

OREGON'S 10-YEAR INNOVATION PLAN

Performed For:
Oregon Business
Development Department
(Business Oregon)

Performed By:
TEconomy Partners, LLC

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FOREWORD

On behalf of Oregon's Futures Commission, it is a great pleasure to introduce our state's 10-Year Innovation Plan. Oregon has made significant strides in its innovation economy since the first plan was created in 2006. The world and our state, however, have changed significantly since then, and the time is ripe for a new Innovation Plan that addresses the challenges of the future while building on the successes of the past. While 2020 was a difficult year, with unprecedented social, economic, environmental, and public health challenges, we strongly believe that implementation of the 10-Year Plan will lead to a brighter future for the State.

Oregon's unique assets and vibrant innovation economy help define our state's identity. Our unmatched natural resources help attract and retain top talent and spur related economic activity. We benefit from our proximity to innovation hubs on the West Coast and our access to the Pacific Rim's fast-growing export markets. In fields such as semiconductor manufacturing and sustainable technologies, our anchor firms and vibrant industry clusters help foster an innovative and entrepreneurial culture. However, while these assets have guided economic growth for decades, access to opportunities in innovation-oriented fields has been unequal. In the next decade, we must focus Oregon's economy on engaging all of our citizens to cultivate more inventors, entrepreneurs, and leaders of innovation-driven enterprises. We believe that economic justice is a fundamental precursor to achieving an equitable outcome for all segments of our population.

The Futures Commission convened in the summer of 2020 to identify opportunities, activities, and resources to help guide inclusive, innovation-based economic prosperity for Oregon over the next 10 years. The Commission, comprised of 31 members from across the state, represents leaders from industry, academia, philanthropy, and the public sector, along with successful entrepreneurs. Over a period of six months, the Commission met to produce a plan for the creation and support of an innovation-based economy, recognizing that the continued vitality of Oregon's economy and the state's high quality of life rests on its ability to encourage innovation. This focus recognizes that innovation not only disproportionately drives the economy and creates quality jobs, but also can yield products that address social and economic issues.

We owe immense thanks and gratitude to all the individuals and organizations throughout the state who took the time to participate in this effort. Through one-on-one interviews, facilitated focus groups, multiple surveys, and other forums for discussion, the planning process successfully incorporated a range of diverse perspectives that augmented our own beliefs. Without the benefit of input from these numerous stakeholders and partners, the attached plan would not be as robust or comprehensive.

As Futures Commission members, we believe that our best days are ahead of us. In order to support Oregon's recovery from recent crises and to build a resilient economy, we must strengthen and grow our capacity to foster the formation of innovation-based businesses and support them as they scale-up and generate new, high-wage jobs. By actively implementing the strategies and actions outlined in this plan, we can achieve a brighter tomorrow together.



Kanth Gopalpur
Co-Chair, Futures Commission



Jenn Lynch
Co-Chair, Futures Commission

FUTURES COMMISSION ORGANIZATIONS AND TITLES

Name	Organization	Title
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Marcelino Alvarez	Fresh Consulting	Chief Product Officer
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Ann Bunnenberg	White Horse Consulting	Chief Executive Officer
Robert Cowen	Hatfield Marine Science Center, Oregon State University	Director
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Carol Dahl	The Lemelson Foundation	Executive Director
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Paula Hayes	Hue Noir	Founder & CEO
Don Hendrickson	Oregon Manufacturing Innovation Center	Chair, OMIC Board of Governors
David Howitt	Meriwether Group	Founder & CEO
Danny Jacobs	Oregon Health & Science University	President
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Pia Wilson-Body	Intel Foundation	President
Duncan Wyse	Oregon Business Council	President

Oregon's 10-Year Innovation Plan was commissioned by the Oregon Business Development Department (Business Oregon). Business Oregon, the state's economic development agency, invests in Oregon businesses, communities, and people to promote a globally competitive, diverse, and inclusive economy. Business Oregon's project team included:

- Kate Sinner, Innovation & Entrepreneurship Manager
- Jordana Barclay, Innovation Strategist
- Mark Brady, Innovation Strategist
- Ricardo Lopez, Capital Strategist
- Brian Plinski, Entrepreneurship Strategist

Business Oregon engaged TEconomy Partners, LLC (TEconomy) to facilitate and coordinate the Innovation Plan process. TEconomy is a global leader in research, analysis, and strategy for innovation-based economic development helping nations, states, regions, universities, institutions, and industries blueprint their future and translate knowledge into prosperity. TEconomy staff that were engaged in this effort included:

- Deborah Cummings, Principal & Senior Director
- Jonathan Dworin, Project Manager

TABLE OF CONTENTS

- Executive Summary i**

- Oregon’s Innovation Plan – An Economic Imperative..... 1**
 - Why Creating an Innovation Plan is Critical to Oregon’s Economic Future 1
 - Critical Components of a Robust Innovation Ecosystem..... 3
 - Why Focus on Traded Sectors?..... 7
 - Why Focus on Entrepreneurship? 8
 - Innovation Plan Methodological Approach 10

- Key Forces Impacting Oregon’s Innovation Ecosystem 13**
 - Key Challenges Facing Oregon’s Current Innovation Ecosystem..... 14
 - Critical Dependencies to Sustain an Innovation Ecosystem 15
 - Global Headwinds Driving the Need for Oregon’s Innovation Plan 23
 - Summary 27

- Oregon’s 10-Year Innovation Plan..... 29**
 - The Innovation Plan’s Strategic Framework 29
 - Strategy 1: Foster Ideation 33
 - Strategy 2: Strengthen the Innovation Ecosystem..... 42
 - Strategy 3: Catalyze Access to Risk Capital..... 47
 - Strategy 4: Brand Oregon as The Place for Innovation – Tell Our Story..... 52

- Implementing the Innovation Plan 55**
 - Organizing for Success 55
 - Timing and Prioritization of Actions..... 56
 - Anticipated Impacts Generated by Oregon’s 10-Year Innovation Plan 59
 - Potential Sources of Funding..... 61
 - Summary 62

- Conclusion 63**

- Appendix A: Oregon’s History of Innovation and Economic Development..... 65**

- Appendix B: List of Oregon Stakeholders Participating in Innovation Plan 71**

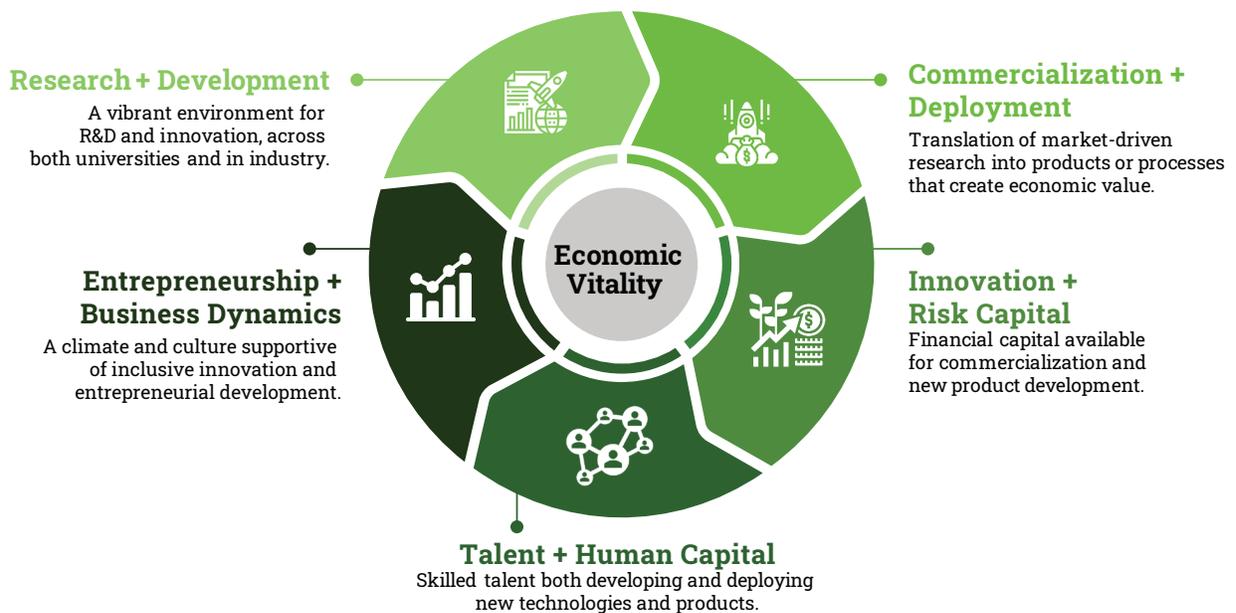
EXECUTIVE SUMMARY

Oregon's Innovation Plan is built on the central premise that the continued vitality of Oregon's economy and the state's high quality of life rests on its ability to encourage innovation.

At a time when Oregon is faced with tremendous uncertainty driven in large part by a global pandemic, but also further complicated by political, natural, and socioeconomic challenges, there is an even greater need to focus on innovation-based economic growth. By coming together around a common issue – innovation – Oregon has an opportunity to improve the livelihoods of its citizens across the state.

Developing a robust, inclusive innovation ecosystem is at the core of Oregon's ability to achieve broad-based economic vitality. Innovation ecosystems consist of five interconnected elements, each of which plays a vital role in developing new value-added products and services that create strong economic impacts (Figure ES-1).

FIGURE ES-1: INTERRELATED COMPONENTS OF A ROBUST INNOVATION ECOSYSTEM



Source: TEconomy Partners, LLC.

Supporting the elements of a robust, inclusive innovation ecosystem will drive economic development in Oregon in the coming decades.

While it is noted throughout the Innovation Plan that a robust innovation ecosystem will require dedicated efforts, ultimately, driving catalytic change in Oregon's innovation economy will also require efforts to effectively address three critical dependencies to economic vitality (see Figure ES-2):

- Pervasive, affordable, and accessible high-quality digital infrastructure (broadband).
- A thriving talent base with inclusive and accessible pathways to cultivate human capital.
- A robust industry- and academic- research and development (R&D) enterprise that tackles our toughest problems.

FIGURE ES-2: CRITICAL DEPENDENCIES FOR INNOVATION PLAN SUCCESS



Source: TEconomy Partners, LLC.

The Futures Commission, a public-private thought leadership group comprised of 31 members representing industry, academia, philanthropy, and government, engaged a wide range of innovation and entrepreneurship expertise over the course of its work with more than 125 stakeholders contributing to this strategic effort. Figure ES-3 illustrates the five-part process that informed the development of Oregon's Innovation Plan.



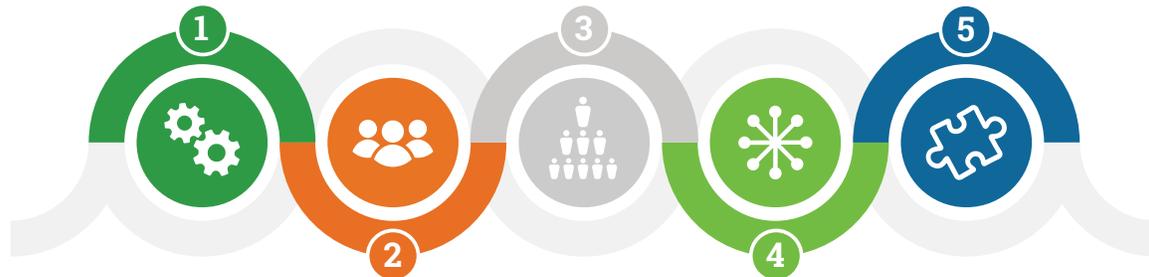
FIGURE ES-3: OREGON'S INNOVATION PLAN METHODOLOGY

FUTURES COMMISSION

Six total meetings and ongoing participation from thought leaders throughout Oregon, including private industry, philanthropy, academia, and other sectors.

EXTERNAL OUTREACH

Opportunities for individuals from across the state to participate in the planning process through surveys and other processes.



SITUATIONAL ANALYSIS

An analysis of Oregon's innovation ecosystem based on a thorough review of previous and ongoing qualitative and quantitative research.

SIX FOCUS GROUPS

- Availability of Risk Capital
- Availability of Value-Added Entrepreneurial Services
- Connectivity of Industry Clusters
- Regional + Geographic Models
- Diversity, Equity, Inclusion Models
- Emerging Market Opportunities

STRATEGY DEVELOPMENT

Synthesizing input to develop a 10-year innovation plan with actionable short-and long-term strategies.

Source: TEconomy Partners, LLC.

It is important to note that Oregon currently has multiple efforts in place to support innovation across the state. Through its historic investments, Oregon's state leadership has demonstrated an understanding that a vibrant and high-functioning innovation ecosystem is necessary for the state's economy to reach its full potential.

Even with these investments, however, Oregon faces significant challenges across a number of critical factors:

- The lack of a statewide entrepreneurial culture stymies the innovation ecosystem and represents a limiting factor to Oregon's ability to scale companies.
- The agglomeration of national risk-capital markets is threatening Oregon's ability to finance its deal flow.
- While levels of R&D are quite high, and commercialization is growing, more can be done to ensure the pipeline of deal flow is robust and "sticky" to the Oregon economy.
- The lack of "buzz" or image regarding Oregon as a desirable location for innovative companies and investment is hindering the development of the ecosystem.

These challenges, however, are not insurmountable and, with a renewed and re-oriented focus toward addressing these barriers, the state's innovation ecosystem can thrive. In the pages that follow, Oregon's Innovation Plan lays out a series of recommended bold strategies and concrete actions that if undertaken will help foster greater levels of economic prosperity for all Oregonians in the years to come.

