Oregon Council for Knowledge and Economic Development

Recommendations to the
Board of Higher Education

October 18, 2002

Oregon State Board of Higher Education
Oregon Council for Knowledge and Economic Development

Executive Summary

The Objective

“Today, a new economy is clearly emerging: it is a knowledge and idea-based economy where the keys to wealth and job creation are the extent to which ideas, innovation and technology are embedded in all sectors.” — The State of the New Economy Report

A knowledge-based economy is everyone’s agenda. It affects all industries in all parts of the state. The ability to innovate and stay competitive is just as important to agriculture and retail as to high technology. We know that industries developing and applying technology to increase their competitiveness will lead future job growth and wealth creation. Investments in research and development, ready access to capital, world-class technical talent, and mature entrepreneurial networks are now prerequisites for economic development.

The Oregon Council for Knowledge and Economic Development (OCKED) is committed to helping the state establish a competitive climate and build the asset base required for the knowledge economy. Our focus is on promoting leadership and collaboration for economic development and investing in the three issues that drive quality job growth and wealth creation: enhancing the skills of Oregon’s workforce throughout the state, commercializing research into profitable business ventures, and accessing capital and business expertise to ensure our businesses thrive.

The Council recognizes that economic development is a combination of short- and long-term strategies. Investments in systems, such as education, today, can have a profound effect for generations to come. Taking direct actions, such as aligning our state policies with national best practices, can have a direct benefit to our economy now as well as continue to attract investment over the decades.

Oregon’s economic health and national and global competitiveness is poor. OCKED members agree that there is an extreme sense of urgency to address the issues contained in this report. Now is the time to invest in a sustained effort to enhance Oregon’s economy.

The OCKED Mission

OCKED was established by the 2001 Legislature under Senate Bill 273. The mission of the Council is to promote knowledge-based economic development in the state of Oregon. To this end, the Council will “focus specifically on ways to increase high-quality research and development; develop successful private-public models for intellectual property and profit sharing; increase technology and knowledge transfer; provide sufficient capital for investment in and commercialization of technology developed by higher education; and promote the development of a technologically skilled workforce.”
OCKED is a collaborative effort among Oregon’s public and private higher education institutions, economic development leadership, and the private sector. Legislation calls for the Council to act as an “early warning system and play an advisory role, providing guidance and leadership to state officials and state agencies on issues, plans, and the necessary infrastructure for improvement in the areas of knowledge-based economic development and the creation of knowledge-based initiatives.” The council provides a unique forum for discussing issues, encouraging the interplay of university knowledge and emerging growth industries, and coordinating the application of the state's assets in higher education, business, industry, and capital resources.

Why It’s Important

The influence of technological innovation on our economy and our society multiplies by the year. Information and technology have driven economic growth in all industries, reduced inflation, and fueled productivity gains. Technology is expected to have an even more profound impact on the economy in the 21st century.

The knowledge economy has redefined the rules of economic development with continual and ever-more rapid change in markets, technology, and firms. During the twentieth century, economic advantage moved from the Henry Ford era of scale and mass production to an era of “dynamic efficiency” where innovation and agility is most important. Finding new ways to add value, streamline operations, and develop new goods and services is at the core of this innovation-oriented economy.

The clearest lesson about the knowledge economy is that those who have more knowledge and those who are good at creating new knowledge and ideas will be in the best position to prosper. Places that invest more in research and development tend to have more sustained economic activity. Over the past several decades, the return on investment in human capital has never been higher. This is highlighted by the fact that:

- The largest part of the growth in America’s real gross domestic product is the result of new insights [discovery and commercialization of ideas] (Greenspan, 2000);
- Income levels in regions with high overall educational attainment grew at a rate almost double the growth of areas with lower educational attainment. (Gottlieb and Fogerty, 1999).

As economist Joe Cortright notes, “Places seeking economic development need to assure that they are good locations for the development of new ideas and the formation of new firms if they are to be able to succeed in an increasingly global, knowledge-based economy... Efforts to maintain a region’s current [traditional] arrangement of firms, markets and technologies may have the effect of retarding the development of more efficient and sustainable activities.”

