based Burton D. Morgan Foundation" to train the next generation of entrepreneurs in Northeast Ohio." Participating institutions are Baldwin-Wallace College, Case Western Reserve University, Kent State Univer-

Students Assume Leadership in Translating Research Outcomes

In fall of 2013, incoming law students at Case Western Reserve University (CWRU) will be able to access the **Intellectual Property (IP) Venture Clinic**. Fundamentally, the IP Venture Clinic plays a parallel role to public service law clinics where students act as practitioners under the supervision of expert legal professionals.

In this cutting-edge approach, not only will students gain hands-on experience in both business law and intellectual property law, but they will also serve as critically important legal resources to pre-investment entrepreneurs and inventors. As a team, IP Venture Clinic students will also engage graduate students from the business, engineering and science disciplines in order to build the case of investment.

The program aspires to be the most comprehensive legal clinic in the country, providing cradle-to-grave law student access to entrepreneurial needs ranging from patentability review and prosecution to corporate structuring and securities offerings.

The new IP Venture Clinic is the perfect companion to the CWRU **Fusion Certificate Program (Fusion Program)** that was established in 2011. Students pursuing law degrees, MBAs and PhDs work collectively to analyze early-stage technologies and engage in a robust opportunity assessment and ultimately decide – under the supervision of the fusion faculty – how best to design a vehicle to address the commercial opportunity and facilitate commercial development.

The opportunity base for student involvement is not confined to CWRU research labs; in 2013, select participants in the Fusion Program were able to contribute to the assessment and development of corporate product development programs at Nautica Windpower and Parker Hannifin, respectively.

11 "Blackstone Charitable Foundation Expands LaunchPad Program to Northeast Ohio," Nov. 18, 2011 (www.blackstone.com/news-views/blackstone-blog/details/blackstone-charitable-foundation-expands-launchpad-program-to-northeast-ohio)

sity and Lorain County Community College, the first community college in the nation to have the Blackstone LaunchPad program. Sponsoring partners expect the program to reach more than 70,000 students and say it has the potential to create 150 businesses and more than 3,000 direct jobs over five years.

Summary/Next Steps

Strong momentum exists across Ohio for expanding entrepreneurial curricula and learning experiences to meet increasing demand. Entrepreneurial education is an expanding dimension of the culture at Ohio's four-year universities and is emerging steadily as part of the mindset and culture on the state's two-year community college campuses. High levels of dialogue are under way to identify ways to expand and accelerate existing efforts.

The Board of Regents will continue to research and identify proven examples of entrepreneurial curricula and activities that offer demonstrable benefits to students and reflect a sustainable commitment by the institution. Research may focus on the nature and type of courses, student enrollments, postgraduate employment and contributions to the economy (e.g., patents, licenses, other innovations).

The Board of Regents will share its findings with Ohio's institutions of higher education and encourage and support those institutions that have indicated a willingness to expand entrepreneurial education across a greater variety of disciplines to consider programs and activities that have led to documented innovations and measureable impact.

Regular provost/chief academic officer meetings could be appropriate venues for advanced dialogue and idea exchange regarding innovative and expanded entrepreneurial programming.

ACTION GROUP 4: Developing a Globally Competitive Workforce

Priority Goal #8: Workforce Forecasting

To meet current and projected industry needs for workers with the capabilities to support business success in a global innovation economy, Ohio's education system must be better aligned with the knowledge, skills, attributes and experience required of workers needed to fill in-demand jobs. Recognizing this need, the Ohio Board of Regents and the Ohio Department of Education are working closely with the Governor's Office of Workforce Transformation to better align education and training programs in Ohio with new and emerging jobs and job-skill requirements – with a special emphasis on occupations in targeted technology areas that offer significant commercialization opportunities within industries deemed strategically vital to Ohio's economic recovery and job creation efforts.

This alignment is a critical step to determine how best to provide training and education to students of all ages to further their careers and employment successes. The changing nature of the economy creates an imperative for higher education, in collaboration with businesses, to obtain ongoing data and information on the knowledge, skills, attributes and experience individuals need to fill and succeed in occupations in Ohio's key industries.

This Sixth Condition Report has been informed by key findings contained in the Fifth Condition Report, Appendix F, "Aligning Ohio's College and University Graduates with Industry Talent Needs to Support Increased Commercialization," which was prepared by the Task Force Sub-Committee on Workforce Development. The Sub-Committee report noted that innovation creates opportunities for commercialization, and that a ready supply of STEM workers is necessary – though not sufficient in and of itself – to drive innovation. The Sub-Committee further highlighted that while scientists, engineers and supporting technicians have long been accepted as critical to the dynamic flow of new ideas emerging from structured R&D activities within corporations and institutions of higher education, employers' demand for workers with STEM competencies is expanding into other occupational areas and levels In the manufacturing sector, for example, job openings directly related to the manufacturing process (i.e., traditional production activities) are far outnumbered by other occupations that support the production process. While many of the traditional jobs in manufacturing are declining, all STEM occupations are increasing.

Identifying Ohio's workforce gaps

STEM employment in Ohio is estimated to exceed 250,000 and is growing about one percent annually. More than half of Ohio's STEM jobs are in IT, with the remainder spread among scientists, engineers, engineer technicians and mathematics.

U.S. vs. Ohio STEM Employment in 2012

	2012 Ohio		2012 Nation	
	Jobs	% of Total	Jobs	% of Total
Computer	125,041	52.8%	3,509,134	51.7%
Math	4,593	1.9%	129,155	1.9%
Engineering	59,422	25.1%	1,638,289	24.1%
Engineering Technicians	23,276	9.8%	652,122	9.6%
Life Scientists (excluding Social Scientists)	24,649	10.4%	862,743	12.7%
Total	**236,981**	**100.0%**	**6,791,443**	**100.0%**

The Task Force found that while Ohio's economy generally mirrors the nation is terms of the composition of STEM jobs *(see chart)*, Ohio ranks 23rd among states (and the District of Columbia) for "concentration" of STEM jobs: Just 3. 9 percent of all jobs in Ohio are STEM jobs, compared to 4.1 percent for the nation.

The Task Force also noted the following:

- Ohio would have to add 44,156 STEM jobs to its economy to rank among the top 25 percent of states.
- Ohio is projected to increase the number of STEM jobs by 3.8 percent over the next four years, compared to a projected national growth rate for STEM jobs of 5.6 percent.
- Ohio would have to grow an additional 15,276 STEM jobs just to keep pace.

Ohio simply cannot afford to lag the nation in production and supply of STEM workers needed to drive innovation and the commercialization of new technologies and products. To drive the level of technology commercialization needed to support a robust innovation economy, Ohio must do more than simply "keep pace." We must close existing gaps between industry demand for STEM workers in Ohio and the annual supply of those workers from the state's institutions of higher education. Compounding the challenge is

the reality that only about half of STEM graduates choose or remain in STEM occupations.[12]

The Task Force concluded that a lack of connections between industry and higher education contributes to existing gaps, and that increased collaboration, improved state-level data and increased opportunities for work-based learning experiences designed and supported by industry are needed to begin to narrow Ohio workplace-workforce gaps. One example of a successful industry/higher education partnership focused on meeting regional workforce needs critical to technology based economic growth is the Northeast Ohio Regional Information Technology Engagement Board *(see sidebar)*.

- **Goal**: Support the Governor's Office of Workforce Transformation to identify Ohio's most urgent workforce needs and to align education institutions to meet businesses' needs.

Activity to Date

The Governor's Office of Workforce Transformation, in partnership with the Ohio Department of Job and Family Services, will soon be launching the Workforce Information Exchange (WIX), a job forecasting tool that will be sent to the top companies within each of JobsOhio's nine industry clusters. WIX will provide businesses with a standardized mechanism for telling the state what their most critical job needs will be in one, three and five years. In February 2013, the Ohio Business Roundtable launched a pilot study for the WIX forecasting tool, which was sent to 130 companies across Ohio.

Summary/Next Steps

The employment trends and gaps data gathered through WIX will become part of the Board of Regents' analysis of the Higher Education Information (HEI) data on degrees, certificates and other credentials. Regents will share this data and provide support to higher education institutions so they will be better able to develop curriculum and training programs that are responsive to documented industry needs.

Northeast Ohio RITE Board: Helping to Close Workforce Gaps

The Northeast Ohio Regional Information Technology Engagement (RITE) Board consists of IT executives from some of the region's biggest corporations (e.g., Eaton, Sherwin Williams), IT firms (e.g., BlueBridge, e-Venture Corp and Hyland Software), along with representatives of Lorain County Community College (LCCC), Cleveland State University, Baldwin-Wallace University, Stark State College and The University of Akron. The goal of the RITE Board partnership is to increase the number of IT graduates in the region earning credentials and degrees that meet the specific IT talent needs of local employers. That goal will be achieved by enhancing industry feedback to educators, raising awareness of IT careers and promoting best practices in experiential learning.

LCCC is the host institution for RITE Board operations. It also is the first institution of higher education to establish an institution-specific RITE Council to serve as an "action arm" of the RITE Board and align institutional IT objectives with projects that can be scaled and repeated by other institutions. Commitments have been secured from the other participating institutions to establish or align existing industry advisory groups into a single Council to guide regional efforts to increase IT enrollment, enhance IT programs and connect completers with real-time career opportunities. Much of the RITE Board's work to date has been aimed at developing the infrastructure necessary to drive change. So far, six detailed job profiles have been developed by gaining consensus among IT recruiters regarding shared IT roles that are in demand across the region.

12 Anthony Carnevale, Nicole Smith and Michelle Melton, STEM, Georgetown University Center on Education and the Workforce, Dec. 2011

Priority Goal #9: Co-ops and Internships

One of Ohio's strategies for meeting current and future needs for a highly skilled, technology-savvy workforce is to dramatically increase the number of quality experiential learning experiences, such as internships and cooperative education experiences (co-ops), available to students enrolled in our colleges and universities. Experiential learning experiences, in STEM fields in particular, play an important role in increasing Ohio's innovation capabilities and capacity. Internships and co-ops in these fields help close existing skills gaps in strategically important industries; develop future scientists, engineers and technology leaders; support the creation of a true entrepreneurial culture; and potentially also create talented and dedicated employees for Ohio companies.

Research shows that students who participate in co-ops and internships complete college at higher rates than those who do not, are better prepared for the demands of the workplace, and are better paid. To build on those findings, Ohio's colleges and universities are encouraged to increase their collaborations with industry partners to provide co-ops and internships. Ideally, these would be opportunities where students can gain valuable experience, expand their skills set and possibly also secure a job upon graduation.

- **Goal**: Encourage each Ohio institution of higher education to develop a co-op and internship program that includes a STEM focus, and have the Ohio Board of Regents and the Ohio Third Frontier Network collaboratively work to expand and broaden co-op and internship programs statewide.

Activity to Date

The **Ohio Means Internships & Co-ops** program is the Board of Regents' centerpiece initiative for providing co-op and internship experiences for students enrolled in Ohio colleges and universities:

- The Ohio Means Internships & Co-ops program leverages investment of both state and private-sector dollars to provide credit-earning, work-based learning experiences for students in key industries in Ohio to help close skills gaps, increase student completion and give Ohio a competitive advantage in the global talent marketplace. Program funds are used to (a) support the creation and maintenance of high-quality academic programs that include an intensive co-op or internship experience for students, and (b) provide scholarship to institutions to use to recruit Ohio residents as students in those programs.

- In December 2012, the Ohio Means Internships & Co-ops program awarded $11 million (supported by an additional $11 million from private-sector employers) to ten Ohio community colleges and 13 Ohio public or private universities. The funds are expected to directly support 3,500 internship and co-op experiences for students enrolled at these institutions, with the vast majority of funded programs emphasizing STEM students. In the aggregate, the colleges and universities will partner with more than 1,500 employers to provide paid and credited internship and co-op positions in JobsOhio target industries – biohealth, energy, automotive, advanced manufacturing, polymers, aerospace/aviation, food processing, financial services, information technology and consumer goods.[13]

- Board of Regents staff met with grantees in February 2013 to begin implementation of the program and will provide technical assistance throughout the implementation process. Additionally, in collaboration with the Ohio Means Internships & Co-ops Advisory Committee, the Board of Regents is working to identify ways to increase STEM students' participation in the program and employment opportunities in STEM industries. The Board of Regents also is working with JobsOhio to develop more

13 See Appendix 4 for a complete list of 2012 recipients of Ohio Means Internships & Co-ops grants.

connections to industries that are interested in developing STEM internship opportunities for students.