OREGON'S 10-YEAR INNOVATION PLAN

If Oregon's economy is going to prosper in the coming decades, it must ensure its competitive position through four means:

- Oregon must have traded sector industries that **constantly innovate**, not only the products that they make but also the technological processes that they use to make them.
- Oregon must foster a robust **entrepreneurial ecosystem** that ensures support services are available that address the continuum of needs from early-stage startups to scalable enterprises.
- Oregon must have **financial capital markets** receptive and prone to investing in innovative firms and entrepreneurs that are developing and applying cutting-edge technologies to products and processes.
- Oregon must **promote** itself as a place to start and grow an innovative company.

Oregon's 10-year innovation vision is captured in the following statement, which is both bold as well as realistic.

VISION

In 10 years, Oregon is globally known as a model for a diverse, inclusive, and resilient economy: a place where innovative people solve the greatest challenges of our times to create novel, sustainable products, processes, and companies that drive economic growth.

To achieve this Vision, Oregon, serving as a steward for all its citizens, will support investments and policies through public-private-philanthropic partnerships that:

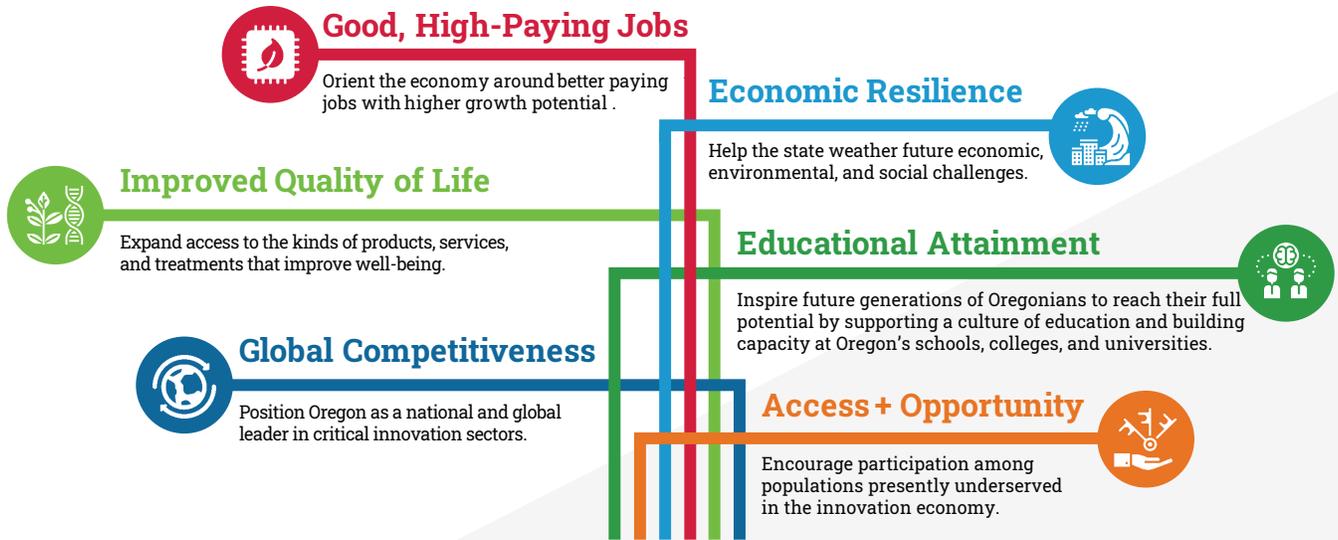
- Create and promote a diverse and inclusive innovation ecosystem that cultivates inventors, entrepreneurs, and leaders of innovation-driven enterprises.
- Intentionally ensure that historically underserved groups are fully integrated into the innovation ecosystem and have an equal opportunity to lead and prosper.
- Strengthen Oregon's unique industrial and natural resources.
- Create an unparalleled quality of life by supporting citizens and businesses striving for economic, societal, and environmental resilience.



By achieving this 10-year innovation vision, Oregon will help ensure the state's future economic vitality.

Examples of anticipated economic and societal impacts that will be realized through the successful implementation of this 10-year Innovation Plan can be found in Figure ES-4.

FIGURE ES-4: IMPACTS OF INNOVATION-BASED ECONOMIC DEVELOPMENT



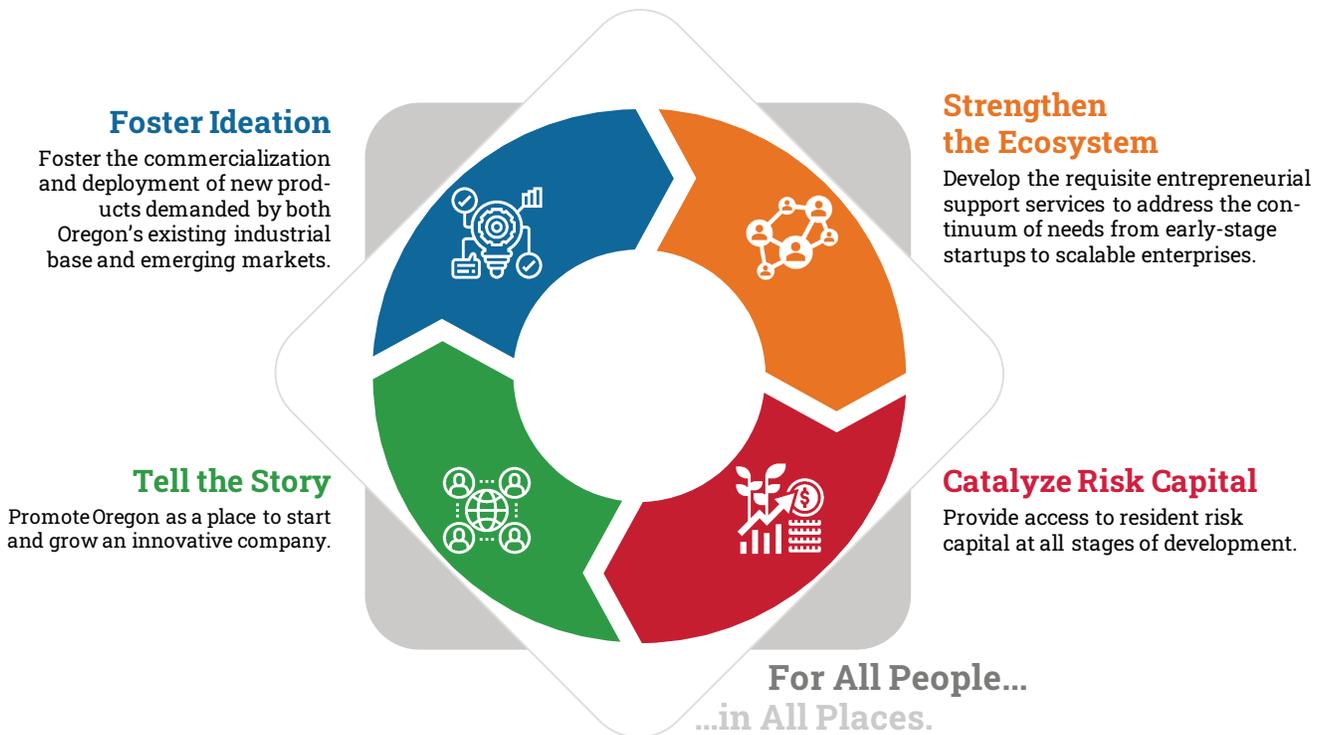
Source: TEconomy Partners, LLC.





Strengthening an innovation ecosystem does not happen on its own, but rather through a series of intentional, strategic, and proactive decisions. Oregon's Innovation Plan has been designed to be driven by public-private partnerships that capitalize on Oregon's comparative advantages while ensuring that future investments are focused on building the innovation, knowledge, and capital that will help ensure Oregon's economic vitality for all people in all places (Figure ES-5).

FIGURE ES-5: OREGON'S 10-YEAR INNOVATION PLAN STRATEGIC FRAMEWORK



Source: TEconomy Partners, LLC.

It is proposed that Business Oregon and its strategic partners initiate a set of four strategies and an associated set of 10 actions to leverage and complement existing efforts while seeking to overcome existing innovation/entrepreneurial challenges and help catalyze long-term economic growth across the state (Figure ES-6). To guide investments, this Innovation Plan is intended to be both an actionable but amendable document, with a wide range of proposed short- and long-term actions to address gaps in Oregon's innovation ecosystem.

FIGURE ES-6: OREGON'S 10-YEAR INNOVATION PLAN ROADMAP

Strategy 1: Foster Ideation – Catalyze the commercialization and deployment of new products/services within Oregon’s existing traded sectors as well as emerging markets. 	
Action 1:	Support Centers of Innovation Excellence that leverage Oregon’s existing traded-sector strengths and emerging market opportunities.
Action 2:	Leverage and expand sources of nondilutive capital to catalyze the commercialization of new innovations.
Action 3:	Support early-stage innovation within Oregon’s university, college, and other research settings, ensuring opportunities for all people in all places to connect to resources.
Strategy 2: Strengthen the Innovation Ecosystem – Develop a systemic, regionally based entrepreneurial service delivery system. 	
Action 4:	Create Regional Innovation Hub designations that will fund and incentivize collaboration to build and advance innovation-focused ecosystems, ensuring opportunities for all innovation-based businesses throughout Oregon.
Action 5:	Link talent to innovation efforts.
Strategy 3: Catalyze Access to Risk Capital. 	
Action 6:	Foster the further development of Oregon’s risk-capital stack.
Action 7:	Incentivize angel investments in Oregon’s innovation-based firms.
Action 8:	As deal flow increases across the state, focus efforts to drive more of the Oregon Growth Account’s investments to Oregon’s businesses.
Strategy 4: Brand Oregon as The Place for Innovation – Tell Our Story. 	
Action 9:	Develop Oregon’s Innovation Brand and market within the state – the brand should be aligned with and leverage Oregon’s existing strengths.
Action 10:	Develop an external marketing campaign that showcases Oregon’s unique identity and competitive strengths in innovation.

Source: TEconomy Partners, LLC.

The details regarding each strategy and subsequent action are outlined in the narrative that follows.

STRATEGY 1: FOSTER IDEATION

Catalyze the commercialization and deployment of new products/services within Oregon's existing traded sectors as well as emerging markets.



Action 1: Support Centers of Innovation Excellence that leverage Oregon's existing traded-sector strengths and emerging market opportunities.

Centers of Innovation Excellence are created through peer-reviewed competitions based on the capacity to do the following:

- Undertake applied R&D around the identified core innovation platform critical to Oregon's traded-sector strength or emerging global market opportunity.
- Include industry-led applied research programs that are supported by a broad consortium of private-sector members.
- Partner with higher education institutions, including research universities, smaller colleges and universities, and research organizations in the projects and programs they undertake.
- Provide access to domain experts with market knowledge that can guide products/services through the commercialization continuum and successful market entry, regardless of location.
- Provide nondilutive early stages of risk-capital funding, and also have the ability to take small equity stakes in the startups they help to create.
- Play an important role in building the state's educated talent base in the multidisciplinary fields required by the innovation platform work by offering new curricula, internships, and work-study opportunities, as well as increasing the pipeline of graduates.
- Help promote inclusive economic growth by intentionally collaborating with relevant and culturally specific organizations to support diverse entrepreneurs, promote talent development, and cultivate innovation-oriented, community-based partnerships.
- Deliver services statewide to meet opportunities wherever they are found.
- Leverage state funds over time with multifold increases in federal and industry support.

Action 2: Leverage and expand sources of nondilutive capital to catalyze the commercialization of new innovations.

- Support funding for the Small Business Innovation Research (SBIR) Support Program.
- Support the University Venture Development Fund (UVDF).
- Strengthen the Commercialization Gap Fund by doing the following:
 - Requiring a 1:1 match for future state investments into the fund.
 - Opening the fund to university and research endowments as potential partners.
 - Requiring the fund to include nondilutive investments.
- Create a Proof-of-Concept Grant Program to be administered through the Centers of Innovation Excellence.
- Create a Traded Sector Matching Grant Program that will match investments by Oregon's private, traded-sector companies in Oregon startups.

Action 3: Support early-stage innovation within Oregon's university, college, and other research settings, ensuring opportunities for all people in all places to connect to resources.

- Support the University Innovation Research Fund (UIRF).
- Create Oregon Corps, leveraging federal National Science Foundation (NSF) funding, to assist faculty and graduate students from across all Oregon universities, colleges, and research institutions in validating the market potential of technologies and launching startup companies.
- Further expand the InventOR Program, which successfully assists college and university students in prototyping novel inventions and honing their entrepreneurial skills by continuing to scale the program by strengthening partnerships with community colleges and additional universities and exploring additional pathways for student inventors and entrepreneurs.

STRATEGY 2: STRENGTHEN THE INNOVATION ECOSYSTEM

Develop a systemic, regionally based entrepreneurial service delivery system to help diversify the state's economy, take advantage of innovation-based opportunities, and drive broader participation among underserved communities.



Action 4: Create Regional Innovation Hub designations that will fund and incentivize collaboration to build and advance innovation-focused ecosystems, ensuring opportunities for all innovation-based businesses throughout Oregon.