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1 Cortright, 21st Century Economic Strategy
How Oregon Measures Up

Oregon currently ranks in the middle of all states on key measures of its ability to compete in a global and knowledge-based economy. OCKED recommends that Oregon adopt the explicit goal of being a top 10 ranked state in new economy measures. States with high rankings in knowledge-based measures also tend to have higher incomes, net wealth, and stable business growth. Also available is a detailed comparison of Oregon to other states, showing that investment in and focus on the critical drivers of a knowledge economy has as much or more impact on economic competitiveness than a state’s population and geographic size.

<table>
<thead>
<tr>
<th>Research &amp; Development Measures</th>
<th>Oregon rank</th>
<th>Value of OR Measure</th>
<th>Value of 10th ranked state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total R&amp;D Dollars per $1,000 of GSP</td>
<td>26</td>
<td>$ 18.00</td>
<td>$ 35.43</td>
</tr>
<tr>
<td>Federal R&amp;D Obligations per $1,000 of GSP</td>
<td>32</td>
<td>$ 3.72</td>
<td>$ 8.03</td>
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<tr>
<td>SBIR Awards per 10,000 businesses (1998-2000 avg)</td>
<td>17</td>
<td>5.8</td>
<td>8.2</td>
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<tr>
<td>STTR Awards per 10,000 businesses (1998-2000 avg)</td>
<td>19</td>
<td>0.4</td>
<td>0.8</td>
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<thead>
<tr>
<th>Capital Measures</th>
<th>Oregon rank</th>
<th>Value of OR Measure</th>
<th>Value of 10th ranked state</th>
</tr>
</thead>
<tbody>
<tr>
<td>VC Funds per $1,000 of 1999 GSP</td>
<td>16</td>
<td>$ 5.41</td>
<td>$ 8.16</td>
</tr>
<tr>
<td>IPO funds per $1,000 of GSP</td>
<td>22</td>
<td>$ 2.45</td>
<td>$ 5.45</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Business Formation Measures</th>
<th>Oregon rank</th>
<th>Value of OR Measure</th>
<th>Value of 10th ranked state</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Patents per 10,000 businesses</td>
<td>13</td>
<td>147</td>
<td>169</td>
</tr>
<tr>
<td>“Gazelle” jobs</td>
<td>19</td>
<td>13.7%</td>
<td>14.4%</td>
</tr>
<tr>
<td>% of technology company births (% tech start-ups compared to all start-ups)</td>
<td>29</td>
<td>6.5%</td>
<td>9.77%</td>
</tr>
<tr>
<td>Net technology company creation: net formation per 10,000 establishments (comparison of births over deaths--ability to sustain firms)</td>
<td>41</td>
<td>11.7</td>
<td>37.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Workforce Measures</th>
<th>Oregon Rank</th>
<th>Value of OR Measure</th>
<th>Value of 10th ranked state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment in IT occupations in non-IT industries as a share of total jobs</td>
<td>25</td>
<td>1.5%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Civilian scientists and Engineers as a percentage of the workforce</td>
<td>14</td>
<td>.52%</td>
<td>.62%</td>
</tr>
<tr>
<td>Managers, professionals and technicians as a share of total workforce</td>
<td>1</td>
<td>31.4%</td>
<td>27.8%</td>
</tr>
<tr>
<td>% of civilian workforce with a recent bachelor’s degree in science or engr.</td>
<td>14</td>
<td>1.65%</td>
<td>1.92%</td>
</tr>
<tr>
<td>% of civilian workforce with a recent master’s degree in science or engr.</td>
<td>18</td>
<td>31%</td>
<td>0.38%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Higher Education Measures</th>
<th>Oregon Rank</th>
<th>Value of OR Measure</th>
<th>Value of 10th ranked state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor’s degrees granted as a percent of the 18-24 year old population (1997-98)</td>
<td>31</td>
<td>4.5% (13,652 degrees)</td>
<td>5.86%</td>
</tr>
<tr>
<td>Percent of bachelor’s degrees granted in science and engineering (1997-98)</td>
<td>31</td>
<td>17.40% (2,369 degrees)</td>
<td>19.30%</td>
</tr>
<tr>
<td>Science and engineering graduate students as percent of the 18-24 year old population (1999)</td>
<td>31</td>
<td>1.20% (3,733 students)</td>
<td>1.78%</td>
</tr>
</tbody>
</table>