Ohio's **Third Frontier Internship Program** is designed to connect talented STEM students with dynamic companies in STEM-related industries to position Ohio for long-term growth by broadening our state's high-tech capabilities in an evolving knowledge-based economy. The goal is to build a young, talented workforce for the future and assist students in gaining valuable work experiences that can lead to permanent full-time employment in Ohio after graduation.

- Since 2002, the Ohio Third Frontier Program has funded more than 4,000 internships. The program reimburses up to 50 percent of an intern's wage, up to $3,000 for a 12-month period. In Fiscal Year 2012 alone, the program provided more than $2.1 million to support 733 student internships with 224 companies. The average hourly wage paid was $12.73.

Board of Regents staff are working with Third Frontier Internship Program staff to strengthen connections and coordination with other programs across the state.

Collaborating with other internship initiatives

Collaboration by Ohio Means Internships & Co-ops and the Ohio Third Frontier Internship Program with several other internship/co-op initiatives in operation in Ohio could be a useful strategy for achieving robust growth in the number of STEM internships and co-op opportunities available to Ohio postsecondary students. Potential synergies to be realized include more strategic targeting of efforts to prepare students for success in evolving industries as well as accelerated enhancement of workforce capabilities in all regions of the state. Three initiatives holding great promise for such collaboration include the following:

- The **Northeast Ohio Council on Higher Education (NOCHE)** connects with employers about internships through its employer internship management seminar, "Maximize Your ROI: Return on Intern." Its free online internship

The Cincinnati Co-op and Internship Plan

The University of Cincinnati (UC) is nationally renowned for its co-operative education program, Co-op, which was invented in 1906. The program routinely is listed as among the nation's best. UC annually places more than 5,800 full-time students in co-ops offered by the program's 2,000-plus employer partners, with total annual earnings of UC co-op students exceeding $44 million.

Building on this reputation, UC – with support from an Ohio Means Internships & Co-ops grant – has launched **The Cincinnati Co-op and Internship Plan**, a regional approach to strengthening ties between industry and higher education in Southern Ohio within key industry clusters. Partnering with the Greater Cincinnati USA Chamber of Commerce and TechSolve, UC, Cincinnati State Technical and Community College, the College of Mount St. Joseph, Shawnee State University and Rio Grande Community College have pledged to develop almost 700 new co-op and internship positions in highly valued industries of strategic importance in Ohio.

The plan builds the talent supply for Southwest Ohio by using co-ops and internships as educational on-boarding vehicles, creating meaningful work-based learning experiences in these key industry clusters: biohealth, finance, insurance and IT, advanced energy, consumer products and brand development, food processing and agriculture, advanced manufacturing, polymers, automotive and aerospace through the creation of new co-op and internship positions.

program, NEOintern (www.neointern.net), connects students with employers. As of April 2013, NEOintern had registered about 20,000 students and 2,300 employers and listed 566 available internship opportunities. Employers benefit from NOCHE's outreach efforts to promote internships and co-ops through email, social media and career fairs with colleges across northeast Ohio, a network comprising 225,000 students. College students have the ability to browse hundreds of new internship postings every month. NOCHE also has administered specialized programs such as its Entrepreneurial Internship Program and the Ohio Third Frontier Internship Program, for which the association oversaw $900,000 in wage reimbursements for more than 400 interns at 100 companies.

- The **Southwestern Ohio Council for Higher Education (SOCHE)** leads the "20 by 20 Challenge," a regional initiative that represents the collective effort of the SOCHE colleges and universities to connect students to 20,000 internships annually by the year 2020. In the recent one-year anniversary report on the 20 by 20 Challenge, SOCHE reported the number of internships had increased from 11,066 to 11,846, a gain of 7.1 percent. Additionally, SOCHE has managed student internships at Wright-Patterson Air Force Base (WPAFB) since 1986, placing students – from sophomore undergraduates to doctoral candidates – in both year-long internships and summer co-ops. In the 2011-12 academic year, for example, SOCHE placed 260 students from 25 institutions at WPAFB in STEM-related internship positions. In the current academic year, SOCHE expanded its program by initiating more than 20 new opportunities at companies off base, as well as expanding its on-base presence with new internships with the 711th Human Performance Wing.

- The **Ohio Export Intern Program** is designed for companies that are looking to export for the first time or to improve their current export initiatives. The program matches companies with highly motivated students who have taken export-focused coursework, providing a 50 percent reimbursement for intern wages, up to $3,600. The internship program offers a mutually beneficial relationship for students and companies alike by providing real-world experiences where both employees and employers can learn and grow. Participating companies build export readiness, identify new markets, get market-specific research and analysis, and can streamline current export processes and procedures. The Ohio Development Services Agency, in partnership with the Fisher College of Business at The Ohio State University, oversees the program, which has received $65,000 in federal funding.

Number of Students Enrolled in Fall Term Who Participated in Work-Based Learning[14] in Any Term of the Academic Year

Sector/Institution	Fall 2009	Fall 2010	Fall 2011
Community Colleges	21,007	20,738	21,207
University Main and Regional Campuses	43,826	44,775	45,984
STATEWIDE TOTALS	**64,833**	**65,513**	**67,191**

14 For definitions and additional demographic data, see Appendix 8.

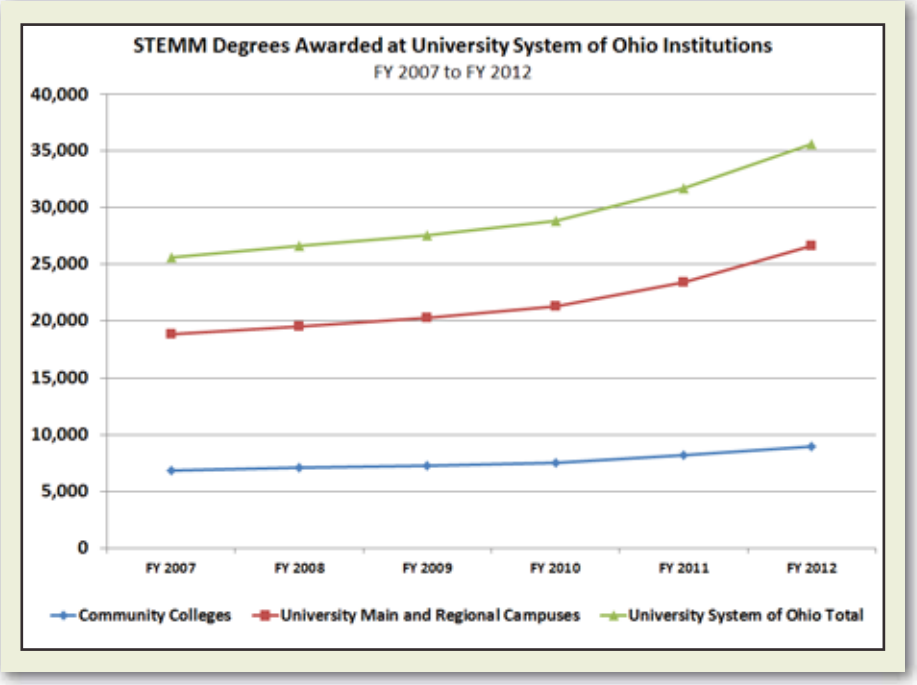
Summary/Next Steps

The Ohio Board of Regents will take several steps to further ramp up current efforts to expand STEM-related internships and co-ops throughout Ohio:

- Collect and share data from colleges and universities on student participation, placement rates and other related metrics to measure the effectiveness of the Ohio Means Internships & Co-ops programs.
- Continue to develop relationships among state and regional co-op and internship programs and business partners to effectively leverage resources and improve efficiencies.
- Work with higher education institutions and industry to support and develop more internship and co-op opportunities specifically related to STEM disciplines, which will enable students to better understand the breadth of business needs for STEM skills across industry sectors. As part of this effort, the Board of Regents will seek to establish stronger linkages between the Ohio Means Internships & Co-ops program and JobsOhio targeted industries.

Priority Goal #10: STEM Education

Ohio's future will be built on its capacity for innovation, invention and creative problem-solving. An ample and continuous supply of STEM workers with high-level critical thinking and problem-solving skills is essential to drive innovation and commercialization and to integrate existing technology in new ways that lead to new products and market growth. The Fifth Condition Report noted that "Scientists, engineers and supporting technicians have long been accepted as critical to the dynamic flow of new ideas emerging from structured research and development activities with corporations and higher education" – and, citing Anthony Carnevale, director of the Georgetown University Center on Education and the Workforce – that STEM students who have earned certifications, two-year and four-year degrees and advanced levels of education "are now in demand to support the wide array of ways in which commercialization now occurs."



What does all this mean for education in Ohio? At a very broad level, it means that Ohio's educational system must prepare all students for success in the new economy. More specifically, however, and most germane to the work of the Task Force, it means we must increase enrollment in, and completion of, STEM

majors and minors over current levels of enrollment and completion. It means we must align the curriculum and experiential learning components of STEM education to better reflect the preparation that industry deems necessary to drive innovation, entrepreneurship and commercialization. It means we must deepen the pool of STEM students and other career-focused youth and transitioning adults ready for college entry. And, it means we must increase the number and placement rate of students securing gainful employment in sectors viewed by industry as vital to increasing the pace of commercialization in Ohio.

There are encouraging signs in the number of STEM graduates being produced by Ohio's institutions of higher education. The total number of STEM degrees awarded at Ohio's public colleges and universities steadily increased from 25,635 students in FY 2007 to 35,615 students in FY 2012 – a 38.9 percent increase.

Progress is being made, but more is needed. The key to building a more robust STEM education pipeline in Ohio – to ensuring high-quality postsecondary STEM education experiences and producing an increased supply of STEM discipline graduates – is even stronger strategic partnerships and collaboration between higher education and K-12 education.

- **Goal**: Strengthen and create new STEM-focused partnerships between K-12 and higher education to ensure students begin postsecondary education ready to engage in STEM coursework and persist through graduation in STEM-related fields.

Activity to Date

Determining an appropriate scope and strategic focus for initial efforts to strengthen and create new STEM-focused partnerships proved to be challenging. The greatest difficulty was reconciling the sheer number and variety of STEM-related initiatives currently under way across the K-12, higher education and other education resource landscapes. Nonetheless, a few important initiatives, at both K-12 and postsecondary levels, merit mentioning here because they provide valuable opportunities for forging a more systemic approach to strengthening Ohio's STEM education pipeline and producing more college and university graduates ready to enter and succeed in STEM-related careers.

- At the postsecondary level, the State of Ohio has made a substantial commitment through its **Choose Ohio First Scholarship Program** to the recruitment of students who want to pursue STEM degrees at Ohio's institutions of higher education. Currently, 23 institutions are participating in the program. Each participating college or university has designed unique and innovative STEM degree pathways aimed at maximizing retention and producing graduates.

- Several of Ohio's universities are leading efforts to partner with school districts and businesses in their region to draw more attention to the need for improved STEM education and are in the process of developing **comprehensive strategies to address regional workforce needs**. For example, in June 2010 the University of Cincinnati received a $978,000 grant from the Ohio STEM Initiative to support expansion of the impact of STEM education in southwest Ohio. The grant supports expansion of a Southwest Regional STEM Education Hub; development of a network that provides STEM resources, expertise and programming to educators throughout southwest Ohio to promote innovation in teaching and programming; development and expansion of STEM initiatives, including professional development and coaching for teachers; and creation of a rural STEM consortium. In total, the grant supports STEM efforts in more than 50 school districts serving 250,000 students.

- To ensure that graduates entering the teaching profession are capable of teaching the more rigorous content contained in the Common Core Standards, the Ohio Board of Regents has elevated it

standards for teacher training programs. Regents also has collaborated with the Ohio Department of Education, through Ohio's **Race to the Top initiative**,[15] to sponsor research on specific components of STEM education to ensure that Ohio has current and relevant information when forming STEM education policy designed to strengthen STEM programming across the state.

- At the K-12 level, the Ohio State Board of Education has adopted **Common Core State Standards in Mathematics**,[16] which are designed to increase the level of rigor of mathematics content and instruction. The new standards will be fully in use by the beginning of the 2014-2015 school year, when assessments aligned to the standards are in place. The State also is beginning the process of reviewing drafts of the **NEXT Generation Science Standards**, a new set of voluntary, rigorous and internationally benchmarked standards, which were released in April 2013, to determine if Ohio will adopt those standards.