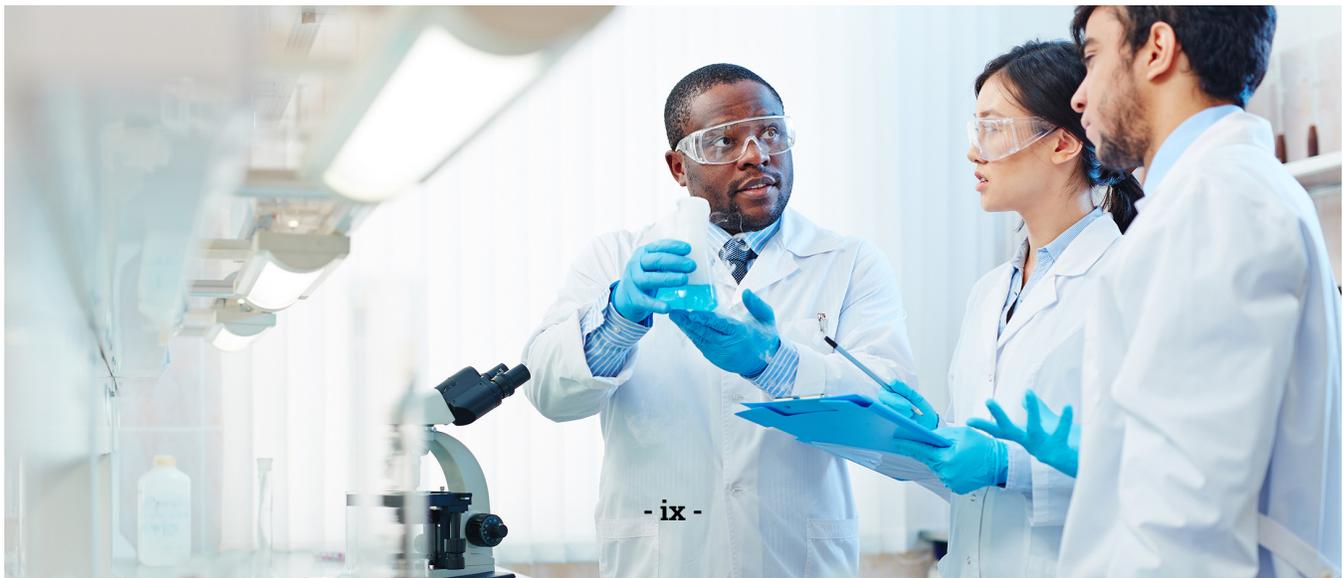
The Innovation Hubs will be expected to do the following:

- Build a sufficient scale of talented serial entrepreneurs in the region by providing intensive, in-depth help and assistance to innovative firms.
- Connect entrepreneurial efforts to existing regional industrial base and emerging opportunities, thereby tailoring each effort to leverage the region's comparative advantages.
- Deliver services throughout the region in coordination with existing efforts, academic assets, and other key stakeholders.
- Consider how best to address the need for physical infrastructure/placemaking to catalyze an entrepreneurial culture within the region.
- Address the need for more robust, value-added inclusive networking throughout each region and across the state.
- Provide linkages/vetting to Centers of Innovation Excellence (Action 1) to ensure the technical domain expertise needs are met for all innovative firms within the region, regardless of the area of technology.
- Provide access/vetting to the risk-capital stack (Action 6) that will be developed to support innovative firms throughout the state.
- Ensure programming is culturally specific and accessible to rural and historically under-resourced populations.

Action 5: Link talent to entrepreneurial efforts.

Support for experiential learning opportunities (internships, co-ops, apprenticeships, etc.) that can help strengthen and retain Oregon's locally rooted talent (particularly those in science, technology, engineering, and mathematics [STEM] fields) by linking students to interesting, innovative traded-sector companies by doing as follows:

- Providing a marketplace to connect students with entrepreneurial employment opportunities.
- Targeting students across the postsecondary continuum (from associate degrees through postdoctoral degrees) and ensuring that programs seek to engage students presently underserved in the innovation economy, such as women; Black, Indigenous, and People of Color (BIPOC); and those outside of the Willamette Valley.
- Providing matching grants to offset costs of internship/co-op student (it is expected that all students will receive financial compensation).
- Supporting unique programs such as InventOR or regional efforts targeting key traded-sector industry clusters, such as the Yamhill Carlton School District's support of the viticulture industry.



STRATEGY 3: CATALYZE ACCESS TO RISK CAPITAL.



Action 6: Foster the further development of Oregon's risk-capital stack.

- Support additional angel, pre-seed, and seed funds in Oregon managed by resident private fund managers and matched at least 3:1.
- Develop a network of sector-specific risk-capital sources of funding so that as Centers of Innovation Excellence (Action 1) come on-line and develop a pipeline of deal flow, sector-specific funds that align with targeted areas of innovation are available.
- Create a working capital loan program for traded-sector startups with limited access to funding from conventional financing sources due to technical and commercial risk factors associated with the development of new products or services within targeted traded sectors.

Action 7: Incentivize angel investments in Oregon's promising innovation-based firms.

- Create an angel investment tax credit that provides a qualified investor with an income tax credit equal to 25 percent of an eligible investment in an eligible Oregon company.
- Encourage Angel Networks by providing funding to offset costs of professional fund management, network administration, and due diligence. Leveraging Action 6, it is recommended that angel networks be encouraged to form by providing 3:1 matching grant dollars.

Action 8: As deal flow increases across the state, focus efforts to drive more of the Oregon Growth Account's investments to Oregon's businesses.

- Foster access to follow-on venture funding by leveraging the Oregon Growth Account by ensuring that policies and guidelines are in place that encourage out-of-state capital partners to have a meaningful Oregon connection/presence.

STRATEGY 4: BRAND OREGON AS THE PLACE FOR INNOVATION — TELL OUR STORY.



Action 9: Develop Oregon's Innovation Brand and market within the state — the brand should be aligned with and leverage Oregon's existing strengths.

- Leverage Oregon's strengths in marketing and communication, as well as its pre-existing functions for tourism and visitor attraction, to develop a shared statewide brand for innovation and entrepreneurship.
- Encourage ecosystem partners to advance this branding as part of their overall marketing efforts and develop an Innovation Ecosystem Ambassador program to elevate the voices of champions for innovation and entrepreneurship.
- Generate excitement through in-person events that celebrate innovation and entrepreneurship.

Action 10: Develop an External Marketing Campaign that showcases Oregon's unique identity and competitive strengths in innovation.

- Update (or create a new) website for Oregon's Innovation and Entrepreneurship programs and initiatives to encourage online connectivity across the ecosystem.
- Establish a digital marketing campaign to further highlight Oregon's unique strengths.
- Develop a consistent and active media presence.



By implementing the strategies and actions outlined in this Innovation Plan, Oregon will help ensure that it is working to position the state's economy for economic growth. Now is the time for Oregon to double down and leverage its existing investments to develop a vibrant and high-functioning innovation ecosystem to ensure that, in 10 years, Oregon is globally known as a model for a diverse, inclusive, and resilient economy: a place where innovative people solve the greatest challenges of our times to create novel, sustainable products, processes, and companies that drive economic growth.

OREGON'S INNOVATION PLAN — AN ECONOMIC IMPERATIVE

Why Creating an Innovation Plan is Critical to Oregon's Economic Future

The global economy is facing a dramatic transformation that is driven increasingly by innovation — through both the creation of new industries as well as the application of technology to traditional industries. Competition is increasing within this innovation-driven economy, and this intense competition does not occur solely between nations. The competition is felt at far smaller spatial scales — individual states, metropolitan

areas, counties, and towns. The United States has become a patchwork of economies — some competing well within the global economy, others failing to adapt and experiencing economic decline. The harsh reality of the 21st century economy is that there are, and will continue to be, winners and losers. The core questions are, of course, what does it take to be a winner and how do we ensure winning equates to widespread prosperity?

“This is how you create private sector jobs in a tough economy — by being entrepreneurial and creative”

Hon. Ron Wyden
U.S. Senator

Oregon's Innovation Plan is built on the central premise that the continued vitality of Oregon's economy and the state's high quality of life rest on its ability to encourage innovation. At a time when Oregon is faced with tremendous uncertainty driven in large part by a global pandemic, but also further complicated by political, natural, and socioeconomic challenges, there is still a need to focus on innovation-based economic growth. By coming together around a common issue — innovation — Oregon has an opportunity to improve the livelihoods of Oregonians across the state.

Entering the 2019-2021 biennium, Oregon's economy was in a strong position, with growth in local jobs and wages faster than the average state.¹ Although 2020 started out much like any other year, the emergence of the coronavirus disease 2019 (COVID-19) quickly re-shaped daily life for much of the world's population and drove the global economy into recession. In Oregon, the number of jobs declined by nearly 144,000 from February 2020 through September, a 7.4 percent decrease.²

As the pandemic continues to wreak havoc on the U.S. economy, a recent examination of sectors and regions experiencing the most disparate impacts related to COVID-19 illuminates the importance of innovation-based economic development. In the study, authors from McKinsey find that many small and mid-sized enterprises (SMEs) are on the brink of failure, and investment in innovation — ranging from both research and development (R&D) to venture capital dollars — is at risk.³ Furthermore, the depth and breadth of the digital divide have been exposed, and the crisis has challenged regions with high concentrations of both vulnerable sectors and vulnerable populations.

1 State of Oregon, Governor's FY 2019-2021 Proposed Budget.

2 “COVID-19 Economic Crisis: By State,” University of New Hampshire Carsey School of Public Policy, October 2020.

3 McKinsey & Co, “Reimagining the postpandemic economic future,” August 2020.



Ultimately, a culture of innovation and support for broad-based economic growth is essential to overcoming these challenges. In particular, the authors from McKinsey recommend that state and local governments invest in innovation ecosystems, build resilience through economic diversification, and embrace trends that enhance productivity, such as investments in new skills and technologies.⁴

As a result, understanding the role of innovation ecosystems in the 21st century, a knowledge-based economy is essential to driving economic growth in the wake of the pandemic. Furthermore, it is critical to understanding how Oregon's state and local policymakers – along with industry, academia, philanthropy, and a wide range of other public, private, and institutional partners – can help Oregon's economy recover from this global pandemic.

"Innovation-based economic development" includes, but is not limited to, a technology, product, process, or innovation that:

- Derives from and supports innovation and research.
- Promotes Oregon's market capacities and competitive advantages.
- Involves technology-based innovation.
- Facilitates the creation of new products, processes and services that retain and create high-wage jobs.
- Involves the establishment of partnerships between and collaboration with research institutions, the private sector and public entities.
- Endeavors to transfer innovative technologies to the private sector or to commercialize innovative research and development.

Source: Oregon Revised Statutes (ORS)

4 Ibid.

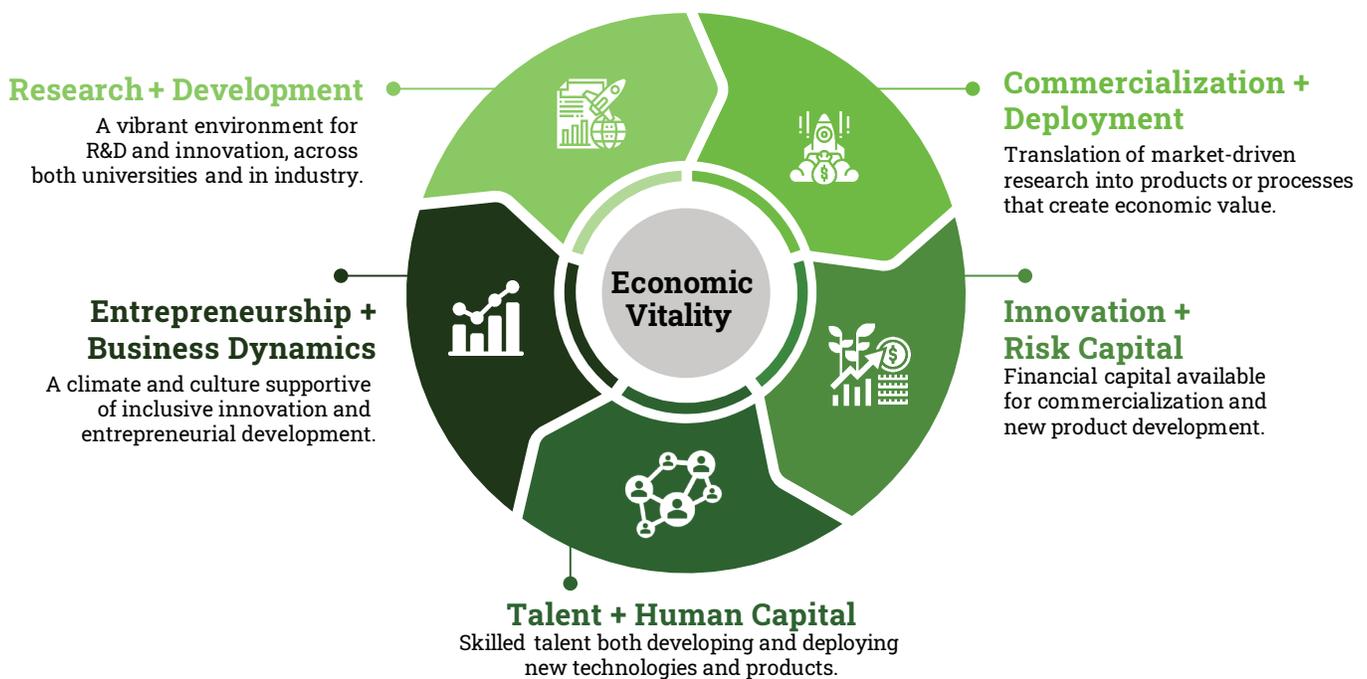
CRITICAL COMPONENTS OF A ROBUST INNOVATION ECOSYSTEM

Areas in the U.S. achieving economic development success (including neighboring states) have mature innovation ecosystems in place. These ecosystems may form naturally over time (as occurred in Silicon Valley and Boston); or they may result from dedicated activities of states, regions, and key stakeholders to proactively foster this ecosystem (as occurred in the Research Triangle area).