Sources: U.S. Department of Commerce, State Science and Technology Indicators, 2001; Milkin Institute, 2002; Progressive Policy Institute, 2002.
The Unfinished Agenda

Oregon’s economy requires an integrated system that equally and fully invests in the key drivers of business and job growth: research and innovation, knowledge workers, business climate and policies, and leadership and collaboration. OCKED established separate committees to work on each of these issues, engaging other experts from around the state to assist the council in developing specific action-oriented recommendations.

The OCKED Model

Research and Innovation (OCKED Research & Tech Transfer Committee): Our capacity to translate ideas into businesses is critical for economic development. Basic research (in universities and industry) produces new insights that, in turn, are refined into practical applications through applied research. The idea is then commercialized and diffused into widespread use, creating new businesses and jobs. This economic cycle is dependent on the research and technology transfer strength of our universities, the ability for universities and industry to collaborate on new ideas, the depth of talent in our entrepreneurial community, and institutions that support commercialized research.

Creating knowledge and ideas and transforming them into new companies and jobs requires:

- Increasing the capacity to conduct research, including more research dollars and in-depth expertise to conduct research.
- Focusing our research on areas with high returns on investment, such as well-paying jobs, viable businesses, and new wealth that build on Oregon’s strengths.
- Expediting and streamlining the research and development process to more quickly and effectively move ideas into commercial products and services.

Knowledge Workers (OCKED Workforce Development Committee): The demand for qualified technology and knowledge-based workers continues to grow despite the recent economic downturn and high unemployment rate. In fact, eight of the top ten family-wage, high demand jobs are technology-related occupations with more than 90 percent of these jobs found in industries outside high technology and throughout the state (financial services, trade and distribution, agriculture, etc.). Despite this widespread need, Oregon has no statewide workforce strategy to address the needs of these occupations and their industries of employment.
While Oregon has a relatively high percent of professional workers and ranks 14th in the percent of scientists and engineers in the workforce, the state ranks 30th in the number of science and engineering degrees awarded. Companies in the state still continue to import a large percent of their highest paid workers, limiting opportunities for Oregonians.

Future job growth depends on having a critical mass of highly skilled workers supported by:

- A flexible and responsive training system for our existing workforce to help employees obtain up-to-date technical, entrepreneurial, and problem-solving skills;
- A dedicated effort to adequately fund and support higher education and the programs that will significantly increase the number of people with degrees in technology, sciences, and business management; and
- A system that ensures Oregon will prepare the next generation for well-paying jobs by ensuring our K-12 system teaches math, science, problem-solving, and technology skills early and consistently; exposes students to hands-on experiences and to the variety of new and traditional technology and science careers; and provides teachers with adequate and ongoing training in these same areas.

Business Climate and Policies (OCKED Capital & Business Formation Committee): Oregon continues to be at a significant disadvantage for starting or relocating a science or technology-oriented company. Investors and industry leaders perceive Oregon as a place that does not welcome business development. The lack of focused economic development programs and funding is compounded by out-of-date policies that are not in line with national best practices. Our high personal income and capital gains tax rates inhibit entrepreneurs and venture capital investors from staying in or moving to Oregon. Because of fewer scientific and technology senior management and investors, we also have fewer spin-off companies from existing firms and fewer new start-ups which begins to erode our ability to develop a critical mass of related industries that is essential to our competitiveness.

Two issues are key to starting and expanding businesses in Oregon: access to capital and experienced management. These issues become even more critical in slower economic times. Oregon has a unique opportunity to revive business development by doing the following:

- Increasing the presence of venture capital funds and investors in the state through the leveraging of existing public and private investments;
- Developing a “New Business in Oregon” package that provides incentives to people who make significant business investments or start a viable technology or bioscience company in the state; and
- Aligning capital gains and other investment policies to be consistent with national best practices.