- School districts across Ohio are partnering with educational service centers, nonprofit organizations and businesses to develop innovative STEM programming. A preeminent example of such partnerships is Battelle's **Ohio STEM Learning Network (OSLN)**. Created in 2007, OSLN is a statewide consortium of STEM schools, regional hubs and training centers designed to share and scale up best practices in STEM education. Much of the OSLN's current activity is focused on the dual objectives of (a) increasing student awareness of, and interest in, STEM careers, and (b) improving student readiness for success in STEM courses of study. That work includes identification, dissemination and replication across Ohio of STEM education best practices, as well as training current and future STEM educators. In 2012, their first year of operation, OSLN's eight STEM Training Centers impacted 1,245 educators from 205 schools through 98 trainings.

- Educational Service Centers are leading collaborations with regional stakeholders to improve STEM education. For example:

  - » In April 2013 the Lake County Educational Service Center launched the Porter STEM Institute.[17] The goal of the Institute is to align K-12, higher education and workforce to create a single community of practice and naturally evolve the STEM culture. The Institute is comprised of regional and statewide partners working to improve STEM education both inside and outside the classroom.

  - » The Hamilton County Educational Service Center is a co-convener of the Greater Cincinnati STEM Collaborative, a regional effort to improve K-12 STEM learning through partnerships with formal and informal education, business and community organizations.

- The Ohio Department of Education and the Ohio Board of Regents have formed cross-agency teams charged with ensuring that Ohio students are ready upon entering postsecondary education to handle the rigors of pursuing STEM degrees.

The number and range of STEM initiatives under way in Ohio – including many efforts not mentioned here – make it clear that Ohio is serious about developing excellence in STEM education. As the Board of Regents reviewed the STEM landscape, it was evident that while much activity was under way, there were few systemic connections between the work being done at the K-12 level and in the nonprofit sector to initiatives under way at the postsecondary level.

15 Race to the Top is a federal initiative designed to spur systemic reform and innovative approaches to teaching and learning in America's schools. Ohio was awarded a $400 million Race to the Top grant in January 2011.

16 The Common Core State Standards Initiative is a state-led effort that established a single set of clear educational standards for Grades K-12 in Mathematics and English Language Arts that states voluntarily adopt.

17 http://www.lcesc.k12.oh.us/public/ESC/programs_portercenter.cfm

This review and analysis led to the conclusion that there was no need for a major new STEM education initiative – that, instead, the focus should be on building stronger awareness of, and connections among, existing initiatives to maximize their results and impact.

Strengthening the Choose Ohio First Scholarship Program

Designed to support increased participation and retention of students majoring in STEM and STEM-education fields, the Choose Ohio First program provides scholarship funds to Ohio colleges, universities and their industry partners with innovative academic programs aimed at attracting students into STEM fields. The Choose Ohio First program plays an important role in Ohio's overall strategy for increasing the state's STEM talent pool by producing the workers needed to drive the state's innovation economy well into the future. Now in its fifth year, the program is already producing impressive results. For example:

- To date, nearly $30 million has been awarded to more than 5,500 Choose Ohio First scholars, in 28 different academic programs, attending an Ohio college or university. At the time of this writing, the Ohio General Assembly had accepted Governor Kasich's request for continued funding for the program over the next biennium by appropriating $16,665,114 for FY14 and an additional $16,665,114 for FY15 in both the House and Senate versions of the state budget bill.

- Choose Ohio First scholarships have leveraged an additional $42 million in funds from the 47 public and private institutions where Choose Ohio First students are enrolled (through June 2012).

- The Choose Ohio First Woodrow Wilson Teaching Fellowship program, which seeks to attract talented, committed, mid-career individuals with backgrounds in STEM fields into teaching in high-need Ohio high schools, is poised to produce more than 300 highly qualified mathematics and science teachers. Currently, seven public and private universities participate in the program: John Carroll University, Ohio State University, Ohio University, University of Akron, University of Cincinnati, University of Dayton, and University of Toledo. In the 2012 cohort year, more than 2,000 individuals applied for fellowships.

- To help combat a statewide shortage of critical primary care physicians and advanced practice nurses, Choose Ohio First launched a new Primary Care Scholarships in Medicine and Nursing initiative in 2012. Annually, the program will offer scholarships to 50 medical students for four years of medical school and 30 nursing students for three years of graduate-level education. Recipients agree to remain in Ohio post-residency for no less than three years and work in practices that accept Medicaid patients.

- For the Fall 2008 cohort (first-time, full-time, entering students) at University System of Ohio institutions, a higher percentage of Choose Ohio First recipients earned degrees within four years compared to their cohort peers.

    - At community colleges, 45 percent of Choose Ohio First scholarship recipients earned an associate degree within four years compared to 14 percent of all full-time, entering students.

    - At university main campuses in Ohio, 35 percent of Choose Ohio First scholarship recipients earned a bachelor's degree within four years compared to 31 percent of all full-time, entering students.

    - Additionally, 57 percent of Choose Ohio First scholarship recipients who did not graduate within four years were still enrolled, compared to 44 percent of all students in the cohort.

- According to student self-reported data cited in the Choose Ohio First 2011-2012 Annual Report, nearly 700 Choose Ohio First scholarship recipients have graduated from college since the program's inception. Of these, more than 200 planned to enter graduate school (the majority in Ohio), and about 450 either found employment in a STEM occupation in Ohio or intended to stay in Ohio in some other capacity.

The Board of Regents' approach to optimizing the results of Choose Ohio First is to create "learning communities" of participating Choose Ohio First institutions and K-12 STEM-related initiatives supported by systemic communication networks that facilitate information sharing and learning opportunities. The primary mechanism for creating these learning communities will be annual Choose Ohio First convenings.

- **Sharing best practices**: Currently, the Board of Regents convenes Choose Ohio First institutions annually to showcase their programs for prospective students and honor the current year's scholarship winners, and is in the process of restructuring these convenings to include extended opportunities for Choose Ohio First institutions to share retention and programming best practices with each other through facilitated learn-

Ohio Woodrow Wilson Fellows

By the Numbers

Total number of Fellows

University	2011	2012	TOTAL
John Carroll University	17	6	**23**
The Ohio State University		16	**16**
Ohio University		12	**12**
University of Akron	18	17	**35**
University of Cincinnati	16	11	**27**
University of Dayton		11	**11**
The University of Toledo		13	**13**
TOTAL	**51**	**86**	**137**

Note: 80 percent of the 2011 Fellows are current high school teachers in their STEM area of study. The teacher placement data for the 2012 Fellows is expected in Fall 2013.

Sample Areas of Study

STEM Area	2011	2012	Total
Science **Biology, Chemistry, Physics, etc.*	37	66	**103**
Technology **Computer Science, Educational Technology, etc.*	3	2	**5**
Engineering **Chemical Engineering, Civil Engineering, etc.*	6	17	**23**
Mathematics	20	16	**36**
TOTAL	**66***	**101**	**167**

**Note: The total "STEM Area" number is higher than the total number of Fellows because some students majored in more than one STEM area.*

For a complete breakdown of schools, majors, and placements of Woodrow Wilson Fellows, see Appendix 6.

ing sessions. The goal is to develop a repository of resources and best practices that can be used by Choose Ohio First institutions and nonparticipating institutions alike to strengthen STEM instruction and improve their STEM-related retention and graduation results.

- **Integration of K-12 initiatives**: The Board of Regents' expansion plans for the Choose Ohio First convenings also include bringing K-12 STEM-related initiatives, such as Battelle's Ohio STEM Learning Network and the Lake County STEM initiative, into the convening process to give them an opportunity to see and learn what is happening in postsecondary institutions and also to share their initiatives with the Choose Ohio First institutions.

- **Industry involvement**: The Board of Regents recognizes the value of involving industry in the convenings. Input from industry representatives will help identify for educators emerging STEM fields and evolving STEM worker skill requirements, which will be invaluable in designing timely, relevant education and training programs to better meet industry needs.

Summary/Next Steps

Prior to future annual convenings of Choose Ohio First institutions, the Ohio Board of Regents will conduct a thorough review of the prior year's program data relating to course completion, retention rates, graduation rates, advanced degree participation and job placement. Based on this data review, themes and content for the annual convening will be determined. The learning community discussions will focus on strategies to achieve improved results in areas that collectively show the most deficiency and will be led by institutions excelling in those areas.

ACTION GROUP 5: Measuring Success Through Meaningful Metrics

Priority Goal #11: Metrics

Communities increasingly recognize higher education as a key driver in process improvement, new product development and increased productivity within a region. Consequently, universities and colleges are being asked to grow and improve their management of – and the returns generated through – technology transfer and commercialization activities in which the institutions are engaged.

To effectively measure the impact of commercialization activity at Ohio's colleges and universities on communities and the economy, it is necessary to select appropriate metrics. Annual data collection and publication of performance metrics should be a priority for state agencies, universities and colleges that promote and support economic development and that make decisions regarding the application of critical human, capital and facilities resources. Ideally, Ohio institutions of higher education would use a consistent, statewide set of metrics, with data normalized to reflect differences in the size of institutions.[18]

18 See Appendix 5 for definitions of common commercialization metrics.

Ohio's discussion of appropriate metrics occurs within a national conversation on how best to gauge higher education's commercialization outputs, outcomes and impact. Historically, commercialization data has been collected and shared by several organizations, led by the Association of University Technology Managers (AUTM). AUTM has been collecting data for 20 years, with many of Ohio's largest universities participating in the association's annual survey. AUTM now is in the process of revising its metrics with input from its members.

On a parallel track, the Association of Public Land-Grant Universities (APLU) Commission on Innovation, Competitiveness and Economic Prosperity (CICEP) is engaged in broad effort to identify new metrics that better gauge the impact of commercialization and technology investment on the regional economy. Ohio's universities are participating in and leading these discussions.

- **Goal**: Identify measures and metrics for inputs, outputs and outcomes for Ohio that demonstrate the benefits and effectiveness of commercialization activities carried out by colleges/universities.

Activity to Date

Measurement remains an important and challenging topic for our institutions of higher education. The development of shared metrics enables colleges and universities to better gauge their progress in commercializing technology and ideas. A number of initiatives, including continued participation by our colleges and universities in national metrics discussions and analysis through AUTM and APLU, are facilitating the collaboration necessary to develop a consensus dashboard of metrics for evaluating Ohio's statewide commercialization ecosystem.

Additional action includes the following:

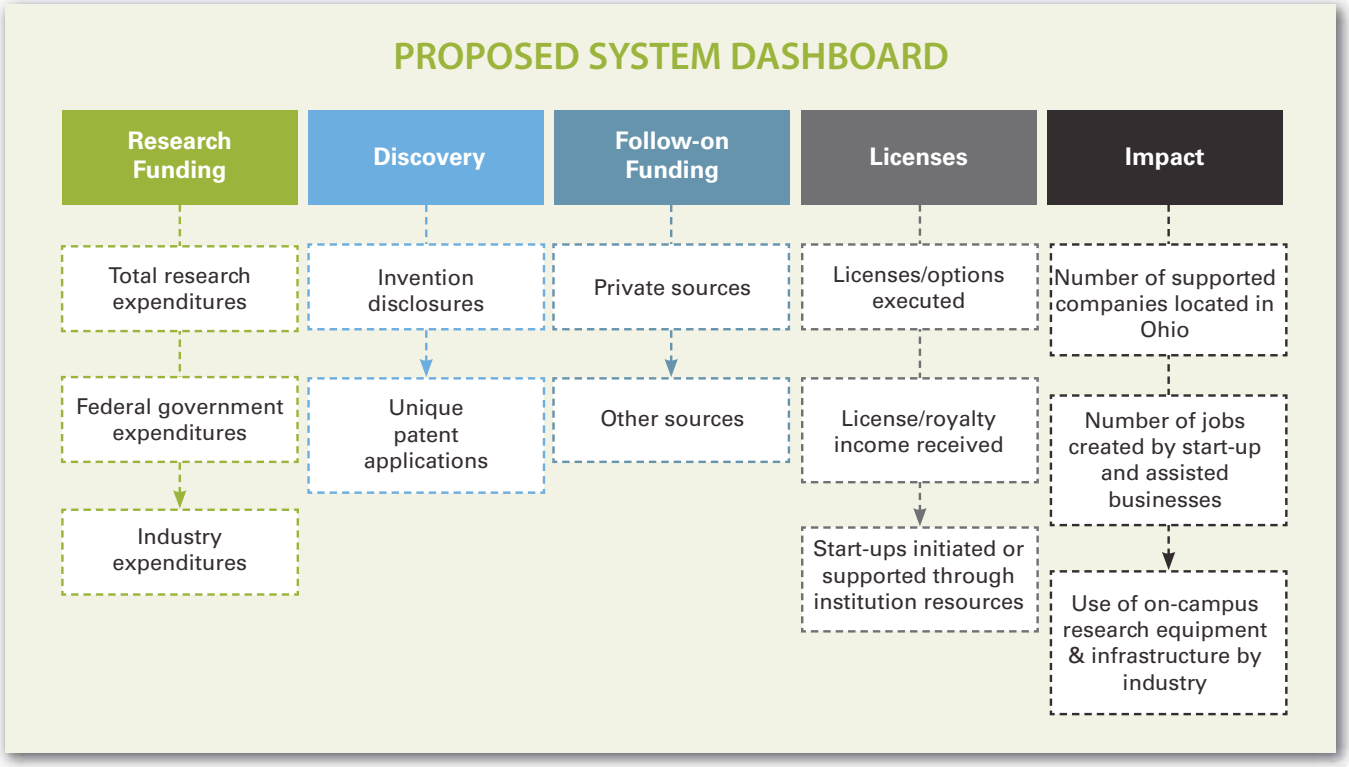
- A Task Force subcommittee led by John Dearborn, President of JumpStart,[19] reviewed current AUTM and suggested APLU metrics and engaged in conversations with stakeholders and researchers.