Successful innovation ecosystems are able to catalyze a variety of economic activities, including assessing the potential markets for R&D-driven capabilities and innovations against current products in the marketplace, developing new products by optimizing engineering and design to meet the marketplace's price points, developing effective management teams to drive business growth, and securing access to financial capital that will fund not only the development of the technology but also the firm through its various maturity stages until it becomes an established company in broader domestic and global markets.

A robust, inclusive innovation ecosystem is at the core of Oregon's ability to achieve broad-based economic vitality. Innovation ecosystems consist of five interconnected elements, each of which plays a vital role in developing new value-added products and services that create strong economic impacts (Figure 1).

FIGURE 1: INTERRELATED COMPONENTS OF A ROBUST INNOVATION ECOSYSTEM



Source: TEconomy Partners, LLC.

To drive innovation-based economic development in Oregon, it is critical to focus on each of these five components' functionality as well as how these essential facets of the system interact with one another.

RESEARCH AND DEVELOPMENT (R&D)

Increasing productivity – the goods and services that can be developed in a place given its availability of people, facilities, and resources – is an important part of improving economic growth and quality of life. While there are various paths to increasing productivity, a fundamental driver of this growth is the production of new knowledge through R&D. R&D comprises three parts:

- **Basic research** refers to the experiments or theoretical work that is undertaken without any application or use in view; the primary purpose is to expand knowledge, not to create or invent something.
- **Applied research** seeks to solve specific, practical issues affecting individuals or groups such as states or businesses. Solving problems and improving conditions are important goals of applied research.
- **Development** refers to the conversion of research into new ideas, services, or products in order to improve standards of living. Common elements of the development process include concept formulation, design, product testing, prototyping, and other types of pilot projects.

While basic research is important because it serves as the pipeline for ideation, there must be a focus within both industry and academia on applied R&D, which help generate further economic growth. Focusing on R&D and the early stages of knowledge generation helps fuel the other innovation ecosystem elements.

COMMERCIALIZATION AND DEPLOYMENT

While Oregon's capacity for conducting R&D in both the private and academic sectors is a noted strength, applying this research into new firms and products is worthy of additional attention.

Many states and regions, including Oregon to a degree, are focusing intentional effort on moving ideas from conception to the marketplace. Critical resources to support the commercialization and deployment stage may include connections to domain expertise in specific technologies or subject matters, access to entrepreneurs-in-residence to assess commercial potential and develop strategies to market, and funds and facilities to support proof-of-concept or pilot-scale production and scalability testing.

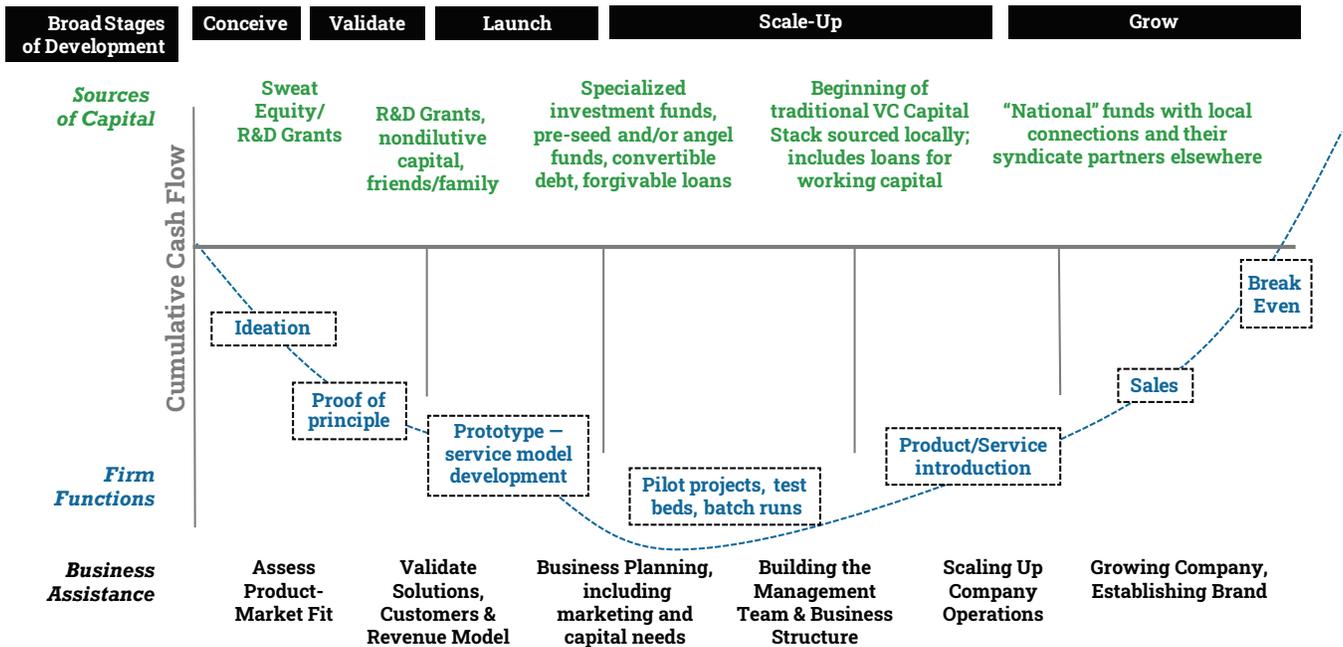
To make the most of its investments in R&D, it is critical that Oregon address gaps in its innovation ecosystem related to commercialization and deployment. This success must leverage the other components of the innovation ecosystem, including access to risk capital, skilled talent, and a strong business climate.

RISK CAPITAL

Financial backing and support are a requirement for moving an innovative idea from just a thought to a marketable product. Overall, financial capital is a prerequisite for overcoming the “valley of death” and translating economic returns for the company and the economy. Whether it is nondilutive sources at the very earliest stages of commercialization funding or funding much further downstream to scale and grow a company, whether it be equity or debt based, financial capital for innovation-oriented firms is vitally necessary to fuel Oregon's innovative ecosystem.

A variety of capital sources may fit a company's needs depending on its stage of technology and business development (Figure 2). In a company's earliest stages, “sweat equity,” R&D grants, nondilutive capital, and support from friends or family drive initial investment. Notably, investment from friends and family is not typically available to entrepreneurs in under-resourced communities, which may prevent new businesses from launching and growing. As companies encounter the “valley of death,” they face a gap in funding: they have likely exhausted these previous stages of capital and are not yet mature enough to begin accessing formalized venture capital or traditional debt markets. During this stage, specialized investment funds, convertible debt or forgivable loans, pre-seed and seed funds, or angel investments are critical forms of risk capital to ensure company survivability and sustainability.

FIGURE 2: SOURCES OF CAPITAL, FIRM FUNCTIONS, AND BUSINESS ASSISTANCE BY STAGE OF DEVELOPMENT



Source: TEconomy Partners, LLC.

TALENT AND HUMAN CAPITAL

Generally, talent refers to people, their intangible skillsets, knowledge, and social attributes, and their ability to contribute positively to a state. While talent in the innovation-oriented economy is typically associated with technology-based skills, the term can mean different things to different audiences, depending on its usage. For example, entrepreneurial and business skills are also a crucial part of talent development. To effectively address the role of talent in an innovation ecosystem, it is essential to incorporate the various types of talent needed, the various stages where this talent is developed, and how this talent is deployed and connected to the regional economy.

Supporting talent and human capital is also an important part of Oregon's efforts to attract and retain businesses. For example, a 2019 study on the site-selection needs of corporations finds that skilled labor availability is the number one factor in determining location decisions, considered "very important" or "important" by more than 90 percent of the corporate respondents.⁵ Meanwhile, labor costs ranked second. The challenge then becomes how states can ensure that the supply of talent is accessible for innovative-small businesses, while workforce opportunities in high-growth, high-paying sectors are open to all.

⁵ Area Development, "Site Selection: Corporate Executive Survey Results," Q1 2019.

ENTREPRENEURSHIP AND BUSINESS DYNAMICS

Creating a business environment where entrepreneurs are willing to accept the risks inherent in new enterprise formation is a constant work in progress. Like all economies, Oregon is heavily dependent on “creative destruction,” the phenomenon where new ideas, technologies, and industries are continually disrupting and replacing those of the past. In economies with fewer entrepreneurs, when jobs, companies, or industries begin to decline, it is less likely that they will be replaced by something better.

In Oregon and throughout the nation, many companies are still struggling with COVID-related repercussions and having difficulty sustaining and scaling operations. Meanwhile, a lack of access to broadband limits many in the state’s ability to launch a business or access customers, service providers, training, networks, and other resources.

For governments, a “business friendly environment” does not exclusively refer to regulations or tax incidence. Instead, support for infrastructure (especially broadband), talent development, or tactics aimed to address gaps in the innovation ecosystem offers different approaches to encouraging economic growth that benefits businesses.

Taken together, these five components of the innovation ecosystem fuel economic development in the 21st century. By serving as the base for the “three-legged stool” of economic development, a highly functioning innovation ecosystem can play a pivotal role in fueling new enterprise development, supporting existing businesses, and attracting new firms to an area (Figure 3). Strengthening the state’s innovation ecosystem and encouraging economic development go hand-in-hand.

FIGURE 3: INNOVATION ECOSYSTEMS AS A FOUNDATION FOR ECONOMIC DEVELOPMENT



Source: TEconomy Partners, LLC.

WHY FOCUS ON TRADED SECTORS?

A state's economy must focus on serving customers and markets beyond the residents and businesses in its community – otherwise known as traded sector activities – in order to drive an increase in a state's gross domestic product (GDP), which in turn contributes to a higher quality of life for its citizens. By bringing new dollars into Oregon's economy, traded-sector firms exhibit a strong multiplier effect: new jobs are created as exporting firms buy from local suppliers and as its workers make purchases from local businesses. Manufacturing firms generally have a multiplier greater than 1.5. In contrast, firms in some traded-sector industries may carry a multiplier more than twice as high, according to an analysis by Tim Bartik of the Upjohn Institute, an expert on economic development policy.⁶

“Traded sector” means industries in which member firms sell their goods or services into markets for which national or international competition exists.

Source: Oregon ORS

Business activities that typically focus on meeting the local needs of families and businesses and do not bring new income into a region are often referred to as “sheltered” or locally serving industries. Examples of sheltered industries include restaurants, retail stores, dry cleaners, and state and local government services. While these sheltered industries are critical to Oregon's quality of life, they rely on purchases from local residents and businesses as their primary market, and so do not generate new income but instead benefit from a growing economy.

Some business activities fall between the activities of traded sectors and sheltered industries and are termed partially traded industries. One example is healthcare providers, which often serve local residents, and can also attract patients from outside of a region if they are based at a major medical center offering clinical excellence. Plus, the availability of quality local healthcare providers is one of the critical quality-of-life factors considered by site location consultants and businesses when locating new business investments. Another partially traded sector is business services, which can serve a mix of customers in and outside a region and are critical to providing the professional services needed by new and growing businesses.

Additional research by Upjohn Institute and Bartik finds that targeting economic development initiatives at traded-sector firms with high multiplier effects helps improve their cost effectiveness and efficiency.⁷ While traditional tools for economic development such as business tax cuts or broad-based tax incentives have a high cost per job, Bartik's rigorous review of peer-reviewed studies finds that there are many other approaches that offer lower costs.

In addition to targeting traded-sector industries, providing customized business services is among the most cost-effective tools for encouraging economic development. These services, which range from customized job training programs to outreach and extension for manufacturers, can have low costs because they help overcome the market failures that are holding back entrepreneurs and small and medium-sized businesses. These businesses face financing and information barriers and may struggle to receive the right assistance or business advice. Offering assistance at modest costs can have a larger effect on the competitiveness of a smaller business.

Finally, improving the effectiveness of the state's innovation ecosystem and ancillary economic development activities also contributes to stronger traded-sector industry clusters. These industries sell their goods and services in markets outside of Oregon, bringing wealth back into the state. Traded sector industries vary widely, from software or services to those manufacturing a physical product. It is important that available support services can effectively address the needs of all traded sector companies, regardless of their size, their stage, or their sector. While Business

⁶ Upjohn Institute, Local Job Multipliers in the United States: Variation with Local Characteristics and with High-Tech Shocks, March 2019.

⁷ Upjohn Institute, What Works to Help Manufacturing-Intensive Local Economies? May 2018.

Oregon traditionally works with businesses across all traded sectors, the state's targeted industry clusters offer distinct competitive advantages that provide the state with unique opportunities for growth, high-wage job creation, innovation, and statewide prosperity.

WHY FOCUS ON ENTREPRENEURSHIP?

An essential part of Oregon's innovation ecosystem is the entrepreneurs who can turn innovation into successful businesses. Innovation, in and of itself, will not necessarily translate into economic activity. Instead, it is applying technology and introducing it into the marketplace that results in economic growth.

Innovation and entrepreneurship are inextricably linked. The Center for American Entrepreneurship, a nationally focused nonpartisan research, policy, and advocacy organization focused on entrepreneurship, notes as follows:⁸

Entrepreneurs

- Advance innovative products and services that serve unmet market through high-growth companies.
- Create dynamic and flexible new industries and firms to replace those that are no longer viable in a rapidly changing global economy.
- Provide most new employment opportunities, especially in high-paying jobs, ultimately improving quality of life.
- Create wealth that is reinvested in new enterprises and, through demonstrated philanthropic activity, in communities.

New ideas are the basic craft and contribution of entrepreneurs. Whether a new product or service, 'building a better mousetrap,' or new methods of producing, distributing, or delivering products and services, new ideas are the essence of innovation, which drives productivity gains and economic growth, and creates jobs, wealth, and opportunity. New ideas can come from the mind and imagination of entrepreneurs or as the result of scientific inquiry and discovery.