Collaboration & Leadership (The OCKED Council, Advisors, and Partners): The ability to implement and realize the benefits of our research, workforce, and business formation recommendations depends on the state’s willingness to make economic development a priority in Oregon. Oregon needs a shared economic vision among public and private sector leaders and collaboration among higher education, government and industry to work towards a set of common economic goals. OCKED views its role as an active player in convening and leading efforts to enhance Oregon’s economy.
Research & Technology Transfer Priority Recommendations

GOALS AND OBJECTIVES

Dramatically increase high quality research and development efforts that will create new products, services, and businesses leading to high paying jobs and sustained economic growth for Oregon:

- Increase the capacity for high quality research and development;
- Facilitate the translation of research into commercial applications; and
- Increase the value and economic benefit of research and technology transfer.

DESIRED OUTCOMES

To be in a top ten ranking, Oregon must:

- Increase federal, state, and industry research and development dollars by 100%;
- Double the number of Small Business Innovation Research (SBIR) and Small Business Technology Transfer Research (STTR) awards;
- Increase patents per $100M of sponsored research by 80%; and
- Increase license income per $100M of sponsored research by 200%.

RECOMMENDATIONS

Priority A: Direct the missions and functions of the state boards of education, Oregon Health & Science University, and Oregon Economic and Community Development Department to promote the creation, dissemination, and commercialization of ideas.

Higher Education

- Continue to ensure the protection of the Bayh-Dole Act;
- Revise missions to include specific language about commercialization of research;
- Streamline state-level review of research and technology transfer agreements and bring into alignment with best practices nationwide; and
- Create year-long entrepreneurial leaves-of-absence and “industry experts in residence” programs.

OECDD:

- Identify barriers to Oregon's knowledge-based industries and technology transfer capacity, review national best practices, and develop a set of tech transfer and knowledge-economy strategies for OECDD;
- Create a database of research and development assets; and
- Establish a commercialization liaison within the agency.

Priority B: Establish nationally recognized “Signature Research Centers” (focal points) that concentrate people, funding, facilities, and support on building a competitive advantage in specific research areas that have strong commercialization potential. Signature Research areas should be targeted on areas of expertise directly linked to Oregon’s knowledge-based and emerging industries and that have the greatest possibility of creating new businesses, producing competitive wage jobs, and increasing public and private investment. Since Oregon has limited capacity compared to more populated states, centers will be collaborative efforts among various public and private research institutions.

Priority C: Provide $5 million in the OECDD budget for seed funding of the Higher Education Technology Transfer (HETT) fund and similar activities, and continue to pursue alternative funding sources.
GOALS AND OBJECTIVES

Enhance the ability to start and grow companies and to promote entrepreneurs willing to commercialize ideas in Oregon:

- Increase the amount of seed and institutional venture capital available for Oregon’s technology sector businesses;
- Increase the amount of available pre-seed, seed, and institutional venture funding for bioscience sector businesses; and
- Improve management depth, attraction, and retention within the state.

DESIRED OUTCOMES

For Oregon to achieve a top ten national ranking (10th position) the state must:

- Increase the amount of venture capital funds per $1,000 of GSP by 50%;
- Increase the total research and development dollars per $1,000 of GSP by 100%;
- Increase the rate of US patents per 10,000 businesses by 25%;
- Increase business start-ups per $100M of sponsored research by 80%; and
- Double the net formation (comparison of births over deaths) of technology companies.

RECOMMENDATIONS

Priority A: Significantly increase investment and the presence of institutional venture capital firms in Oregon.

- Work with philanthropic foundations and state retirement funds already investing in private equity funds to encourage their venture capital partners to establish an Oregon office staffed by a partner-level investor who will review Oregon investment deals on a regular basis.
- Develop a model for a revenue-neutral tax shift that would reduce or eliminate capital gains while modifying the income tax rates. This shift would reduce the current vulnerability of state revenue and significantly increase Oregon’s opportunities for business and economic investments within the state.
- Work with OECDD to treat venture capital as an industry cluster and to develop a strategy to expand and recruit a larger venture capital industry sector in Oregon.

Priority B: Enhance the depth of management and entrepreneurial capacity.