- The subcommittee also spoke with the APLU CICEP members to become more familiar with the issues currently being deliberated at the national level and the extent of those conversations. One outcome of this outreach was that Ohio was invited to participate in an APLU "learning community" of states and universities continuing to analyze and review issues related to metrics.

- The Task Force subcommittee also talked with representatives of Ohio universities and colleges to discuss their use of commercialization metrics. This outreach was supplemented by a Task Force survey soliciting information regarding campus-level metrics. These outreach efforts reinforced the importance of leveraging existing campus-level work on metrics and minimizing data collection requirements at campuses.

19 JumpStart provides direct support to Northeast Ohio entrepreneurs leading innovative, high-growth, technology-based companies that have the potential to become some of the largest-scale companies in the region.

- The Task Force subcommittee identified key output measures, recognizing that there is ongoing research and discussion of outcome measures. The following proposed system dashboard, which focuses on *system* metrics, is a product of this work:



Summary/Next Steps

The Board of Regents will coordinate a pilot implementation of the proposed system dashboard and will engage Ohio colleges and universities in evaluating its utility and value.

Stark State College

SECTION 6

Conclusion

Cleveland State University

If the recommendations outlined in the Fifth Condition Report serve as a roadmap for how Ohio can position itself for leadership and prosperity in a global innovation economy, the eleven Priority Goals identified in this Sixth Condition Report might be viewed as a series of initial mile markers that direct us and keep us focused on our way. It's true that the journey to increased technology transfer and commercialization is not a linear one; nonetheless, there is value in pausing to check progress to date, with those checkpoints representing initial phases of action on implementing the Task Force recommendations.

The good news: Ohio is headed in the right direction and making steady progress.

Momentum is building and is evident across the landscape – in the entrepreneurial curricula and experiential learning experiences in our colleges and universities; in the incentives and support for faculty to commercialize their research; in the partnerships being forged between higher education and industry; and in the energy and excitement being generated by and among regional stakeholders who are coming together in new and creative ways to fuel economic growth and create jobs and wealth in all regions of the state.

The Sixth Condition report reaffirms that Ohio's colleges and universities are leading catalysts for and contributors to the statewide effort to promote Ohio's innovation economy. In many communities, institutions of higher education are principal architects and essential partners in building local and regional ecosystems necessary to support innovation, commercialization and a culture of entrepreneurship. Colleges and universities are also providing the infrastructure and intellectual leadership needed to create Ohio's globally competitive workforce.

> The good news: Ohio is headed in the right direction and making steady progress.

The continuing challenge: Our journey is far from being complete.

The eleven Priority Goals discussed in this report represent initial "building blocks" for implementation of the Task Force's full slate of recommendations. We are making progress, but we have achieved nowhere near the magnitude of system change that is needed for Ohio to emerge as a robust, nation-leading state for technology transfer and commercialization. Sustained progress in the foundational areas highlighted in this Sixth Condition Report, combined with a marshalling of new and heightened activity in other critical areas identified by the Fifth Condition Report, is needed to fully implement the Task Force's recommendations.

Looking ahead, the Task Force suggests a number of near-term priorities:

- **Building Capacity for Commercialization:** Task Force members find that more work is needed to encourage and promote new approaches to industry-higher education legal agreements. This Sixth Condition Report underscores the suggestion in the Fifth Condition Report that a change in culture is needed to promote more industry-higher education collaboration. The report calls upon both industry and higher education to move away from historical transaction-based relationships to relationships built on promoting collaboration and building partnerships earlier in the technology commercialization process. The report further encourages universities to incentivize faculty to pursue commercialization of their intellectual property, as well as to promote new opportunities for faculty to work with industry partners. One of the ways Task Force members believe this can be accomplished is by creating an environment that fosters collaboration through the expansion and enhancement of incubator and accelerator resources statewide in closer proximity to university and college campuses.

- **Creating an Entrepreneurial/Innovative Ecosystem:** The Task Force calls upon university and college leaders to expand and improve institution-based activities related to regional economic development; promote opportunities to showcase regional-based technology and intellectual resources and capabilities; and expand career-training opportunities. The Sixth Condition Report notes that universities and colleges have numerous physical and intellectual assets they need to promote more aggressively through the development of web-based tools to facilitate industry-higher education collaborations and more effectively leverage institutional assets. The report also identifies investment capital as an essential ingredient in the successful commercialization of emerging technologies and calls upon higher education leadership to work collaboratively with state and industry representatives to identify and generate new forms of venture capital and early-stage seed funding.

- **Fostering a Culture of Entrepreneurship:** The Task Force finds evidence of strong momentum for expanding entrepreneurial curricula and learning experiences across the state. Two specific opportunities for improvement are (a) targeted courses that are more closely aligned with postgraduate job and career opportunities and requirements, and (b) integration of entrepreneurial experiences in a greater variety of courses across a wider range of disciplines. The Ohio Board of Regents will work with academic leaders at universities and colleges to share best practices for entrepreneurial learning and continue to expand entrepreneurial programming across the state.

- **Developing a Globally Competitive Workforce:** The Task Force finds a clear need for more timely and efficient sharing of workforce data and analysis with higher education institutions, noting also that certain gaps in data analysis negatively impact the ability of universities and colleges to respond to statewide needs. The Sixth Condition Report recommends a closer working relationship with the Governor's Office of Workforce Transformation to develop more effective forecasting tools. The report also calls for expanded internship opportunities more closely aligned with postgraduate employment opportunities in Ohio as well as a renewed focus on Choose Ohio First institutions and their course completion, retention and graduation rates, advanced degree participation, and job placement in STEM-related programs – all to advance progress toward the explicit goal of improving Ohio's competitiveness in the global economy.

- **Measuring Success through Meaningful Metrics:** The Task Force reaffirms the Fifth Condition Report finding that measurement remains an important and challenging topic for Ohio's institutions of higher education. The Sixth Condition Report calls for the development of shared metrics to enable colleges and universities to better gauge their progress in commercializing technologies and ideas. The report also acknowledges that there are a number of initiatives that Ohio's universities and colleges could undertake using national metrics that could lead to a consensus dashboard for the state.

The bottom line: Targeted areas for continued action and implementation will not change.

We must continue to build the state's capacity for commercialization and encourage and support industry-higher education collaboration toward that end. We must redouble and accelerate efforts to create an ecosystem that supports innovation and commercialization. We must expand and sustain work to foster a culture of entrepreneurship. We must ramp up efforts to develop a globally competitive workforce ready for the jobs that increased innovation and commercialization create. And we must continue to measure progress and results through meaningful metrics.

As Ohio's institutions of higher education continue to evolve – and as the imperative for increased dialogue and collaboration between industry and higher education becomes more and more a matter of economic survival – the role of the Ohio Board of Regents in advancing commercialization will likewise evolve. The exact trajectory of that evolution is not yet clear, but Regents staff have identified two opportunities for leadership:

As Ohio's institutions of higher education continue to evolve, the role of the Ohio Board of Regents in advancing commercialization will likewise evolve.

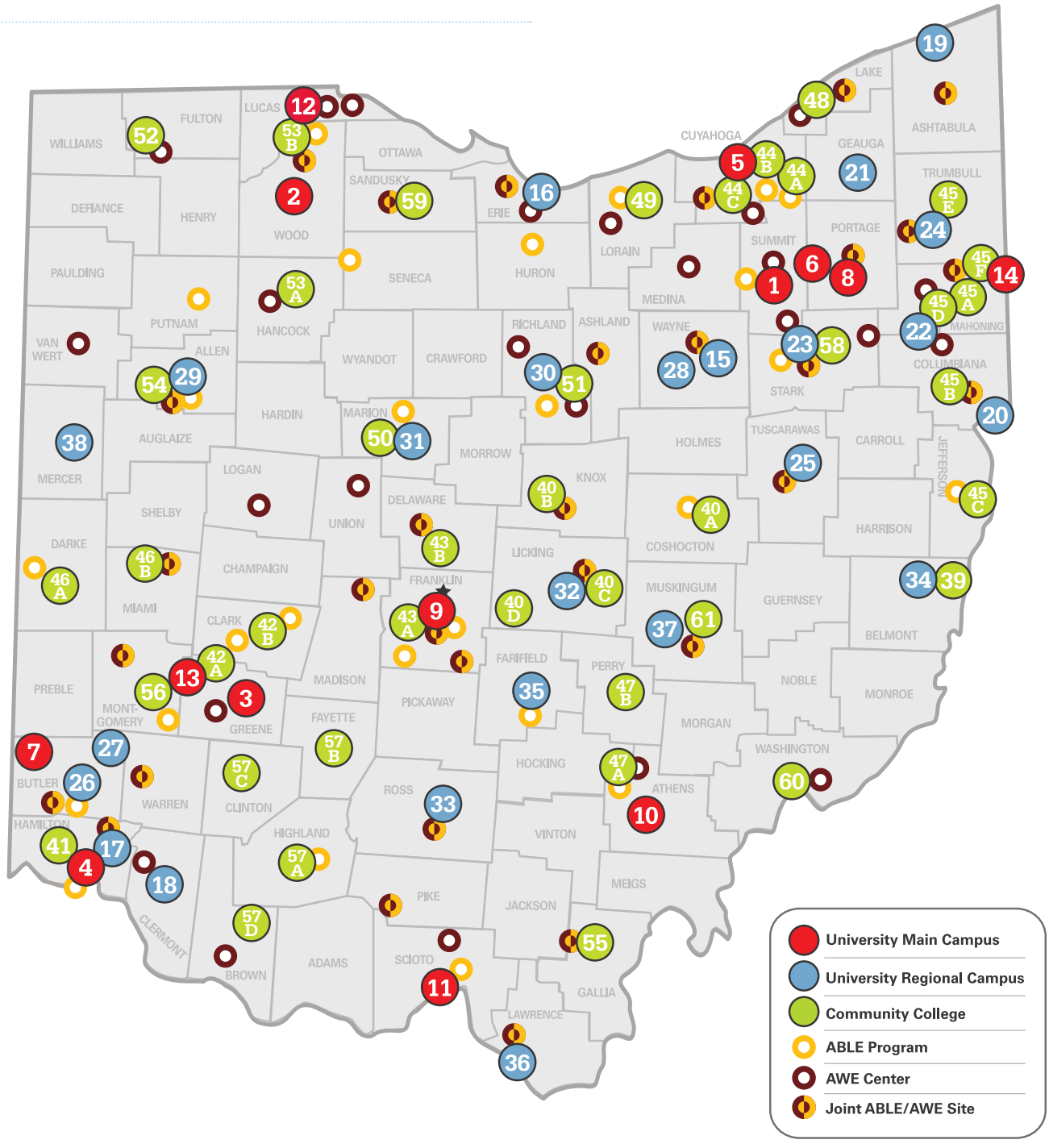
- In cooperation with the Ohio Development Services Agency and JobsOhio, the Ohio Board of Regents will collect and disseminate data to measure the state's competiveness in the global innovation economy. Each of these organizations has knowledge and expertise regarding the economy that should be included in an annual update. Ohio's ability to thrive in the global knowledge economy will require a deeper understanding of data and information for three factors of production: (1) natural resources, (2) human capital, and (3) financial capital. The data and information collected and shared can be an ongoing resource for shaping local, regional and state policies that support innovation and commercialization.

- Drawing on the efforts of the Ohio Third Frontier and JobsOhio, the Board of Regents will promote increased linkages and incentives to invest in intellectual property in Ohio.