Small businesses are frequently touted for their significant impact on job growth. An analysis of high-growth firms finds that a small cohort of mostly younger high-growth firms (Gazelles) stood out as high-growth businesses and accounted for roughly 50 percent of new jobs created each year between 1980 and 2010.⁹

It is important to note that, while most entrepreneurs start by forming small businesses, not all small businesses are entrepreneurial. The needs of small businesses and entrepreneurs may be similar at first during the startup phase. However, they quickly diverge as entrepreneurs focus on assembling resources and creating innovative products or services that will lead to further investment and growth. Small business owners develop companies to generate wealth and provide employment and income for themselves and others; entrepreneurs are interested in creating innovative products or services that lead to further investment and growth. Most small businesses serve a local or regional market (sheltered-sector activities), whereas entrepreneurial companies are often focused on the national and global marketplace (traded-sector activities). It is also important to remember that entrepreneurship includes more than just startups. Mature firms must be entrepreneurial in developing new products and entering new markets.

While all entrepreneurship is of value to an economy, studies show that young firms in innovation-based industries are particularly important. Research from the Information Technology and Innovation Foundation (ITIF) finds that innovation-based startups (firms younger than 10 years old in these innovative traded sectors) have an outsized

⁸ Center for American Entrepreneurship, "Innovation," 2020.

⁹ Ryan Decker, John Haltiwanger, Ron Jarmin, and Javier Miranda, "The Role of Entrepreneurship in US Job Creation and Economic Dynamism"; *Journal of Economic Perspectives*; Vol. 28, No. 3; Summer 2014.

impact on economic growth.¹⁰ This is because they provide better-paying, longer-lasting jobs than other startups and also contribute more to innovation, productivity, and competitiveness. Because of these benefits, the authors argue that entrepreneurship policy should focus on spurring more innovation-based startups.

The state of Oregon has a long history of supporting innovation and entrepreneurship (see Appendix A for a history of Oregon's investments). Currently, the Oregon Innovation Council (Oregon InC) invests in a variety of initiatives that support entrepreneurs within traded sectors:

- Signature Research Centers (SRCs)
- Small Business Innovation Research (SBIR) Support Program, and
- Commercialization Gap Fund.

In addition, the Oregon Growth Board focuses its efforts on expanding Oregon's risk-capital stack through two investment vehicles: the Oregon Growth Account and the Oregon Growth Fund.

Finally, it is important to note that Business Oregon also has numerous initiatives that support all entrepreneurs and small businesses throughout the state, regardless of whether they are considered to be within a traded sector. These initiatives include the following:

- Oregon Small Business Development Center Network
- Oregon Manufacturing Extension Partnership
- Business Oregon Lending and Loan Guarantee Programs
- Rural Opportunity Initiative
- Small Business Technical Assistance Program, and
- Business Retention Services.

In addition to state-funded programs, there are many other resources across the state (public, private, nonprofit) that are supporting entrepreneurs. The bottom line is that states, including Oregon, that recognize the benefits of entrepreneurship and the role it plays in today's knowledge-based economy are developing policies and programs to establish an environment that creates, attracts, and retains entrepreneurs and an infrastructure to support them. For example, a report prepared for the SBA's Office of Advocacy comparing regions with strong and weak entrepreneurial activity found that the most entrepreneurial regions experienced greater economic prosperity compared with the least entrepreneurial regions: "They had 125 percent higher employment growth, 58 percent higher wage growth and 109 percent higher productivity."¹¹

¹⁰ Information Technology and Innovation Foundation, "How Technology-Based Start-Ups Support U.S. Economic Growth," November 2017.

¹¹ The Innovation-Entrepreneurship NEXUS: A National Assessment of Entrepreneurship and Regional Economic Growth and Development. Powell, Ohio: Advanced Research Technologies, LLC, April 2005, p. 5.

INNOVATION PLAN METHODOLOGICAL APPROACH

As previously noted, the COVID-19 pandemic is a human tragedy that has also caused unprecedented economic disruption. While the uncertainty resulting from the pandemic is far from over, policy leaders are beginning to shift their attention to what can be done to catalyze economic revitalization. Oregon's ability to recover from this economic crisis will depend in large part upon its capacity to foster the formation of innovation-based businesses and sustain their growth as they scale-up and generate new, high-paying jobs.

A Data-Driven Plan

The Oregon Innovation Plan builds on years of previous work, including a variety of in-depth quantitative and qualitative analysis. Notably, the plan builds on the following:

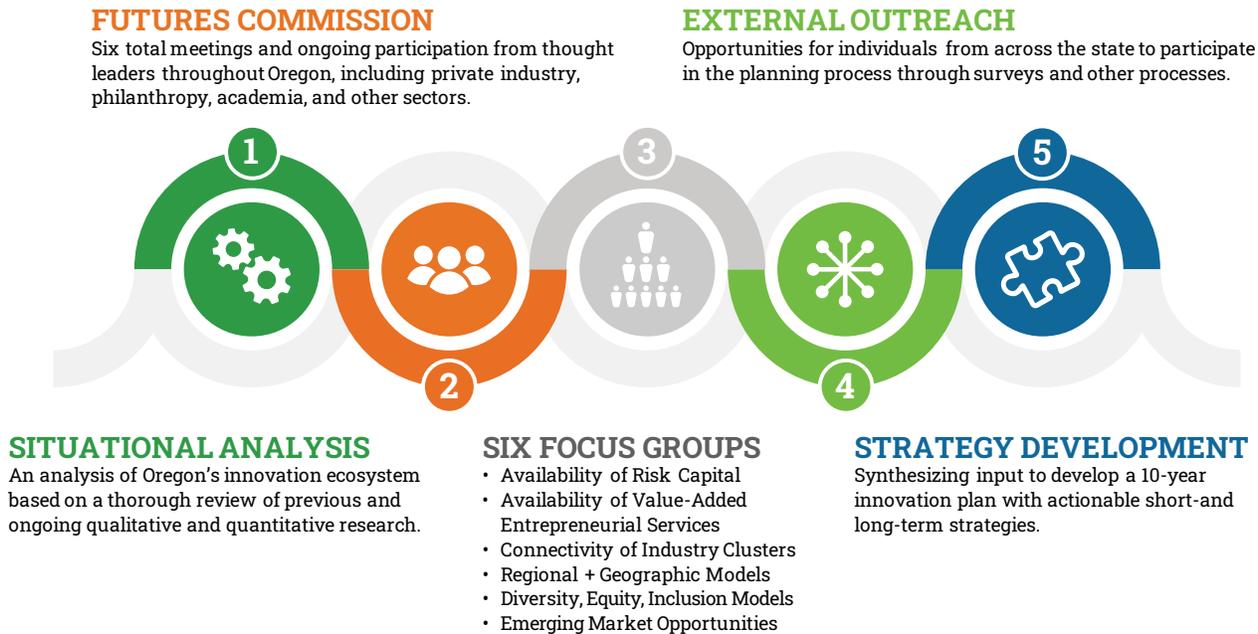
- *Business Oregon's Strategic Plan (2018-2022)*
- Oregon InC's *Innovation & Entrepreneurship Benchmarking and Best Practices Study (2019)*
- *Oregon Innovation Index (2018)*, and
- *Oregon Capital Scan (2020)*.

Even prior to the global pandemic, Business Oregon recognized the importance of innovation as a significant driver of the state's economy when it made "Innovating Oregon's Economy" the first of five goals in its 2018-2022 strategic plan. In the years that followed, Business Oregon commissioned a wide array of quantitative and qualitative analyses related to Oregon's innovation economy. The findings of these studies (see textbox) helped to guide this plan.

Central to the development of Oregon's Innovation Plan is the work of the Futures Commission. Comprised of 31 members representing industry, academia, philanthropy, and government, the Futures Commission was convened by Business Oregon in 2020 to bring together diverse expertise from across the state. Meeting six times over the course of 2020 and 2021, Futures Commission members help inform, create, and serve as ambassadors for this plan. To help guide the work of the Futures Commission, Business Oregon engaged TEconomy Partners, LLC (TEconomy) to facilitate and coordinate the Innovation Plan process. TEconomy is a global leader in research, analysis, and strategy for innovation-based economic development. For the past 20 years, the team at TEconomy has helped craft innovation-led economic development strategies throughout the nation. Figure 4 illustrates the five-part process that informed the development of the Innovation Plan.



FIGURE 4. OREGON'S INNOVATION PLAN METHODOLOGY



Source: TEconomy Partners, LLC.

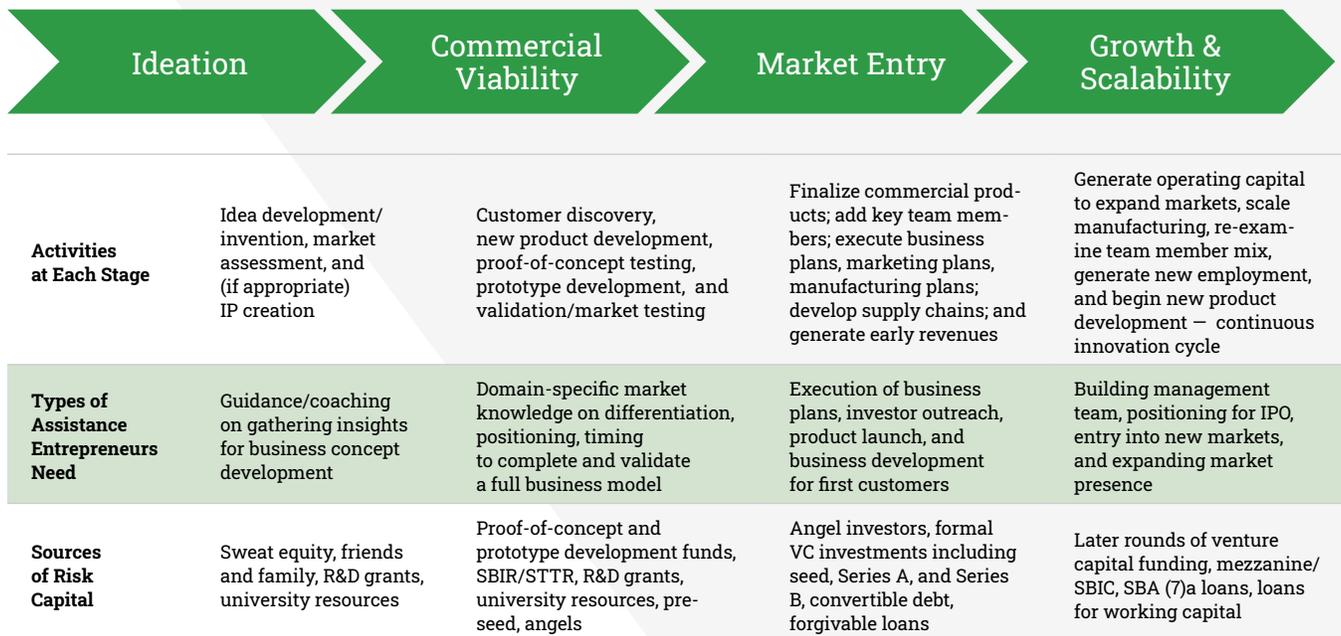
It is important to note that the members of the Futures Commission represent only a small fraction of the wide range of innovation and entrepreneurship expertise consulted and engaged for this effort. Across in-depth, one-on-one interviews and focus groups related to key components of the innovation ecosystem, more than 125 stakeholders contributed to this strategic effort (see Appendix B for a list of stakeholders who provided input to the Oregon Innovation Plan). Across the interviews, focus groups, and Futures Commission meetings (referred to collectively as “discussions” throughout the Plan), Oregonians volunteered a significant amount of time to contribute to this plan’s development. The commitment of these participants is reflected in the vigor of this strategic document.

The Innovation Plan is a culmination of views of key thought leaders and ecosystem builders from across the state of Oregon seeking to position Oregon for future economic growth driven by increased innovation. In the pages that follow, the Innovation Plan lays out a series of recommended bold strategies and concrete actions that, if undertaken, will help foster greater levels of economic prosperity for all Oregonians in the years to come.

KEY FORCES IMPACTING OREGON'S INNOVATION ECOSYSTEM

The “innovation continuum” can be described as the range of activities, types of assistance, and sources of capital required to move a concept from ideation into a viable business that enters new markets and grows and scales. In the innovation continuum’s ideal state, seamless transitions from each stage to the next, with a wide array of support services and resources available, help meet the needs of fledgling innovation-based businesses (Figure 5). Innovation-based economic development in this ideal state requires a continuum of activities, assistance, and risk-capital sources.

FIGURE 5. INNOVATION CONTINUUM — THE IDEAL STATE



Source: TEconomy Partners, LLC.

Oregon must support intentional collaboration between the public and private sectors to facilitate and catalyze the activities requisite for economic development. However, three different forces impact Oregon's efforts to develop this continuum:

- Key challenges facing Oregon's current innovation ecosystem
- Reliance on critical dependencies of other economic forces within the state, and
- Impact of global headwinds that continue to shift and evolve the economic landscape.

The following narrative addresses each force in turn, describing and providing evidence for its identification.