- Develop a “New Business in Oregon” incentive package that would offer relocation and investment incentives to attract highly qualified Venture Fund Managers, Signature Bioscience Researchers, and uniquely qualified bioscience and technology executives. The objectives of this package are to increase the number of active and viable businesses in Oregon, and to provide new investments with a high multiplier effect of creating jobs and new wealth, and increasing our competitiveness and ability to attract related firms.
- Establish training and networking programs to develop qualified CEOs and help train companies in various aspects of business management, technology assessment and project planning, company formation and capitalization, regulatory requirements, and other skills.
Knowledge-Based Workforce Development Priority Recommendations

The workforce recommendations are divided into three categories: How to address workforce issues in the next 2-3 years (incumbent worker strategies), how to fill knowledge-based jobs over the next 3-10 years (higher education efforts), and how to sustain a qualified workforce in future generations (K-12 strategies).

GOALS AND OBJECTIVES:

Quality: Raise Oregon’s commitment to excellence in the education and training of knowledge and technology-based workers.

Capacity: Expand Oregon’s capacity to meet the growing demand for knowledge- and technology-based workers.

Capability: Provide quality education and training for knowledge- and technology-based occupations in all geographic regions of the state.

DESIRED OUTCOMES

Achieving a world-class competitive workforce over the next five years will require the state to:

- Double the funding for information technology training grants and double the number of incumbent workers receiving training in technology and entrepreneurial skills;
- Significantly increase the number of students graduating from Oregon universities with math, science, computer science, or engineering degrees;
- Double the number of Oregon students entering four-year math, science, or engineering programs;
- Increase by 50 percent of the workforce with a PhD in Science or Engineering; and
- Increase the number of K-12 teachers adequately trained in the use and application of technology in the classroom by at least 250 teachers per year.

RECOMMENDATIONS

Priority A: Immediately enhance the skill level of incumbent workers by developing a statewide strategy for high-demand, technology- and knowledge-based occupations that are central to the competitiveness of multiple industries across the state. Develop a statewide action-oriented workforce strategy for information technology occupations that clearly articulates statewide growth potential, industry needs, training and education capacity, and implementation strategies to fill these critical jobs. The strategy should include base skills, technological skills, and entrepreneurial and business management skills, and should fully integrate industry and education training efforts throughout all parts of the state.

Priority B: Actively support existing higher education efforts that significantly increase the capacity of our engineering, technology, and science programs as well as the number of state-granted engineering, technology, and bioscience degrees through:

- Immediately and dramatically increasing state granted engineering degrees;
- Accelerating the development of a top-tier Bioscience school;
- Creating of a top-tier engineering school;
- Increasing engineering faculty and expanding laboratories;
- Enhancing pre-college programs; and
- Increasing the quality and diversity of engineering and computer science students.
Priority C: Increase the number and availability of science and technology degrees through enhanced collaboration among institutions [full articulation] and access to distance and e-learning.

- Establish a Joint Boards of Education policy to ensure that full transferability of accredited courses among higher education institutions in Oregon;
- Minimize developing redundant programs and increase the resources available for delivery of education and training through e-learning and regional collaboration of curriculum development; and
- Pilot two e-learning programs (one two-year degree and one four-year degree) for high demand technology occupations that take advantage of online and other e-learning strategies to serve students and workers throughout the state. Partner with the private sector to use a broader array of “wired” facilities.

Priority D: Increase K-12 capacity to prepare students for future career opportunities by strengthening student interest in science and technology careers through direct exposure and hands-on experiences and by increasing technology, math, and science training for teachers throughout the state.

- Work with OMSI, Saturday Academy, workforce boards and other youth programs to sponsor at least 10-12 teams throughout Oregon to participate in the competition for the International Science and Engineering Fair (ISEF). Establish ongoing industry and higher education involvement and a sustained funding source for student participation in science and technology fairs.
- Enhance the capacity of teachers to use technology in classrooms and to teach to current math, science, and technology standards. Establish a scholarship fund for 250 teachers per year to complete technology, math, and science training with at least 60% of these teachers from economically distressed communities. Support “teachers in industry” internship programs for at least 100 teachers each year.
Oregon Council for Knowledge and Economic Development

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