As Ohio seeks to expand and accelerate efforts to be a leader in innovation, technology transfer and commercialization, the Ohio Board of Regents reasserts its commitment to support those efforts through continued collaboration with Ohio's institutions of higher education, private industry, local and regional economic development entities, and elected state officials.

Appendix 1

University System of Ohio Overview



University System of Ohio Overview

Universities

1. The University of Akron
2. Bowling Green State University
3. Central State University
4. University of Cincinnati
5. Cleveland State University
6. Kent State University
7. Miami University
8. Northeast Ohio Medical University
9. The Ohio State University
10. Ohio University
11. Shawnee State University
12. The University of Toledo
13. Wright State University
14. Youngstown State University

Regional Campuses

15. The University of Akron - Wayne
16. Bowling Green State University - Firelands
17. University of Cincinnati - Blue Ash
18. University of Cincinnati - Clermont
19. Kent State University - Ashtabula
20. Kent State University - East Liverpool
21. Kent State University - Geauga
22 Kent State University - Salem
23. Kent State University - Stark
24. Kent State University - Trumbull
25. Kent State University - Tuscarawas
26. Miami University - Hamilton
27. Miami University - Middletown
28. The Ohio State University Agricultural Technical Institute
29. The Ohio State University - Lima
30. The Ohio State University - Mansfield
31. The Ohio State University - Marion
32. The Ohio State University - Newark
33. Ohio University - Chillicothe
34. Ohio University - Eastern
35. Ohio University - Lancaster
36. Ohio University - Southern
37. Ohio University - Zanesville
38. Wright State University - Lake

Community Colleges

39. Belmont College
40. Central Ohio Technical College
    - A. Coshocton Campus
    - B. Knox Campus
    - C. Newark Campus
    - D. Pataskala Campus
41. Cincinnati State Technical & Community College
42. Clark State Community College
    - A. Greene Center
    - B. Springfield Campus
43. Columbus State Community College
    - A. Columbus Campus
    - B. Delaware Campus
44. Cuyahoga Community College
    - A. Eastern Campus
    - B. Metro Campus
    - C. Western Campus
45. Eastern Gateway Community College
    - A. Choffin Career & Technical Center
    - B. Columbiana County Career & Technical Center
    - C. Jefferson County Campus
    - D. Mahoning County Career & Technical Center
    - E. Trumbull Career & Technical Center
    - F. The Valley Center
46. Edison Community College
    - A. Darke County Campus
    - B. Piqua Campus
47. Hocking College
    - A. Nelsonville Campus
    - B. Perry Campus
48. Lakeland Community College
49. Lorain County Community College
50. Marion Technical College
51. North Central State College
52. Northwest State Community College
53. Owens Community College
    - A. Findlay Campus
    - B. Toledo Campus
54. Rhodes State College
55. Rio Grande Community College
56. Sinclair Community College
57. Southern State Community College
    - A. Central Campus
    - B. Fayette Campus
    - C. North Campus
    - D. South Campus
58. Stark State College
59. Terra Community College
60. Washington State Community College
61. Zane State College

University System of Ohio Overview

Adult Basic & Literacy Education Programs (ABLE)

ALLEN: Lima City Schools

ATHENS: SEPTA Correctional Facility

BUTLER: Hamilton City School District

CLARK: Clark State Community College; Springfield City School District

COSHOCTON: Coshocton County Job & Family Services

CUYAHOGA: Cuyahoga Community College; Parma City School District

DARKE: Greenville City Schools

FAIRFIELD: Lancaster-Fairfield Community Action Agency

FRANKLIN: Godman Guild Association; South-Western City Schools

HAMILTON: Cincinnati Public Schools

HANCOCK: Owens Community College (Findlay Campus)

HIGHLAND: Southern State Community College

HURON: Norwalk City Schools

JEFFERSON: Eastern Gateway Community College

LORAIN: Lorain County Community College

MARION: Marion Technical College

MONTGOMERY: Kettering City School District

MUSKINGUM: Muskingum Valley Educational Service Center

PUTNAM: Putnam County Educational Service Center

RICHLAND: Mansfield City Schools-Adult & Community Education

SCIOTO: South Central Ohio Educational Service Center

SENECA: Fostoria City Schools

STARK: Massillon City Schools

SUMMIT: Project Learn of Summit County

WOOD: Owens Community College

Adult Workforce Education Centers (AWE)

ATHENS: Tri-County Career Center

BROWN: Southern Hills Career & Technical Center

CLERMONT: Grant Career Center

COLUMBIANA: Hannah E. Mullins School of Practical Nursing

CUYAHOGA: Cuyahoga Valley Career Center

ERIE: EHOVE Career Center

FULTON: Four County Career Center

GREENE: Greene County Career Center

HANCOCK: Millstream Career Center

LAKE: Willoughby-Eastlake City Schools

LOGAN: Ohio Hi-Point Career Center

LORAIN: Lorain County Joint Vocational School

LUCAS: Oregon City Schools; Toledo City Schools

MAHONING: Mahoning County Career & Technical Center

MEDINA: Medina County Career Center

RICHLAND: Madison Adult Career Center; Pioneer Career & Technology Center

SCIOTO: Scioto County Career Technical Center

STARK: Alliance City Schools

SUMMIT: Akron City Schools; Portage Lakes Career Center

UNION: Tri-Rivers Career Center

VAN WERT: Vantage Career Center

WASHINGTON: Washington County Career Center

Joint ABLE/AWE

ALLEN: Apollo Career Center

ASHLAND: Ashland County-West Holmes Career Center

ASHTABULA: Ashtabula County Technical & Career Center

BUTLER: Butler Tech

COLUMBIANA: Columbiana County Career & Technical Center

CUYAHOGA: Polaris Career Center

DELAWARE: Delaware Area Career Center

ERIE: Sandusky City Schools

FRANKLIN: Columbus City Schools; Eastland-Fairfield Career Center

GALLIA: Buckeye Hills Career Center

HAMILTON: Great Oaks Institute of Technology & Career Development

KNOX: Knox County Career Center

LAKE: Auburn Career Center

LAWRENCE: Collins Career Center

LICKING: C-TEC

MADISON: Tolles Career & Technical Center

MAHONING: Choffin Career & Technical Center (Youngstown City Schools)

MIAMI: Upper Valley Career Center

MONTGOMERY: Miami Valley Career Technology Center

MUSKINGUM: Mid-East Career & Technology Centers

PIKE: Pike County Career Technology Center

PORTAGE: Maplewood Career Center

ROSS: Pickaway-Ross Career & Technology Center

SANDUSKY: Vanguard-Sentinel Career & Technology Centers

STARK: Canton City Schools

TRUMBULL: Trumbull Career & Technical Center

TUSCARAWAS: Buckeye Career Center

WARREN: Warren County Career Center

WAYNE: Wayne County Schools Career Center

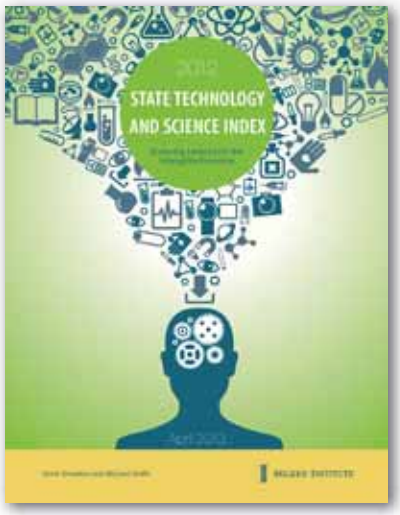
WOOD: Penta Career Center

Shawnee State University

Appendix 2

Indicators Used in National Benchmark Data

The Milken Institute's State Technology and Science Index provides a benchmark for states to assess their science and technology capabilities as well as the broader ecosystem that contributes to job and wealth creation. The index computes and measures 79 individual indicators relative to population, gross state product (GSP), number of establishments, number of businesses, and other factors. Data sources include government agencies, foundations and private sources. States are ranked in descending order with the top state being assigned a score of 100, the runner-up a score of 98, and the 50th state a score of 2. The indicators are then combined to create these five composite rankings:



- **Research and development inputs**: Indicators examine a state's R&D capacity to see if it has facilities that can attract funding and create innovations that can be commercialized. The category includes measures such as industrial, academic and federal R&D; Small Business Innovation Research awards; and the Small Business Technology Transfer program, among others.

- **Risk capital and entrepreneurial infrastructure**: Indicators include several measures of venture capital activity as well as entrepreneurial pursuits, including patenting activity, business formations and initial public offerings.

- **Human capital investment**: Indicators suggest the skill levels of the current and future workforce. Examples include the number of bachelor's, master's and doctorate degrees relative to a state's population, and measures specific to science, engineering and technology degrees.

- **Technology and science workforce**: Indicators examines 18 occupation categories in three main areas of employment: computer and information sciences, life and physical sciences, and engineering. Intensity is derived from the share of employment in a particular field relative to total state employment.

- **Technology concentration and dynamism**: Indictors measures the percent of establishments, employment and payrolls that are in high-tech categories, as well as growth in a number of technology categories.

In the most recent version of the Milken Institute Index (2012), Ohio ranked 28th in research and development and 28th overall.

The Information Technology & Innovation Foundation's 2012 State New Economy Index (funded by the Ewing Marion Kauffman Foundation) focuses on answering this question: To what degree does the structure of state economies match the ideal structure of the "new economy"? The Index measures 26 separate indicators, divided into five categories, to determine the degree to which a state's economy is knowledge-based, globalized, entrepreneurial, IT-driven and innovation-based. The five categories include the following:

- **Knowledge jobs**: Indicators measure employment of IT professionals outside the IT industry; jobs held by managers, professionals and technicians; the educational attainment of the workforce; immigration of knowledge workers; migration of domestic knowledge workers; worker productivity in the manufacturing sector; and employment in high-wage traded services.

- **Globalization**: Indicators measure foreign direct investment and the export orientation of manufacturing and services.

- **Economic dynamism**: Indicators measure the degree of job churning; the number of fast-growing firms; the number and value of initial public stock offerings (IPOs); the number of entrepreneurs starting new businesses; and the number of individual inventor patents granted.

- **The digital economy**: Indicators measure the percentage of households online; the degree to which state governments use information technologies to deliver services; Internet and computer use by farmers; residential and business access to broadband telecommunications; and use of information technology in the healthcare system.

- **Innovation capacity**: Indicators measure the number of jobs in high-tech industries; the number of scientists and engineers in the private sector; the number of patents granted; industry investment in research and development; non-industry investment in research and development; movement toward a green energy economy; and venture capital investment.

In the most recent version of the ITIF Foundation Index (2012), Ohio ranked 32th overall and 42nd for its "economic dynamism."