KEY CHALLENGES FACING OREGON'S CURRENT INNOVATION ECOSYSTEM

As a result of nearly 20 years of investment, Oregon has in place many of the fundamental ingredients required for a robust innovation ecosystem. As identified in the quantitative analyses undertaken for this effort, including Oregon InC's *Innovation & Entrepreneurship Benchmarking and Best Practices Study* (2019), the Oregon Innovation Index (2018), and the Oregon Capital Scan (2020), there are numerous strengths across the ecosystem. Notable strengths identified through these reports include the following:

- **R&D:** Oregon ranks highly in R&D performance, especially in the private sector and manufacturing industries such as semiconductors and electrical components. Oregon's growth in R&D is outpacing the national average, and R&D intensity (R&D as a share of GDP) ranks in the top-10 nationally.¹² At Oregon's colleges and universities, active licensing income as a share of total university R&D expenditures ranks in the top-5 nationally and had performance higher than the U.S. average in both the short (3-year) and long (10-year) terms.¹³
- **STEM talent:** Oregon boasts a high concentration of workers in science, technology, engineering, and mathematics (STEM) fields and has a strong track record of success at attracting technical talent from outside of the state.¹⁴
- **Startup performance:** The number of new startups forming each year (including university startups) is increasing faster than the national average, as is the survival rate of startups (measured as the share of startups still operating five years after their founding).¹⁵
- **Entrepreneurial culture:** Oregon features an array of accelerators, incubators, and SRCs supporting startups, as well as a collaborative environment among the state's investors and its service providers.¹⁶

Nevertheless, the planning process exposed a range of challenges that impact the development of Oregon's robust innovation ecosystem. These challenges cut across the four elements of the innovation continuum introduced in Figure 5 (ideation, commercial viability, market-entry, and growth and sustainability). While the challenges range in their scale and scope, when combined, they significantly hold back entrepreneurs' ability to start and grow new innovative ventures in the state of Oregon.

An analysis of the ideation stage finds that Oregon's entrepreneurs require both value-added services and non-dilutive sources of capital to launch their businesses. When there is a disconnect between these two resources, entrepreneurs may struggle to acquire the necessary assistance (e.g., mentorship, networking, access to expertise) and the working capital needed to determine the commercial viability of a business. Importantly, this analysis also identified the need to "broaden the funnel" of the idea pipeline and ensure that all Oregonians can pursue their entrepreneurial endeavors regardless of demography or geography.

Oregon's innovation continuum faces challenges at the commercial viability stage. Many in the ecosystem expressed the need for individuals with domain expertise in niche technical areas, especially those with an understanding of market opportunities. Invaluable resources at this stage include access to mentors, serial entrepreneurs, and other service providers to help startups with business expertise. Beyond service providers, however, there was a sense that no amount of assistance could substitute for working capital. One critical challenge facing Oregon companies seeking to prove their commercial viability is the relatively small amount of organized angel investment dollars and "resident" seed funding (capital that is located and seeks to invest primarily in-state).

¹² *2018 Oregon Innovation Index*, Prepared for Oregon Business Development Department, p. 9.

¹³ *Oregon Innovation & Entrepreneurship Benchmarking and Best Practices*, Prepared for Oregon Business Development Department, March 2019, p. 6.

¹⁴ *Oregon Innovation & Entrepreneurship Benchmarking and Best Practices*, Prepared for Oregon Business Development Department, March 2019, p. 64.

¹⁵ *Ibid.*

¹⁶ *Ibid.*

Many of these challenges persist for companies at the market entry stage of the continuum and continue to impact company growth and scalability. Stakeholders expressed the need for skilled technical talent at all levels and the importance of resident sources of risk capital that can lead deals and foster syndication.

Lastly, Oregon businesses face challenges related to growth and sustainability. In advanced industry clusters that help drive economic growth, there is concern that Oregon is lagging compared with other states and may be losing out on innovative companies. Many individuals expressed concern that the state's economic development incentives are not aligned to assist these "second-stage" firms trying to scale. These challenges are further complicated by a social and political environment that is not always in tune with innovation-based economic growth.

Across the stages of the innovation continuum, the planning process uncovered various disparities in access to resources. The bulk of the state's innovation activities concentrate around Greater Portland, the broader Willamette Valley, and Bend. However, entrepreneurs in many other parts of the state may find these activities out of reach. Within rural areas, population density limits connectivity to domain experts and alternative types of technical mentors.

These challenges are also magnified for businesses in under-resourced communities, and especially those started by women and Black, Indigenous, and People Of Color (BIPOC) entrepreneurs. While the planning process highlighted Oregon's collaborative and entrepreneurial culture as a strength, it also uncovered that this culture was not always inclusive. When resource providers (e.g., risk capital, mentorship, domain expertise) can offer similar experiences to the entrepreneurs they help – in terms of similar backgrounds and shared languages, similar industries, or similar geographies – these experiences can be vital to business growth and scalability.

CRITICAL DEPENDENCIES TO SUSTAIN AN INNOVATION ECOSYSTEM

While a robust, inclusive innovation ecosystem requires dedicated efforts to strengthen every critical element in the innovation chain, ultimately, driving catalytic change in Oregon's innovation economy will also require efforts in several other areas important to achieving broader prosperity in the state. As Oregon approaches the redevelopment of its economy in response to the COVID-19 pandemic, three areas emerged throughout this process as foundational to this plan's success:

- Pervasive, affordable, and accessible high-quality digital infrastructure (broadband).
- A thriving talent base with inclusive pathways to cultivate human capital.
- A robust industry- and academic-R&D enterprise that tackles our toughest problems.

Through this Innovation Plan, Oregon can become a more prosperous state by strongly orienting its economy around innovation and entrepreneurship. However, Oregon's ability to effectively address these three "critical dependencies" is at the root of this plan's success (Figure 6).

FIGURE 6: CRITICAL DEPENDENCIES FOR INNOVATION PLAN SUCCESS



Source: TEconomy Partners, LLC.

Today, Oregon is working on these other fundamental issues critical to the overall business environment and foundational to a thriving innovation economy. Although Oregon has made recent strides in these three areas, more is needed to ensure their effective, widespread implementation. This section describes each of these three dependencies in detail, their impact on Oregon's innovation economy, and current efforts to facilitate their viability. While these areas are essential to success, the purpose of this plan is not to explicitly address these items, but instead help elevate their importance and accelerate their progress.

PERVASIVE, AFFORDABLE, AND HIGH-QUALITY DIGITAL INFRASTRUCTURE (BROADBAND)

The proliferation of the internet across every industry and nearly all facets of life has made broadband truly essential infrastructure. While this was becoming increasingly clear through the first two decades of the 21st century, the onset of the COVID-19 pandemic and the expansion of remote work and learning highlight both the indispensability of high-speed internet access and existing inequities in its distribution. As one Futures Commission member astutely noted, "Perhaps nothing illustrates the importance of widespread broadband more than the image of a child trying to access their schoolwork from a McDonald's parking lot because it's unavailable at their home."

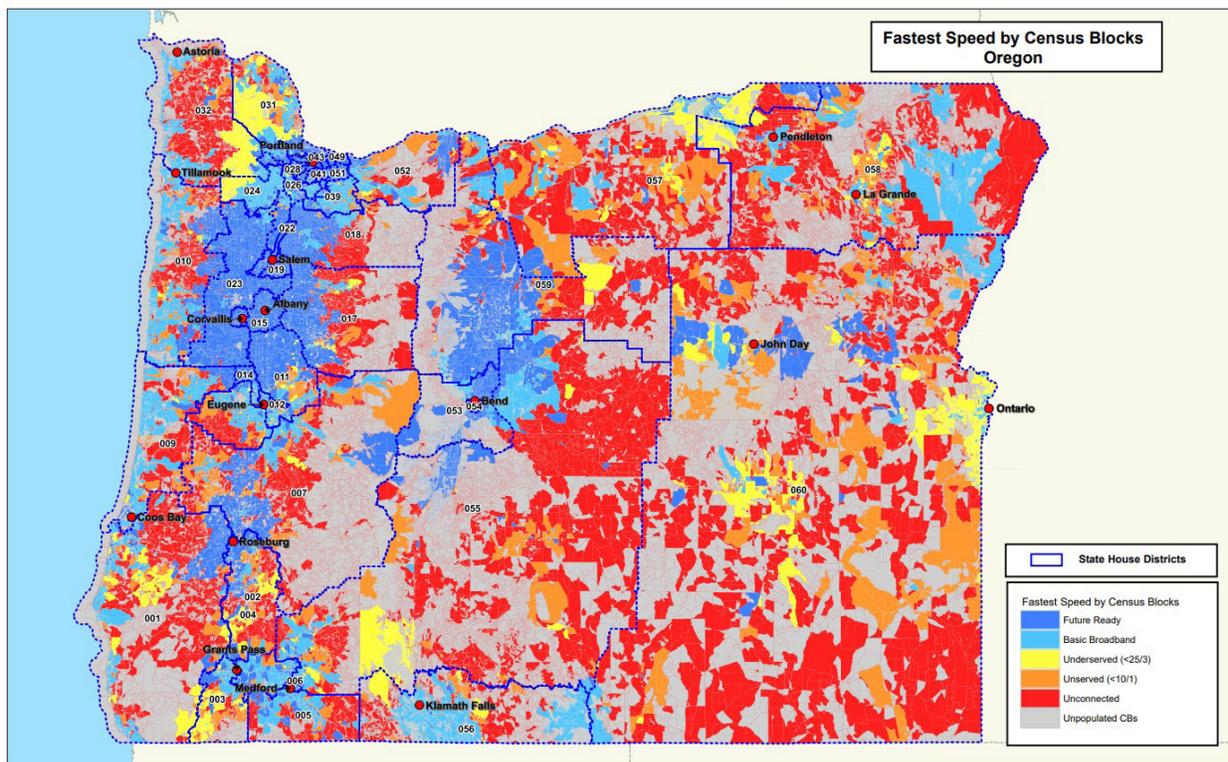
The success of this Innovation Plan is dependent on pervasive, affordable, and accessible high-quality broadband internet for all households in Oregon. Given the importance of spreading innovation-based industries to areas throughout Oregon to this strategic plan, digital infrastructure is especially important to ensuring that opportunities for rural innovation are realistic.

A recent analysis by the Oregon Department of Economic Analysis highlights the importance of broadband in the state: "On the economic side, having residents better connected to labor markets to search for jobs, and interact with co-workers and clients is important. It's not just the availability of a broadband connection, but really about the speed, reliability and price of that connection. We know once you get outside of the major cities in the Willamette Valley, the speed and reliability can fall off, impacting potential growth opportunities."¹⁷

¹⁷ Josh Lehner, Oregon Office of Economic Analysis Blog, "Working from Home and Broadband Access in Oregon," July 2020.

Meanwhile, the 2020 *Oregon Statewide Broadband Assessment and Best Practices Study* sheds additional light on the need for improved broadband, especially in rural areas.¹⁸ As the analysis notes: “While at a state level it may appear that Oregon is in good shape for broadband availability, there are many areas where businesses and households are clamoring for better service with approximately 1.17 million Oregonians living in areas that are unconnected, unserved, underserved, or have older technologies providing Basic Broadband.” Notably, the study finds that 46 percent of populated census blocks in Oregon are unserved or underserved (Figure 7), and that these census blocks are in rural and sparsely populated areas representing approximately 5 percent of Oregon’s population (approximately 148,000 people and 60,000 households in rural Oregon).

FIGURE 7: FASTEST INTERNET SPEED AVAILABLE BY OREGON CENSUS BLOCK



Source: 2020 *Oregon Statewide Broadband Assessment and Best Practices Study*.

Through collaborative efforts made by Business Oregon and other partners, the state is making strides in its broadband development activities. Throughout the next decade and beyond, as digital infrastructure becomes even more integral to the success of industries and continues to impact quality of life, it is imperative that Oregon continues to strengthen its capacity to connect all of its citizens to the digital age.

Oregon is striving to improve its digital infrastructure, but additional work is needed. The Oregon Broadband Advisory Council (OBAC) and a Broadband Advisory Council Fund were created in the 2009 Legislative session to help ensure the implementation of statewide broadband strategies. The mission of the council is to encourage coordination and collaboration between organizations and economic sectors to leverage the development and utilization of broadband for education, workforce development, and telehealth and to promote broadband utilization by citizens

¹⁸ *Oregon Statewide Broadband Assessment and Best Practices Study*, Prepared for Oregon Business Development Department; January 31, 2020. <https://www.oregon4biz.com/assets/docs/SNGStudy2020.pdf>.



and communities. In 2018, Governor Brown signed an Executive Order establishing the Oregon Broadband Office to promote access to broadband services for all Oregonians in order to improve the economy and quality of life.

In addition, in response to the COVID-19 pandemic, the Oregon Legislature has approved numerous initiatives to support broadband expansion, including funding to school districts to help low-income students access distance learning as well as supporting rural areas to access telework and telehealth for unserved and underserved areas. The Governor also included approximately \$125 million in additional funding for broadband activities in her 2021-23 recommended budget. Funding primarily targets broadband connectivity for schools and expansion of broadband infrastructure to unserved and underserved areas throughout the state.

Ultimately, broadband is just one element of the infrastructure system that is important to the success of this Innovation Plan. While broadband is vital to linking Oregonians with each other and the rest of the world, physical infrastructure remains critical for moving people and goods across the state. This is especially valuable for export-intensive traded-sector businesses, who require multimodal transportation options to deliver their products around the world. In addition to the proliferation of broadband connectivity, supporting 21st century advanced infrastructure means encouraging the maintenance and digital integration of traditional infrastructure (e.g., roads, bridges, rails, ports, transit, airports, etc.) as well.

A THRIVING TALENT BASE, WITH INCLUSIVE PATHWAYS TO CULTIVATE HUMAN CAPITAL

Just as digital infrastructure such as broadband helps lay the foundation for an innovation-based economy, so too does a thriving base of talent. Generally, talent refers to people, their intangible skillsets, knowledge, and social attributes, and their ability to contribute positively to a state's economy. While talent in the innovation-oriented economy is typically associated with technology-based skills, it is important to view talent with a wide lens incorporating the various types of talent that is needed, the various stages where this talent is developed, and the ways in which this talent is deployed and connected to the state's economy.

While this plan is not focused solely on strengthening Oregon's talent pipelines, education, training, and workforce development undoubtedly play an important role in the success of innovation-based economic development. Skilled talent at all stages of the innovation development pipeline is essential to moving concepts from ideation to commercialization. As such, the success of this Innovation Plan is dependent on people.

In addition to the development of a thriving talent base, it is also important that all Oregonians have inclusive pathways to develop human and social capital. These pathways help attract talented young minds to STEM education and are crucial to broadening participation in the STEM workforce among frequently underserved populations, such as women, Blacks, Hispanics, and Indigenous Americans. Scholars at Georgia Tech and the University of Minnesota note that traditional approaches to strengthening the STEM pipeline suggest a linear progression from K-12 science and math preparation to university enrollment, and ultimately, entrance into STEM careers. On the other hand, the pathway model recognizes that many individuals pursue STEM careers through multiple routes. Although the pipeline model may apply for a majority group in STEM positions, the pathway model suggests that the underlying problem with inclusive STEM is not an undersupply of graduates, but the existence of barriers that may undervalue the pathways taken by women and people of color. Central to overcoming these barriers is the cultivation of human and social capital, which refers to intangible traits such as knowledge, habits, and experiences, as well as interpersonal relationships and shared values and culture.

Ultimately, having multiple pathways to develop human and social capital is at the core of improving opportunity and is essential to strengthening and diversifying Oregon's talent base. This is true at all levels of the talent pipeline: in pre-K and elementary schools, in middle and high schools, in colleges and universities, and for lifelong learners. Oregon's formal and informal systems for education and skills development must support a thriving base of talent and ensure that this talent has clear pathways to reach new opportunities, whether they are in STEM fields; as entrepreneurs; or in other areas of personal, economic, or societal interest. Oregon's K-12 schools, universities, community colleges, and workforce development providers, which are widespread throughout the state, present a strong opportunity to cultivate STEM pathways and ought to work to minimize existing barriers.

Oregon's STEM Goals:

The STEM Investment Council and its partners have identified the following goals, each with a set of associated strategies, indicators, performance metrics, and evaluation methods.

Goal 1: Inspire and empower our students to develop the knowledge, skills, and mindsets necessary to thrive in a rapidly changing, technologically rich, global society.

Goal 2: Ensure equitable opportunities and access for every student to become a part of an inclusive innovation economy.

Goal 3: Continuously improve the effectiveness, support, and number of formal and informal P-20 STEM educators.

Goal 4: Develop a sustainable funding and policy environment for STEM and CTE that provides reliable, seamless, and sufficient support across biennia.

Source: Oregon STEM Investment Council

An important competitive advantage for Oregon is that it is a place that people want to live and work. The 2019 *Innovation & Entrepreneurship Benchmarking and Best Practices Study* finds that Oregon has an above-average performance

with its concentrations of STEM and management/finance workers, as well as its ability to attract knowledge workers from outside of the state. However, these areas also show declining trend lines, which suggests Oregon's competitive positioning in regard to talent may be slipping.

Oregon has several efforts focused on increasing talent and skill level across the state. Oregon's STEM Investment Council recently approved its 2021-2025 Education Plan that aims to address the disconnect between the in-demand skills and talent sought after by Oregon's employers. The plan notes that the current number of young Oregonians emerging from the education system who possess such skills and talent is a threat to the competitive capacity of Oregon's economy. Recognizing the need for a path to readiness for highly skilled, high-paying jobs in an evolving economy, the STEM Education Plan identifies student learning benchmarks and calls out the urgent need and opportunity to effectively engage more students in STEM, especially students from communities of color and families in poverty. The "applied curiosity" nature of STEM education clearly is tied to creating a strong innovation-based economy.

The Oregon Talent Assessment,¹⁹ completed by the Oregon Workforce Talent and Development Board in 2018, similarly highlights where the state can improve to build and retain a skilled workforce. The Talent Assessment signaled a strong need for occupations, such as engineers, important to innovation-based economic development. Businesses have found success through training their current workforce and strengthening the talent supply chain through externships, internships, and other similar workplace learning initiatives. In addition, business associations have been effective collaborators and connectors for industry because they are able to support employers' quickly evolving training needs at the speed of business.

A ROBUST R&D ENTERPRISE CAPABLE OF TACKLING OUR TOUGHEST PROBLEMS

In July 2020, the U.S. House Budget Committee held a hearing on "Fueling American Innovation and Recovery: The Federal Role in Research and Development."²⁰ The hearing clearly showed why R&D matters (especially now, as the nation remains gripped by the COVID-19 pandemic), why the federal commitment to R&D is critical, and how increased federal investments could enhance and expedite the nation's recovery efforts.

The hearing can be summarized by the following statement by Dr. Sudip Parikh, CEO of the American Association for the Advancement of Science: "Science and engineering are more important now than ever in our national preparation and response to current crises, including COVID 19 but also ongoing challenges such as climate change and economic competitiveness." For example, decades of investments in the life sciences and biomedical research, such as the Human Genome Project, have built immense genomics and biotechnology capabilities. As a result, in 10 months, scientists have gone from the first isolation of the coronavirus to its complete molecular characterization and the development and deployment of a vaccine.

Retaining global leadership in innovation will require substantial investments of public resources. Despite its immense importance, federal R&D funding as a share of the economy has fallen from a peak of 1.9 percent in the mid-1960s to less than 0.7 percent in 2018.²¹ In 1960, the nation drove worldwide developments in science and technology by virtue of the size of its investment, leading the world with 69 percent of global public and private R&D funding. But other countries increased their investments, and by 2018, the U.S. share of global R&D expenditures had fallen to just 28 percent.²² Moreover, preliminary 2019 data indicate that China may have now overtaken the United States in total R&D spending for the first time – emerging as an increasingly strong competitor with a long-term strategic plan for increasing its R&D funding, intellectual property acquisition, and high-tech manufacturing. The

¹⁹ Oregon Talent Assessment, September 2018.

²⁰ House Committee on the Budget, "Fueling American Innovation and Recovery: The Federal Role in Research and Development," July 8, 2020.

²¹ <https://nces.gov/pubs/nsf20307/#data-tables&>.

²² <https://nces.gov/pubs/nsb20203>.

greatest global competition will be for leadership in the multiple, revolutionary technologies that are converging simultaneously: biotechnology and gene-editing, nanotechnology, artificial intelligence, autonomous systems, and a new phase of the digital revolution linked to big data and widespread deployment of sensors. These platform technologies have the potential to transform and disrupt industries, markets, and jobs across sectors; to raise productivity and living standards; and to provide solutions to the challenges we face in health, energy, food production, clean water, and sustainability.

Research universities are increasingly expected to be drivers of economic development, serving as local sources of innovation. Regional industry clusters that form around universities and federally funded research centers increase the inventive activities of nearby firms, accelerate the creation of new startups, attract additional private R&D investment, and advance regional economic opportunities – creating jobs in both the short and long term. A robust base of R&D is critical to the ideation process, and as a result, this Innovation Plan requires a robust R&D enterprise, with high-quality infrastructure and incentives in place to encourage investments in innovation.

At the heart of the world's most vibrant innovation economies is an R&D base that can generate new knowledge, which in turn can be transitioned into new products, services, or companies. Formally, this research base is found throughout private industries, at colleges and universities, in federal labs (like the National Energy Technology Laboratory [NETL] in Albany), and by other nonprofit or public research institutions. In Oregon, this multisector R&D enterprise performed nearly \$8.6 billion in 2017, according to data from the National Science Foundation (NSF).²³ R&D intensity in Oregon (R&D as a share of state GDP) is estimated at 3.8 percent, which ranks 7th nationwide. This robust R&D enterprise, with strong contributions from both the public and private sector, is a strong competitive advantage for Oregon.

Beyond its role in driving ideation, R&D also helps address fundamental problems facing society. From Oregon's forest fires to the COVID-19 pandemic, this year has underscored the importance of innovation to helping address society's toughest problems. Recent innovative research at Oregon's colleges and universities speaks to this ability to help address shared challenges:

- A team led by David Blunck of Oregon State University's College of Engineering is leading a four-year \$2.1 million effort to better predict how forest fires and blazes behave, including how they generate fire-spreading embers. The effort is funded through a partnership between the U.S. Forest Service and the U.S. Department of Defense, and comes on the heels of Oregon's most expensive wildfire seasons ever.
- An award from the NSF to University of Oregon chemist Victoria DeRose is enabling 3D modeling of coronavirus RNA structures. This has the potential to provide leads for the development of therapeutic interventions against the COVID-19 pandemic.
- Oregon Health & Science University is establishing an emergency critical care network to not only assist with Oregon's ongoing waves of COVID-19 cases, but also help in the long term in the event of a natural disaster that overwhelms local hospital capacity. The U.S. Army is funding the project as a proof of concept at OHSU, as well as at eight other institutions across the country.

One bright spot related to university-based R&D is the collaborative culture and big-picture thinking expressed by Oregon's colleges and universities. While many instances stand out, the following are notable examples:

²³ National Science Foundation, National Center for Science and Engineering Statistics 2019. *National Patterns of R&D Resources: 2017–18 Data Update*. NSF 20-307. Alexandria, VA. Table 10. Available at <https://ncses.nsf.gov/pubs/nsf20307>.



- Phil and Penny Knight Campus for Accelerating Scientific Impact has an ambitious initiative to fast-track scientific discoveries into innovations that improve the quality of life for people in Oregon, the nation, and the world.
- Oregon State University is leading a national effort to study adding innovation and entrepreneurial achievements into the criteria for higher education faculty promotion and tenure.
- Invent Oregon (InventOR) is a state-wide competition for college and university students with ideas for inventions to address today's most pressing problems that is supported in part by the Lemelson Foundation and other public-private partners. Through the program, students are empowered to see themselves as innovators. The schools and students receive funding and mentoring support as they develop their inventions. Most of the participating students are from schools that have not had the expertise or resources to run previous competitions. The competition culminates in a finals event where teams present their inventions and compete for cash prizes.
- Five universities (OHSU, the University of Oregon, Oregon State University, Portland State University, and Oregon Tech) have formalized agreements, so scientists can share specialized laboratories and centers housed in university facilities across Oregon – including major campuses in Portland, Eugene, Corvallis, and Klamath Falls.²⁴

It is important to note that the Innovation Plan is by no means limited to those businesses emerging from university or industry laboratories. A wide range of enterprises across a wide range of traded-sector industries are or have the potential to become extremely innovative. Just as the case with university-based spinouts, these businesses also require a combination of value-added services, access to risk capital, and connections to customers or other resources to ensure their sustainability and guide future growth opportunities.

²⁴ Oregon Health & Sciences University, "OHSU Joins OSU, PSU, UO, OIT on New Agreements to Share Research Facilities," December 2019

GLOBAL HEADWINDS DRIVING THE NEED FOR OREGON'S INNOVATION PLAN

Multiple disruptive global macroeconomic forces (headwinds) affecting economic development, demographics, and the changing nature of work – many of which have accelerated since the COVID-19 pandemic – are expected to impact Oregon's ability to support economic development in the future. Understanding these trends and their potential impacts is critical to developing a responsive plan that embraces the ongoing shifts and leverages them to catalyze the state's economic growth. The disruptive trends are discussed below.

HEADWIND 1: THE INCLUSION IMPERATIVE

While advancements have improved the lives of many in technology-based industries, the benefits are not always equally distributed. A considerable portion of the U.S. population has historically and structurally been denied access to participate in the innovation-based economy, especially women and people of color (including Black people, Latinx, Native Americans, and other groups). Recent research shows that these groups are underrepresented in STEM education attainment, STEM occupations, and among leading inventors and patent recipients.²⁵

Analysis by the Harvard-based Opportunity Insights Project finds that persistent inequality in STEM outcomes could be hindering U.S. innovation, and as a result, broader economic prosperity. Its research shows that if women, people of color, and children from low-income families became inventors at the same rate as white men from high-income families, innovation in the United States could increase as much as four-times.²⁶

An imperative for this Innovation Plan is to grow the state's economy through innovation without exacerbating the challenges associated with underrepresentation, persistent poverty, and growing inequities. **In other words, Oregon must strive to foster inclusive economic growth.**

Research from the Philadelphia Federal Reserve defines inclusive economic growth by those who can participate in and drive new development in the economy.²⁷ Accomplishing inclusive growth requires an understanding of the dynamics driving economic growth and identifying areas where inclusion can enhance growth across all areas. "Inclusion is not an afterthought or a separate set of programs, but rather, it's an integral part of all growth activity. Inclusive growth is one activity, not two," according to the report.

In a practical sense, this means that activities to support inclusion should be strategically embedded in all economic development efforts. Areas of economic development strategies where inclusive growth frameworks can be applied include innovation and entrepreneurship, industry clusters, human capital development, and improvements in the built environment and placemaking. Within these areas, there is a role for intentional programs and activities that seek to encourage economic mobility and broader participation in the regional economy's growth sectors.

By focusing on the entirety of the innovation ecosystem, this Innovation Plan can effectively serve as a lens for inclusive economic growth. Ultimately, there is no one-size-fits-all approach to increasing access to the innovation ecosystem for populations presently underserved in this space. Instead, there is a need to use a holistic approach to identify the barriers faced by different communities and the various opportunities to drive inclusivity into the system.

25 Information Technology and Innovation Foundation, *The Demographics of Innovation in the United States*, 2016; and Brookings, *The Hidden STEM Economy*, 2016, among others. .

26 Rebecca Linke, Massachusetts Institute of Technology (MIT), "Lost Einsteins: The US may have missed out on millions of inventors," February 2018.