Appendix 3

Research Expenditures at Ohio Public and Private Universities

Institution	Source	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Air Force Institute of Technology	Federal	$3,237	$7,793	$5,541	$5,691	$5,791	$7,234	$8,610	$11,843	$13,788	$18,986
	Industrial	$-	$130	$5	$36	$327	$28	$84	$344	$264	$4
	Other	$8,231	$7,199	$9,900	$11,189	$14,751	$10,929	$12,714	$15,372	$14,840	$11,100
	Total	**$11,468**	**$15,121**	**$15,446**	**$16,915**	**$20,869**	**$18,191**	**$21,407**	**$27,559**	**$28,893**	**$30,090**
Ashland University	Federal										$509
	Industrial										$-
	Other										$7
	Total										**$516**
Baldwin-Wallace College	Federal										$50
	Industrial										$166
	Other										$74
	Total										**$290**
Bowling Green State University (All Campuses)	Federal	$3,510	$5,316	$6,318	$7,402	$6,009	$6,820	$6,181	$4,413	$5,064	$6,162
	Industrial	$73	$47	$124	$118	$543	$259	$2,207	$1,834	$115	$10
	Other	$3,026	$3,544	$3,385	$3,721	$4,461	$2,796	$2,800	$2,399	$3,014	$2,662
	Total	**$6,609**	**$8,907**	**$9,827**	**$11,241**	**$11,013**	**$9,875**	**$11,188**	**$8,646**	**$8,193**	**$8,834**
Case Western Reserve University	Federal	$225,676	$249,453	$232,298	$245,073	$341,072	$329,963	$319,047	$322,376	$340,208	$352,938
	Industrial	$6,892	$6,482	$6,344	$21,506	$6,974	$6,250	$5,089	$6,666	$6,762	$5,121
	Other	$39,206	$48,425	$36,753	$106,671	$62,227	$66,980	$110,415	$98,884	$79,318	$70,147
	Total	**$271,774**	**$304,360**	**$275,395**	**$373,250**	**$410,273**	**$403,192**	**$434,552**	**$427,926**	**$426,288**	**$428,206**
Central State University	Federal	$994	$1,287	$1,567	$1,821	$2,514	$2,450	$2,482	$2,974	$2,596	$3,475
	Industrial	$55	$36	$17	$-	$18	$17	$116	$219	$353	$107
	Other	$150	$96	$46	$-	$46	$44	$69	$147	$173	$112
	Total	**$1,199**	**$1,419**	**$1,630**	**$1,821**	**$2,578**	**$2,512**	**$2,666**	**$3,341**	**$3,122**	**$3,694**
Cleveland State University	Federal	$5,768	$4,384	$7,580	$8,311	$5,732	$5,519	$5,250	$4,203	$25,399	$42,292
	Industrial	$2,168	$720	$456	$367	$257	$424	$64	$154	$2,373	$2,094
	Other	$9,255	$12,030	$12,028	$9,642	$10,117	$11,325	$9,445	$9,467	$6,772	$10,658
	Total	**$17,190**	**$17,134**	**$20,064**	**$18,320**	**$16,106**	**$17,268**	**$14,758**	**$13,824**	**$34,544**	**$55,044**
College of Wooster	Federal	$352	$415	$334	$539	$563	$237	$157	$292	$254	$512
	Industrial	$78	$75	$-	$-	$-	$-	$-	$-	$-	$-
	Other	$19	$11	$-	$119	$510	$785	$481	$614	$703	$598
	Total	**$449**	**$501**	**$334**	**$657**	**$1,073**	**$1,022**	**$638**	**$906**	**$957**	**$1,110**
Denison University	Federal	$227	$463	$266	$245	$222	$169	$330	$372	$434	
	Industrial	$-	$8	$-	$-	$110	$92	$-	$-	$-	
	Other	$236	$192	$227	$211	$84	$87	$83	$79	$61	
	Total	**$463**	**$663**	**$493**	**$456**	**$417**	**$348**	**$413**	**$451**	**$495**	

Institution	Source	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Heidelberg College	Federal										$476
	Industrial										$31
	Other										$238
	Total										**$745**
John Carroll University	Federal	$607	$406	$234	$398	$502	$317	$391	$276	$457	$474
	Industrial	$25	$17	$-	$92	$24	$5	$32	$62	$120	$86
	Other	$390	$114	$334	$93	$-	$-	$-	$24	$-	$22
	Total	**$1,021**	**$537**	**$568**	**$584**	**$527**	**$323**	**$423**	**$361**	**$577**	**$582**
Kent State University (All Campuses)	Federal	$11,696	$11,265	$10,803	$8,787	$9,108	$10,612	$13,030	$13,678	$13,581	$13,334
	Industrial	$1,381	$1,101	$972	$1,014	$778	$1,442	$358	$512	$317	$489
	Other	$2,888	$5,299	$3,328	$2,938	$2,420	$8,519	$10,939	$11,607	$11,217	$10,565
	Total	**$15,966**	**$17,665**	**$15,103**	**$12,739**	**$12,306**	**$20,574**	**$24,327**	**$25,797**	**$25,116**	**$24,388**
Kenyon College	Federal							$583	$348	$421	$358
	Industrial							$-	$-	$-	$-
	Other							$-	$-	$15	$75
	Total							**$583**	**$348**	**$437**	**$433**
Medical College of Ohio	Federal	$14,896	$17,176	$17,335	$17,019	$16,229					
	Industrial	$346	$279	$428	$398	$458					
	Other	$5,900	$4,683	$6,187	$6,843	$7,275					
	Total	**$21,142**	**$22,138**	**$23,950**	**$24,260**	**$23,962**					
Miami University (All Campuses)	Federal	$4,989	$5,235	$6,097	$9,243	$8,748	$9,706	$11,355	$13,902	$11,780	$11,476
	Industrial	$1,001	$800	$1,075	$729	$651	$422	$416	$372	$725	$552
	Other	$10,486	$10,631	$11,097	$10,819	$11,965	$15,565	$14,394	$16,422	$2,351	$2,767
	Total	**$16,476**	**$16,667**	**$18,269**	**$20,791**	**$21,364**	**$25,693**	**$26,164**	**$30,697**	**$14,857**	**$14,795**
Northeast Ohio Medical University (NEOMED)	Federal	$2,321	$2,074	$3,521	$3,768	$3,060	$3,007	$2,524	$2,903	$4,090	$4,081
	Industrial	$144	$146	$119	$97	$127	$53	$29	$106	$41	$230
	Other	$3,149	$3,079	$3,014	$2,713	$2,695	$2,337	$7,018	$7,368	$6,907	$9,270
	Total	**$5,614**	**$5,299**	**$6,654**	**$6,578**	**$5,882**	**$5,396**	**$9,572**	**$10,377**	**$11,039**	**$13,581**
Oberlin College	Federal	$504	$515	$346	$970	$609	$692	$611	$703	$1,387	$1,183
	Industrial	$41	$39	$43	$178	$142	$121	$131	$178	$63	$44
	Other	$-	$18	$64	$74	$149	$24	$17	$13	$530	$425
	Total	**$545**	**$572**	**$453**	**$1,221**	**$900**	**$837**	**$758**	**$895**	**$1,979**	**$1,652**
Ohio Northern University	Federal								$111	$184	$181
	Industrial								$-	$10	$-
	Other								$61	$79	$246
	Total								**$172**	**$272**	**$427**
Ohio State University (All Campuses)	Federal	$220,707	$240,998	$338,214	$339,150	$350,998	$339,167	$350,001	$349,950	$392,443	$471,331
	Industrial	$63,445	$55,800	$67,221	$93,910	$118,052	$153,944	$133,270	$123,165	$121,270	$102,608
	Other	$252,328	$305,962	$210,090	$269,250	$255,724	$286,701	$250,518	$264,703	$220,471	$220,084
	Total	**$536,480**	**$602,759**	**$615,525**	**$702,310**	**$724,774**	**$779,812**	**$733,789**	**$737,818**	**$734,185**	**$794,023**
Ohio University (All Campuses)	Federal	$21,933	$24,776	$24,749	$23,916	$21,747	$20,145	$19,012	$17,000	$18,579	$21,938
	Industrial	$3,386	$3,437	$3,516	$5,011	$3,879	$3,089	$3,959	$5,289	$3,997	$4,769
	Other	$20,094	$17,350	$17,719	$20,931	$16,595	$18,638	$16,828	$20,197	$22,755	$16,692
	Total	**$45,412**	**$45,564**	**$45,983**	**$49,859**	**$42,220**	**$41,871**	**$39,800**	**$42,486**	**$45,330**	**$43,399**

Institution	Source	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Ohio Wesleyan University	Federal	$252	$246	$314	$375	$301	$285	$126	$163	$207	$611
	Industrial	$-	$-	$-	$-	$-	$-	$-	$-	$-	$-
	Other	$101	$98	$127	$155	$139	$122	$123	$136	$135	$108
	Total	**$352**	**$345**	**$441**	**$529**	**$440**	**$407**	**$250**	**$299**	**$342**	**$719**
University of Akron (All Campuses)	Federal	$11,833	$11,350	$12,218	$11,817	$12,703	$12,138	$9,684	$11,293	$12,185	$12,001
	Industrial	$3,186	$3,696	$4,129	$3,931	$3,684	$3,507	$3,391	$4,061	$1,624	$1,747
	Other	$19,821	$18,894	$16,311	$15,264	$15,211	$13,739	$15,314	$20,182	$34,714	$42,500
	Total	**$34,840**	**$33,940**	**$32,658**	**$31,012**	**$31,598**	**$29,384**	**$28,389**	**$35,536**	**$48,524**	**$56,248**
University of Cincinnati (All Campuses)	Federal	$186,317	$224,938	$231,632	$233,734	$224,147	$274,841	$231,007	$236,160	$267,301	$286,003
	Industrial	$5,644	$6,379	$8,267	$9,481	$5,399	$6,014	$7,847	$10,240	$17,868	$20,255
	Other	$76,848	$77,204	$88,396	$86,689	$97,272	$126,104	$120,469	$120,986	$116,339	$113,198
	Total	**$268,809**	**$308,521**	**$328,295**	**$329,904**	**$326,817**	**$406,958**	**$359,322**	**$367,386**	**$401,508**	**$419,456**
University of Dayton	Federal	$49,867	$57,463	$67,301	$67,797	$63,085	$65,062	$67,380	$72,570	$74,040	$69,847
	Industrial	$4,165	$3,816	$4,492	$5,111	$4,740	$4,515	$5,189	$5,102	$5,061	$4,747
	Other	$3,730	$3,003	$3,928	$4,881	$8,927	$10,553	$12,316	$18,612	$14,709	$14,443
	Total	**$57,761**	**$64,282**	**$75,721**	**$77,789**	**$76,752**	**$80,130**	**$84,884**	**$96,283**	**$93,810**	**$89,037**
University of Findlay	Federal	$124	$140	$48							
	Industrial	$-	$67	$214							
	Other	$186	$36	$13							
	Total	**$310**	**$243**	**$274**							
University of Toledo	Federal	$11,162	$13,268	$15,717	$17,901	$18,370	$34,500	$30,498	$30,202	$37,735	$42,680
	Industrial	$2,467	$2,154	$1,471	$1,211	$969	$2,336	$5,388	$3,227	$3,534	$3,225
	Other	$17,173	$13,867	$15,731	$18,200	$14,540	$19,953	$26,343	$34,678	$26,927	$24,259
	Total	**$30,801**	**$29,289**	**$32,919**	**$37,312**	**$33,879**	**$56,789**	**$62,229**	**$68,107**	**$68,196**	**$70,164**
Wilberforce University	Federal	$139	$97	$475	$830	$1,155	$1,473	$892	$568	$752	$729
	Industrial	$-	$-	$13	$25	$37	$49	$26	$30	$-	$-
	Other	$10	$-	$-	$-	$-	$-	$-	$20	$23	$34
	Total	$149	$97	$488	$856	$1,192	$1,521	$918	$618	$775	$763
Wittenberg University											$141
											$-
											$70
	Total										$211
Wright State University (All Campuses)	Federal	$19,939	$22,745	$24,473	$23,675	$24,921	$24,069	$22,261	$23,468	$25,288	$27,422
	Industrial	$4,730	$4,335	$3,445	$4,465	$4,066	$4,320	$2,151	$2,018	$2,080	$2,243
	Other	$13,747	$15,246	$17,290	$18,373	$24,022	$25,438	$25,478	$24,102	$22,010	$18,803
	Total	**$38,416**	**$42,326**	**$45,208**	**$46,513**	**$53,010**	**$53,827**	**$49,891**	**$49,588**	**$49,379**	**$48,468**
Youngstown State University	Federal	$993	$997	$1,645	$1,313	$1,185	$502	$1,106	$1,222	$2,109	$3,304
	Industrial	$120	$141	$78	$108	$74	$61	$66	$92	$141	$91
	Other	$449	$560	$451	$173	$193	$99	$74	$829	$2,360	$1,230
	Total	**$1,562**	**$1,697**	**$2,175**	**$1,594**	**$1,453**	**$662**	**$1,246**	**$2,143**	**$4,610**	**$4,625**

Overall	Source	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total	Federal	$798,042	$902,800	$1,009,026	$1,029,776	$1,118,772	$1,148,907	$1,102,517	$1,120,990	$1,250,284	$1,392,353
Total	Industrial	$99,347	$89,706	$102,427	$147,786	$151,308	$186,949	$169,813	$163,672	$166,720	$148,619
Total	Other	$487,421	$547,541	$456,420	$588,947	$549,325	$620,737	$635,837	$666,902	$586,424	$570,317
Total	**Total**	**$1,384,811**	**$1,540,047**	**$1,567,873**	**$1,766,509**	**$1,819,404**	**$1,956,592**	**$1,908,167**	**$1,951,564**	**$2,003,428**	**$2,111,289**

Appendix 4

Recipients of Ohio Means Internships & Co-ops Grants (December 2012):

- **Antioch College** - $140,676, creates up to 12 co-op employer relationships for 36 students in the Ohio food production/processing industry.
- **Bowling Green State University** - $697,260, will increase the number of small businesses utilizing co-op/internship opportunities in northwest Ohio in computer science, supply chain management and information technology.
- **Central State University** - $18,000, will expand an existing student support program that matches students with potential business and industry employers.
- **Cincinnati State Technical and Community College** - $123,000, builds new co-op program infrastructure at the Butler County Workforce Center in Middletown.
- **Clark State Community College** - $28,965, will support up to 20 interns with embedded faculty and technology staff at the Advanced Virtual Engine Test Cell Inc. (AVETEC), a not-for-profit public benefit research organization in Springfield that helps local technology employers solve business problems.
- **Cleveland State University** - $385,439, will place up to 102 student interns in northeast Ohio businesses while recruiting faculty mentors to connect classroom learning and workplace practices.
- **Cuyahoga Community College** - $186,677, will support local employers with outreach and technical assistance and support up to 105 student interns.
- **Kent State University** - $724,553, will support up to 200 student interns and improve the intern tracking system to discover new opportunities and develop a strong feedback loop between the university and area companies. Will also create an Intern Advisory Board to help improve internship experiences.
- **Lorain County Community College/Stark State College** - $444,813, will support the creation of up to 135 new internship/co-op opportunities while creating employer preference for community college talent and developing the Career Advantage Program and the Career Advantage Transcript Designation.
- **Marion Technical College** - $6,750, will expand the co-op coordinator position from half- to three-quarter time to grow the number of students in the Cooperative Education Experience Program in Business & IT.
- **Miami University** - $81,000, will allow the Engineering Technology and Computer IT programs at Miami's Middletown and Hamilton campuses to increase the number and degree areas of co-ops and internships that are paid and for credit.

- **The Ohio State University** - $1,569,637, will allow businesses to receive cost share of wages on a sliding size scale and students to receive credit and wages for internships, plus stipends to offset other costs such as transportation and housing.

- **Rhodes State College** - $261,662, will support the Honda-created Ohio Manufacturing Education Collaborative of regional community colleges to support talent needs of manufacturers and processors in the region to help close the skills gap while providing students with internships.

- **Sinclair Community College** - $203,140, will create new internships in manufacturing, IT and biohealth in the Dayton region by providing students with scholarships and businesses with access to Sinclair students.

- **Southern State Community College** - $236,450, will support a partnership between six educational institutions and 15 businesses to create up to 80 positions, align curriculum and create pathways from high school to adult career centers to associate and bachelor's degrees.

- **Terra Community College** - $69,145, will expand infrastructure to enhance future co-op placements with area businesses and increase student, business and faculty participation in co-ops.

- **University of Akron** - $932,571, will educate employers about the benefits of co-ops and internships using individual contacts, regional partners, workshops and conference calls, and will use one-time seed money to provide a match for employer contributions to support a new co-op or internship program.

- **University of Cincinnati** - $1,822,373, will create hundreds of internships and allow the university to continuously monitor the development and needs of the industry clusters in cooperation with the Chamber of Commerce, and incentivize students and employers with scholarships for placements.

- **University of Dayton** - $253,995, will add up to 20 internships and enhance the help given by the UD Engineering Co-op office to UD and Sinclair Community College students in obtaining co-op and internship positions.

- **University of Toledo** - $896,898, will create up to 150 internships and a self-sustaining and adaptable co-op and internship model that includes aggressive outreach to employers and addresses entrepreneurship and work-ready skills.

- **Wright State University** - $1,304,631, will create up to 100 internships and align with the Board of Regents' Aerospace & Aviation Workforce Strategy Report to implement curricular reform and institutional reform, influence high school students with co-ops, and provide more work-based learning.

- **Youngstown State University** - $573,300, will increase work-based learning in northeast Ohio, Appalachia and the Mahoning Valley in Advanced Manufacturing, and provide partial wage reimbursement to employers for new student internships.

Appendix 5

Metrics Definitions

Research Funding

- **Total research expenditures** – annual amount of research expenditures (includes direct and indirect costs)
- **Federal government expenditures** – annual amount of federally funded research expenditures
- **Industry expenditures** – annual amount of industry-funded research expenditures

Discovery

- **Invention disclosures** – annual number of disclosures (public distribution of information about an invention or discovery)
- **Unique patent disclosures** – annual number of unique patent disclosures filed by faculty, staff and students of a college/university

Follow-on Funding to companies receiving university/college assistance

- **Private sources** – annual amount of additional later stage private capital received by companies
- **Other sources** – annual amount of additional later-stage capital from public or non-government organizations received by companies

Licenses

- **Licenses/options executed** – number of licenses/options executed on an annual basis
- **License/royalty income received** – total annual amount of license/royalty income received by a university/college
- **Start-ups initiated or supported through institution resources** – number of start-up companies receiving financial and/or technical support on an annual basis

Impact

- **Number of supported companies located in Ohio** – companies receiving financial and/or technical support, assisted on an annual basis
- **Number of jobs created by start-up and assisted companies** – jobs created annually by companies receiving university/college support
- **Use of on-campus research equipment and infrastructure by industry** – percent utilization by industry on an annual basis

Appendix 6

Ohio Woodrow Wilson Fellows Placement Information & Choose Ohio First Demographic Data

2011

Fellow	University	Background/Major	Clinical Placement	Permanent Placement Location	Permanent School District/Township/ School Corporation	Placement Position
1	John Carroll University	Microbiology/Life Sciences	John Hay High School (CMSD)	Mogadore Jr/Sr High School	Mogadore Local School District	2 CH, H CH, A&P, Forensic, Environment
2	John Carroll University	Ph.D. Chemistry	John Hay High School (CMSD)			
3	John Carroll University	Biology	East Technical High School (CMSD)	Stivers School of the Arts	Dayton Public Schools	11-12 Chemistry and Physics
4	John Carroll University	Mathematics/ Statistics	John Hay High School (CMSD)	Progressive Academy at Lima Senior High		HS Math Teacher
5	John Carroll University	Biology	John F. Kennedy High School (CMSD)			
6	John Carroll University	Mathematics	Glenville High School (CMSD)	Summit Academy Secondary School		Algebra
7	John Carroll University	Systems and Controls Engineering	John Adams High School (CMSD)	Brookside High School		HS Math Teacher
8	John Carroll University	Mathematics	John Adams High School (CMSD)	Columbus Collegiate Academy		Middle School Math
9	John Carroll University	M.S. Mathematics	John F. Kennedy High School (CMSD)	I CAN (Northeast Ohio Collge Prep School		High School Math Teacher
10	John Carroll University	Biology	Glenville High School (CMSD)			
11	John Carroll University	Integrated Sciences	John Adams High School (CMSD)	North Union High School		High School Physical Science
12	John Carroll University	Mathematics	Collinwood High School (CMSD)			
13	John Carroll University	Biology/Chemistry	Washington Park (CMSD)	Dunbar High School	Dayton Public Schools	Biology and Chemistry
14	John Carroll University	Biochemistry	Ginn Academy High (CMSD)	Reynoldsburg High School, eSTEM Academy	Reynoldsburg City Schools	Physical Science and Physics
15	John Carroll University	M.S. Biology	John Hay High School (CMSD)			

Fellow	University	Background/Major	Clinical Placement	Permanent Placement Location	Permanent School District/Township/ School Corporation	Placement Position
16	John Carroll University	M.S. Mechanical Engineering/Mathematics	Garrett Morgan School of Science (CMSD)			
17	John Carroll University	Mathematics	John Adams High School (CMSD)	Summit Academy	Parma	Title I Math Teacher
18	University of Akron	Physics	Firestone High School (APS)			
19	University of Akron	Chemistry	Firestone High School (APS)	Stow-Munroe Falls High School	Stow-Munroe Falls City School District	10-12 Chemistry
20	University of Akron	Chemistry/Mathematics	Hartford Middle School (Canton City)	Lion of Judah Academy (K-8)	Cleveland	Middle School Math
21	University of Akron	Mathematics/Computer Science	Firestone High School (APS)	Buchtel Middle Schol	Akron Public Schools	7th & 8th Math Intervention
22	University of Akron	Marine Engineering/ Naval Architecture	Firestone High School (APS)			
23	University of Akron	Physics/Mathematics	Timken Senior High School (Canton City)			
24	University of Akron	Integrated Life Sciences/Health Care Ethics/Biology	Early College Academy (Canton City)	Plymouth-Shiloh	Plymouth-Shiloh School District	Biology
25	University of Akron	Biology	Timken Senior High School (Canton City)	Imagine Harvard Academy Community School (6-9)	Cleveland	
26	University of Akron	Physics/Mathematics	Firestone High School (APS)	Akron Public STEM High School	Akron Public Schools	Engineering
27	University of Akron	Biology	Hartford Middle School (Canton City)	Imagine Harvard Academy Community School (6-9)	Cleveland	
28	University of Akron	Biology	Hartford Middle School (Canton City)	Summit Academy	Canton City Schools	
29	University of Akron	Chemistry	Timken Senior High School (Canton City)	C.A.S.T.L.E. High School	Cleveland	
30	University of Akron	Chemistry	Timken Senior High School (Canton City)	Noble Academy Cleveland		Middle School Science (5th-8th)
31	University of Akron	Chemistry/Biology	Firestone High School (APS)	Cleveland Heights/University Heights	Cleveland Heights/ University Heights	
32	University of Akron	Business Administration/Chemistry	Firestone High School (APS)	Kenneth Clement Boys Leadership Academy	Cleveland Metropolitan School District	
33	University of Akron	Applied Mathematics	Firestone High School (APS)	Green High School		High School Math Teacher

Fellow	University	Background/Major	Clinical Placement	Permanent Placement Location	Permanent School District/Township/ School Corporation	Placement Position
34	University of Akron	Mathematics	Early College Academy (Canton City)	Lima South	Lima City Schools	Algebra I/II & Geometry
35	University of Akron	Mathematics	Timken Senior High School (Canton City)	Valley Forge High School	Parma City Schools	
36	University of Cincinnati	Mechanical Engineering/Applied Mathematics	Hughes High School (CPS)	Parma Senior High School	Parma City School District	8th Grade Math
37	University of Cincinnati	Chemistry	Taft High School (CPS)	Withrow University High School	Cincinnati Public School District	HS Bio/Integrated Science
38	University of Cincinnati	Biology	Withrow High School (CPS)	Lockland High School	Lockland Public School District	HS Science (Bio, Physical Science)
39	University of Cincinnati	Animal Science/Life Science	Taft High School (CPS)	Eastern High School	Eastern High School/Brown County	HS science (Chemistry, Health)
40	University of Cincinnati	Pharmaceutical Sciences	Hughes High School (CPS)	GEARUP	CPS/Hamilton Co	Tutor and academic suport to math/science teachers and students
41	University of Cincinnati	Mathematics	Woodward High School (CPS)	GEARUP	CPS/Hamilton Co	Tutor and academic suport to math/science teachers and students
42	University of Cincinnati	Mechanical Engineering	Hughes High School (CPS)	Winton Woods High School	Winton Woods City Schools	HS Math (Algebra II/Geometry)
43	University of Cincinnati	Physics	Withrow High School (CPS)	Colerain High School	Northwest Local Schools	HS Physics
44	University of Cincinnati	Biology	Withrow High School (CPS)	Bristol Jr-Sr. High	Bristol High School	7/8/10 grade science
45	University of Cincinnati	Mathematics	Taft High School (CPS)			
46	University of Cincinnati	Health Sciences	Taft High School (CPS)	Withrow University High School	Cincinnati Public Schools	10th grade Integrated Sciences/ OGT Intervention
47	University of Cincinnati	Mathematics	Withrow High School (CPS)	Finneytown Secondary Campus	Finneytown Local	HS Math Teacher/7th Grade Basketball Coach
48	University of Cincinnati	Mathematics	Woodward High School (CPS)	Hughes STEM High School	Cincinnati Public Schools	HS Mathematics
49	University of Cincinnati	Neuroscience	Hughes High School (CPS)	Edgewood High School	Edgewood City Schools	HS Chemistry
50	University of Cincinnati	Zoology	Hughes High School (CPS)	Centennial High School	Columbus City Schools	Physical Science
51	University of Cincinnati	Management Information Systems/ Computer Science	Hughes High School (CPS)	Meadowdale	Dayton Public Schools	Algebra, Geometry & OGT Prep

2012

Fellow	University	Background/Major	Clinical Placement
52	University of Dayton	Civil Engineering	Ponitz Career Technology Center & Wilbur Wright Middle School (DPS)
53	University of Dayton	Ecology/Evolutionary Biology	Dayton Early College Academy (DPS)
54	University of Dayton	Mechnical Engineering Technology	Brookville High School (Brookville Local)
55	University of Dayton	Mathematics	Miami Valley Career Technology Center
56	University of Dayton	M.S. Engineering/M.B.A.	Brookville High School (Brookville Local)
57	University of Dayton	Chemistry	Miami Valley Career Technology Center
58	University of Dayton	Mathematics/Ed.S. Educational Technology	Miami Valley Career Technology Center
59	University of Dayton	Biology	Miami Valley Career Technology Center
60	University of Dayton	Biology	Ponitz Career Technology Center (DPS)
61	University of Dayton	Microbiology	Meadowdale High School (DPS)
62	University of Dayton	Mathematics	Ponitz Career Technology Center & Wilbur Wright Middle School (DPS)
63	University of Cincinnati	Civil Engineering	Withrow High School (CPS)
64	University of Cincinnati	Chemical Engineering	Withrow High School (CPS)
65	University of Cincinnati	Plant Cellular/Molecular Biology	Taft High School (CPS)
66	University of Cincinnati	M.S. Biology	Withrow High School (CPS)
67	University of Cincinnati	Chemistry	Taft High School (CPS)
68	University of Cincinnati	Environmental Studies	Taft High School (CPS)
69	University of Cincinnati	Ph.D. Archaeology/Anthropology	Hughes High School (CPS)
70	University of Cincinnati	Physics	Hughes High School (CPS)
71	University of Cincinnati	Ph.D. Organic Chemistry	Hughes High School (CPS)
72	University of Cincinnati	M.S. Inorganic Chemistry	Hughes High School (CPS)
73	University of Cincinnati	Marine Engineering/Naval Architecture	Hughes High School (CPS)
74	University of Akron	Chemical Engineering	East High School (Akron Public)
75	University of Akron	Chemistry/Neuroscience	Akron Firestone High School (Akron Public)
76	University of Akron	Applied Physics/Computer Software	Crenshaw Middle School (Canton Public)
77	University of Akron	Entrepreneurial Chemist	Akron Firestone High School (Akron Public)
78	University of Akron	M.S. Geology	Canton McKinley High School (Canton Public)
79	University of Akron	Mechanical Engineering	Early College Academy (Canton Public)
80	University of Akron	Zoology	East High School (Akron Public)
81	University of Akron	Mathematics/Biology	Timken Senior High School (Canton Public)
82	University of Akron	Human Ecology/Design	Crenshaw Middle School (Canton Public)
83	University of Akron	Civil Engineering	Akron Firestone High School (Akron Public)
84	University of Akron	Electrical Engineering/M.B.A.	East High School (Akron Public)
85	University of Akron	Chemical Engineering	Akron Firestone High School (Akron Public)
86	University of Akron	M.S. Biology/Ph.D. coursework Neuroscience	Hartford Middle School (Canton Public)

Fellow	University	Background/Major	Clinical Placement
87	University of Akron	Biology	Early College Academy (Canton Public)
88	University of Akron	Geophysics	Timken Senior High School (Canton Public)
89	University of Akron	Biology	Lehman Middle School (Canton Public)
90	University of Akron	Biological Anthropology	East High School (Akron Public)
91	The Ohio State University	Chemistry	Southwestern Local Schools
92	The Ohio State University	Wildlife Biology	Southwestern Local Schools
93	The Ohio State University	Civil Engineering	Southwestern Local Schools
94	The Ohio State University	M.S.E. Materials Engineering	Southwestern Local Schools
95	The Ohio State University	Biology	Southwestern Local Schools
96	The Ohio State University	Chemistry	Southwestern Local Schools
97	The Ohio State University	Mathematics	Southwestern Local Schools
98	The Ohio State University	M.S. Actuarial Science	Southwestern Local Schools
99	The Ohio State University	Mathematics	Southwestern Local Schools
100	The Ohio State University	M.S. Earth/Environmental Science	Southwestern Local Schools
101	The Ohio State University	Mathematics	Southwestern Local Schools
102	The Ohio State University	Food Business Management	Southwestern Local Schools
103	The Ohio State University	Physics/M.Ed. Astronomy	Southwestern Local Schools
104	The Ohio State University	M.S. Environmental Economics	Southwestern Local Schools
105	The Ohio State University	M.S. Chemical Physics	Southwestern Local Schools
106	The Ohio State University	M.S. Engineering	Southwestern Local Schools
107	The University of Toledo	Chemistry	Scott High School
108	The University of Toledo	Biology	Start High School
109	The University of Toledo	Biochemistry	Waite High School
110	The University of Toledo	Political Science/Biology/M.P.A.	Rogers High School
111	The University of Toledo	Electronic Media/Broadcast Journalism/Geosciences (Award-winning meteorologist)	Springfield Middle School
112	The University of Toledo	Mathematics	Start High School
113	The University of Toledo	Mathematics	Start High School
114	The University of Toledo	Chemistry	Penta Career Center High School
115	The University of Toledo	Biology/Anthropology	Start High School
116	The University of Toledo	Biology	Waite High School
117	The University of Toledo	M.S. Biology/Ecology	Toledo Early College High School
118	The University of Toledo	Chemistry	Toledo Technology Academy
119	The University of Toledo	Biology/Chemistry	Clay High School
120	John Carroll University	Biology	Garrett Morgan School of Science
121	John Carroll University	Electrical Engineering/M.S. Management	Lincoln West - Community Wrap Around Academy
122	John Carroll University	Biology	Cleveland Heights High School - Renaissance Academy
123	John Carroll University	Biology	Cleveland Heights High School - Legacy New Tech Academy
124	John Carroll University	Molecular Biology	Cleveland Heights High School - Mozaic Academy
125	John Carroll University	M.S. Ecology	Garrett Morgan School of Science

Fellow	University	Background/Major	Clinical Placement
126	Ohio University	Civil Engineering	Athens Middle School
127	Ohio University	Botany/Plant Biology	West Elementary
128	Ohio University	Mathematics	Nelsonville-York HS
129	Ohio University	Anthrology	Vinton High School
130	Ohio University	Natural Resources Management	Tri-County Career Center
131	Ohio University	Zoology	Logan High School
132	Ohio University	Biology/Mathematics and Statistics	Alexander Middle School
133	Ohio University	Chemistry/Mathematics	Alexander High School
134	Ohio University	Wildlife Biology	Alexander Middle School
135	Ohio University	Applied Mathematics	Vinton High School
136	Ohio University	Mathematics/Accounting	Logan High School
137	Ohio University	Physics	Vinton High School

Choose Ohio First Demographic Data

Fall 2009 to Fall 2011 by Race/Ethnicity/Gender

Race/Ethnicity	2009-2010	2010-2011	2011-2012
American Indian/Native Alaskan	9	26	29
Asian	183	250	196
Black/African-American	306	601	678
Native Hawaiian/Pacific Islander	2	0	0
Hispanic	119	258	175
Multi-racial	24	174	79
White/Caucasian	1,527	2,028	2,267
Unknown race or ethnicity	150	202	80
Statewide Total	**2,320**	**3,539**	**3,504**
Gender	**2009-2010**	**2010-2011**	**2011-2012**
Female	1,090 (47%)	1,734 (49%)	1,716 (49%)
Male	1,230	1,805	1,788

Appendix 7

STEM Degrees Awarded at University System of Ohio Institutions

FY 2007 to FY 2012

Sector / Institution	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012
Community Colleges	**6,827**	**7,148**	**7,288**	**7,535**	**8,252**	**8,971**
Belmont Technical College	145	153	185	188	209	196
Central Ohio Technical College	268	285	329	388	373	374
Cincinnati State Technical & Community College	440	448	453	534	512	695
Clark State Community College	138	122	189	139	237	189
Columbus State Community College	604	683	663	683	772	879
Cuyahoga Community College	698	733	748	816	879	1,081
Eastern Gateway Community College	57	79	68	73	90	86
Edison State Community College	112	133	107	109	193	197
Hocking Technical College	482	430	331	320	388	322
James A. Rhodes State College	307	324	341	366	396	357
Lakeland Community College	249	262	253	305	283	314
Lorain County Community College	401	372	393	403	425	481
Marion Technical College	150	122	139	136	162	184
North Central State College	236	253	188	190	233	274
Northwest State Community College	102	127	112	112	186	174
Owens State Community College	546	594	650	609	590	618
Rio Grande Community College	122	100	192	149	146	150
Sinclair Community College	625	747	729	811	848	998
Southern State Community College	137	135	149	134	161	174
Stark State College of Technology	516	553	548	581	591	643
Terra State Community College	103	118	114	108	133	140
Washington State Community College	178	185	199	173	222	212
Zane State College	211	190	208	208	223	233

Sector / Institution	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012
University Main and Regional Campuses	**18,808**	**19,496**	**20,295**	**21,268**	**23,418**	**26,644**
Bowling Green State University	915	1,049	971	1,036	989	936
Central State University	28	18	20	24	28	26
Cleveland State University	861	812	875	880	917	1,147
Kent State University	1,726	1,675	1,944	2,043	2,178	2,540
Miami University	1,110	1,142	1,150	1,198	1,250	1,268
Northeast Ohio Medical University	112	101	120	110	184	192
Ohio State University	4,930	4,919	5,129	5,497	5,855	6,497
Ohio University	1,482	1,656	1,733	1,847	2,406	3,521
Shawnee State University	304	252	276	299	287	327
University of Akron	1,293	1,335	1,424	1,416	1,751	1,735
University of Cincinnati	2,548	2,979	2,901	3,121	3,466	3,996
University of Toledo	1,694	1,682	1,769	1,778	1,948	2,087
Wright State University	1,179	1,182	1,251	1,270	1,375	1,597
Youngstown State University	626	694	732	749	784	775
STATEWIDE TOTALS	**25,635**	**26,644**	**27,583**	**28,803**	**31,670**	**35,615**

Appendix 8

Number of Students Enrolled in Fall Term Who Participated in Work-Based Learning in any Term of the Academic Year

Fall 2009 to Fall 2011 by Gender

Sector/Institution	Fall 2009		Fall 2010		Fall 2011	
	Female	Male	Female	Male	Female	Male
Community Colleges	15,239	5,768	15,379	5,359	15,502	5,705
University Main and Regional Campuses	28,703	15,123	28,803	15,971	29,717	16,267
STATEWIDE TOTALS	**43,942**	**20,891**	**44,182**	**21,330**	**45,219**	**21,972**

Work-based learning includes enrollment in course sections identified as being one of the following types:

Clinical: A clinical laboratory applies only to health technology programs. A clinical is a laboratory section which meets at a health-related agency facility in lieu of on-campus laboratory facilities. Clinical laboratory sessions provide a realistic environment for student learning. During a clinical laboratory session, a regular faculty member directly supervises the class. The instructor assigned to teach clinical laboratory sessions will be a full- or part-time faculty member.

Practicum: A practicum is an on- or off-campus work experience which is integrated with academic instruction in which the student applies concurrently learned concepts to practical situations within an occupational field. To assure proper coordination of the experience, the practicum is coordinated by a faculty member who visits the student at least once every two weeks, provides the final grade, and teaches at least one course on the campus.

Field Experience: Field experience is planned, paid work activity which relates to an individual student's occupational objectives, such as geology or archaeology, and which is taken in lieu of elective or required courses in his or her program with the permission of a faculty advisor. The experience is coordinated by a faculty member of the college who assists the student in planning the experience, visits the site of the experience for a conference with the student and his or her supervisor at least once during the quarter or semester, and assigns the course grade to the student after the appropriate consultation with the employer or supervisor.

Number of Students Enrolled in Fall Term Who Participated in Work-Based Learning in any Term of the Academic Year

Fall 2009 to Fall 2011 by Race/Ethnicity

Sector/Institution	Fall 2009	Fall 2010	Fall 2011
Community Colleges			
American Indian or Alaskan Native	93	96	104
Asian or Pacific Islander	257	224	255
Black, non-Hispanic	1,970	2,176	2,347
Hispanic	401	384	402
Native Hawaiian or Other Pacific Islander	3	6	11
White, non-Hispanic	17,220	16,649	16,658
Two or More Races	6	42	82
Nonresident Alien	108	116	121
Unknown	949	1,045	1,227
Community College Total	**21,007**	**20,738**	**21,207**
University Main and Regional Campuses			
American Indian or Alaskan Native	138	136	117
Asian or Pacific Islander	863	925	936
Black, non-Hispanic	2,557	2,798	2,935
Hispanic	731	763	912
Native Hawaiian or Other Pacific Islander	4	6	16
White, non-Hispanic	36,508	36,969	37,499
Two or More Races	19	79	227
Nonresident Alien	1,032	1,110	1,280
Unknown	1,974	1,988	2,062
University Main and Regional Campus Total	**43,826**	**44,774**	**45,984**
Statewide Total	**64,833**	**65,512**	**67,191**

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