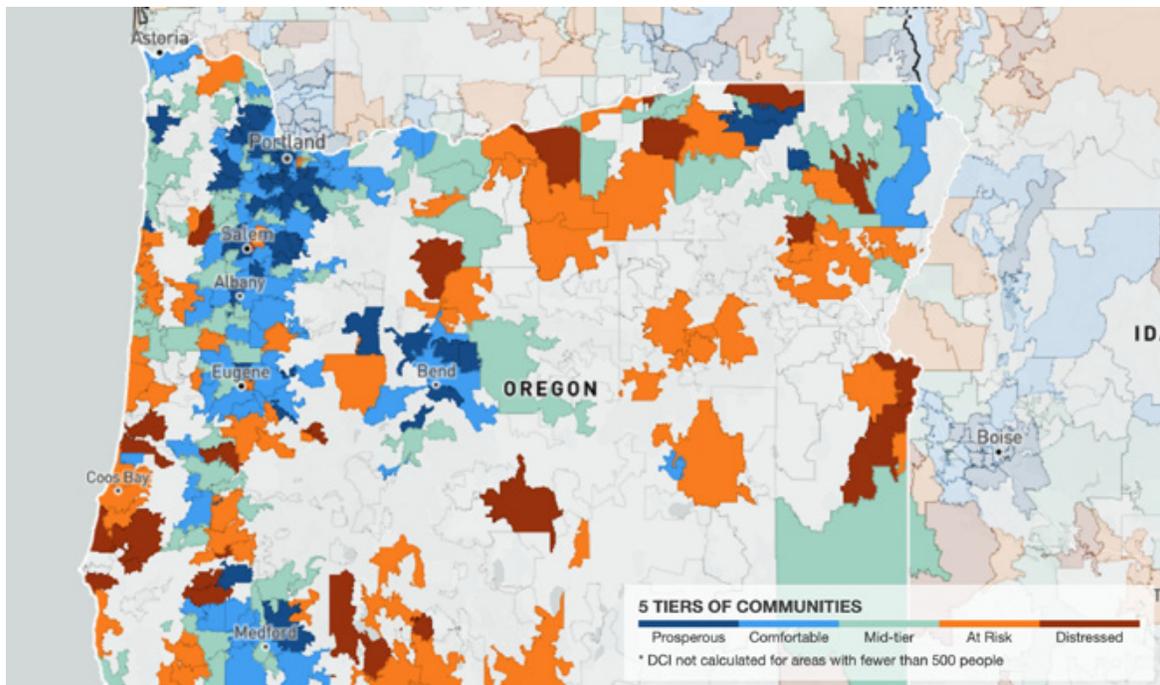
27 Paul C. Brophy, Robert Weissbourd, and Andy Beideman; prepared for the Federal Reserve Bank of Philadelphia; *Transformative Economies: Emerging Practices for Aligning Growth and Inclusion*; 2017.

HEADWIND 2: GEOGRAPHIC DIVERGENCE

The spatial concentration of innovation assets – colleges and universities, risk capital, private-sector R&D labs, and population/talent centers – has profoundly impacted Oregon’s ability to deliver broad-based economic growth to every corner of the state. While some areas of the state are prime to thrive in the 21st century knowledge-based economy, other regions are struggling to compete.

One way to paint the picture of Oregon’s geographic divisions is through the Distressed Communities Index, an analysis of economic well-being at the zip code level. Developed annually by the Economic Innovation Group, the index combines seven distinct and complementary socioeconomic indicators into a single score that depicts how economic well-being in a community compares with its peers (e.g., changes in education, poverty, labor force participation, employment, housing vacancies, incomes, establishments).²⁸ Figure 8 shows how Oregon’s zip codes rate according to this index.

FIGURE 8: COMMUNITIES IN OREGON ACCORDING TO INDEX OF ECONOMIC DISTRESS



Source: Economic Innovation Group, *Distressed Communities Index*, 2020.

Twenty-seven percent of Oregon’s population lives in a prosperous community, while four percent lives in a distressed community, according to the index. Perhaps unsurprisingly, Oregon’s most prosperous communities are heavily concentrated in the Portland Metropolitan area, the Willamette Valley, and Bend. While there are thriving and comfortable communities throughout Oregon, the state’s rural areas are generally more distressed or at risk of becoming distressed.

Using innovation as a lens to explore geographic divergence, especially as it relates to entrepreneurship and economic development more broadly, this Innovation Plan intends to identify new ways to share 21st century prosperity with communities in all corners of the state. Ultimately, as with diversity and inclusion, there is no one-size-fits-all approach to increasing access to the innovation ecosystem for populations presently underserved

²⁸ Economic Innovation Group, *Distressed Communities Index*, 2020.

in rural geographies. Instead, there is a need to use a holistic approach to identify the various opportunities to drive innovation-based growth throughout the state.

HEADWIND 3: STRUCTURAL DECLINES IN ENTREPRENEURSHIP

“Many economists point toward the low rate of entrepreneurship as one key reason for low productivity growth,” according to a recent study from the Oregon Office of Economic Analysis. “After all, new products and services are usually brought to market by young companies who seize the opportunity to improve efficiencies and generate profits. COVID-19 may further entrench these trends.”²⁹ Indeed, numerous independent studies over the past several years, using different ways to measure the growth and success of startups and entrepreneurship, all point to the same conclusion: the decline in U.S. entrepreneurship impedes economic growth. Examples of studies include the following:

- A study by the National Bureau of Economic Research (NBER) shows that startup activity has been slowing down nationally for about three decades, dropping sharply over the past 10 years. New firms accounted for about 13 percent of all companies in the late 1980s, but only about 8 percent two decades later. In the 1980s and 1990s, a small number of young, innovative, and dynamic companies grew at very high rates. But, in the post-2000 period, startups contributed less to U.S. job creation than they did in earlier decades.³⁰
- A study by the Brookings Institution finds that the startup rate (the number of new companies as a percentage of all firms) has fallen by nearly half since 1978.³¹
- An analysis by the Federal Reserve Bank of St. Louis reports that, while startups are essential for economic growth at the national level, the share of employees in startups has been declining for more than a decade: from 2.2 percent in 1994 to 1.4 percent in 2018.³²

Perhaps more troubling, a recent study found many small businesses had little cash on hand toward the beginning of the COVID-19 pandemic.³³ This suggests that they will either have to dramatically cut expenses, take on additional debt, or declare bankruptcy. This analysis indicates that new funding to support these companies might impact medium and longer-term outcomes.

Taken together, entrepreneurship was facing structural decline before the pandemic, and the repercussions of the recent unprecedented economic declines are yet to be determined. Improving the success and stability of Oregon’s startups so that they not only survive but continue innovating and scaling is critical to this plan. Strategies that specifically target short-, mid-, and long-term horizons will be essential.

29 Josh Lehner, Oregon Office of Economic Analysis Blog, “Economic Dynamism in Oregon,” October 2020.

30 Ryan A. Decker, John Haltiwanger, Ron S. Jarmin, and Javier Miranda; “Where has all the skewness gone? The decline in high-growth (young) firms in the U.S.,” NBER Working Paper No. 21776; January 2016.

31 The Brookings Institution, *What’s Driving the Decline in the Firm Formation Rate? A Partial Explanation*, November 2014.

32 Federal Reserve Bank of St. Louis, “Trends in Startups’ Share of Jobs in the U.S. and Eighth District,” Regional Economist, Q1 2020.

33 Proceedings of the National Academy of Sciences Research Article, “The impact of COVID-19 on small business outcomes and expectations,” July 2020.

HEADWIND 4: CHANGING RELATIONSHIP BETWEEN TALENT AND PLACE

A central question in economic development has long been whether people follow jobs or whether jobs follow people. For generations, company attraction policies focused on business climates that included low tax rates and/or a minimal licensing/regulatory environment were a favored approach for practitioners and policymakers, all with the assumption that attracting companies would in-turn attract talented people and ensure economic growth.

Although many jobs related to natural resources or geographic advantages are still tied to specific places, the rise of the knowledge economy has turned the classic notion of “people following jobs” on its head. Now, amenities, quality of life, and access to talent are heavily tied to a sense of place. Placemaking, or efforts to encourage a sense of place, is increasingly driving the location decisions for both companies and people. As urban economic development researcher Richard Florida notes, “Highly skilled and talented people – the knowledge and professional workers, artists, musicians, and media workers that comprise the creative class – have the ability to pick where they want to live and then create and attract companies.”³⁴

The fallout from the COVID-19 pandemic has only accelerated the importance of place and the trend of remote work. For example, research from the online jobs posting company Indeed found that both searches for remote work and companies advertising for jobs with flexible working arrangements were growing rapidly.³⁵ The expansion of these digital living and working environments, otherwise known as “Zoomtowns,” has occurred throughout the nation, including in Oregon.

In-migrants from both inside and outside of Oregon are choosing towns throughout the state because of their quality of life and access to amenities, not because of a commute. While these newcomers present opportunities, they also present challenges. Research finds that these communities face a range of planning and development challenges in areas such as housing affordability, cost of living, congestion, and the preservation of a small-town ideal.³⁶

Overall, understanding the relationship between talent and place offers an opportunity to ensure that all regions within a state have the opportunity to attract and retain skilled workers and experience positive economic growth without profound ill effects.

HEADWIND 5: AUTOMATION AND THE FUTURE OF WORK

While it remains to be seen precisely how digitization, automation, and artificial intelligence will transform the future of work, it is expected that the economic and societal repercussions of this technological change will be immense. For example, research from the Brookings Institution estimates that, by 2030, roughly 25 percent of U.S. employment will have experienced high exposure to automation, while another 36 percent will experience medium exposure.³⁷

While technology-oriented industries such as software have adjusted to remote work somewhat seamlessly, many other sectors of the economy have had to invest in automation to help adjust to the market conditions presented by COVID-19. As companies struggled to find and retain workers throughout 2020, many began purchasing new industrial robotics equipment to accommodate. For example, the recent *2020 Honeywell Integrated Automation Investment Study* finds that e-commerce (66 percent); grocery, food, and beverage (59 percent); and logistics (55 percent) industries are most willing to invest more in automation.³⁸

34 Richard Florida, Bloomberg CityLab, “Do Jobs Follow People or Do People Follow Jobs?” May 2017.

35 Indeed, “Searches for Remote Work Surge on Indeed: Analyzing the Trend,” April 2020.

36 Philip Stoker, Danya Rumore, Lindsey Romaniello, and Zacharia Levine; “Planning and Development Challenges in Western Gateway Communities”; *Journal of the American Planning Association*; August 2020.

37 Brookings Institution, “Automation and Artificial Intelligence: How machines are affecting people and places,” January 2019.

38 Honeywell, “Companies Planning To Increase Automation Investments Due To COVID-19, Honeywell Study Shows,” July 2020.

Although automation has been an ongoing trend, its acceleration poses a particular threat to Oregon's economy, especially as it relates to food and manufacturing. A 2017 report commissioned by the Portland Business Alliance sheds light on automation trends and what it means for the future of work in Oregon. Importantly, its analysis finds that manufacturing is the third-largest sector in the state in terms of automation risk as it relates to employment (trailing food services and retail). Of the more than 160,000 manufacturing jobs identified in 2016, approximately 56 percent are at high risk for automation, and an additional 20 percent are at mid-risk. More recently, a 2019 report from Oxford Economics found that "Oregon is the most vulnerable state in the U.S. to a future acceleration in robot installations."³⁹

While automation in industries like manufacturing is here to stay, it also offers excellent potential. Even if technological change displaces some jobs, the workers who remain employed and subsequent new hires will benefit. Recent research also finds a positive relationship between technological change at the county-level and individual-level satisfaction. The authors find that technological change is associated with robust positive effects on Gallup data on individuals' sense of empowerment and life satisfaction. They suggest that structured managerial practices may be most effective for mediating the emergence of artificial intelligence and automation.⁴⁰

Understanding the future of work and focusing on critical headwinds related to automation and workforce development in the innovation economy offers Oregon an opportunity to take a proactive approach. Ensuring that efforts to support innovation-based economic growth are centered on the individual – the innovator – is critical.

SUMMARY

Understanding the critical forces impacting Oregon is a crucial element in designing proactive approaches that support the state's innovation ecosystem. From ideation through company growth and scalability, there are significant challenges within the state's innovation ecosystem, ranging from disparities in resources to a disconnect between risk capital and service providers. At the root of overcoming these challenges is a heavy reliance on critical dependencies that must be addressed in areas ranging from broadband, to skills and talent, to a robust R&D enterprise. The innovation ecosystem is also challenged by global headwinds that continue to shift and evolve the economic landscape.

While these challenges are significant, they are not insurmountable. Oregon's Innovation Plan has been designed to help the state address these challenges through intentional collaboration between the public and private sectors.

³⁹ Oxford Economics, "How Robotics Change the World," 2019.

⁴⁰ Christos Makridis and Joo Han, *Future of Work and Employee Empowerment: Evidence from a Decade of Technological Change*, August 2020.

OREGON'S 10-YEAR INNOVATION PLAN

THE INNOVATION PLAN'S STRATEGIC FRAMEWORK

If Oregon is to succeed in the knowledge economy, it must ensure its competitive position through four means:

- Oregon must have traded-sector industries that **constantly innovate**, not only the products that they make but also the technological processes that they use to make them.
- Oregon must foster a robust **entrepreneurial ecosystem** that ensures entrepreneurial support services are available that address the continuum of needs from ideation to early-stage startups to scalable enterprises.
- Oregon must have **financial capital markets** receptive and prone to investing in innovative firms and entrepreneurs that are developing and applying cutting-edge technologies to products and processes.
- Oregon must **promote** itself as a place to start and grow an innovative company, and enable firms to stay in the state as they scale.

Oregon's 10-year innovation vision is captured in the following statement, which is both bold as well as realistic.

VISION

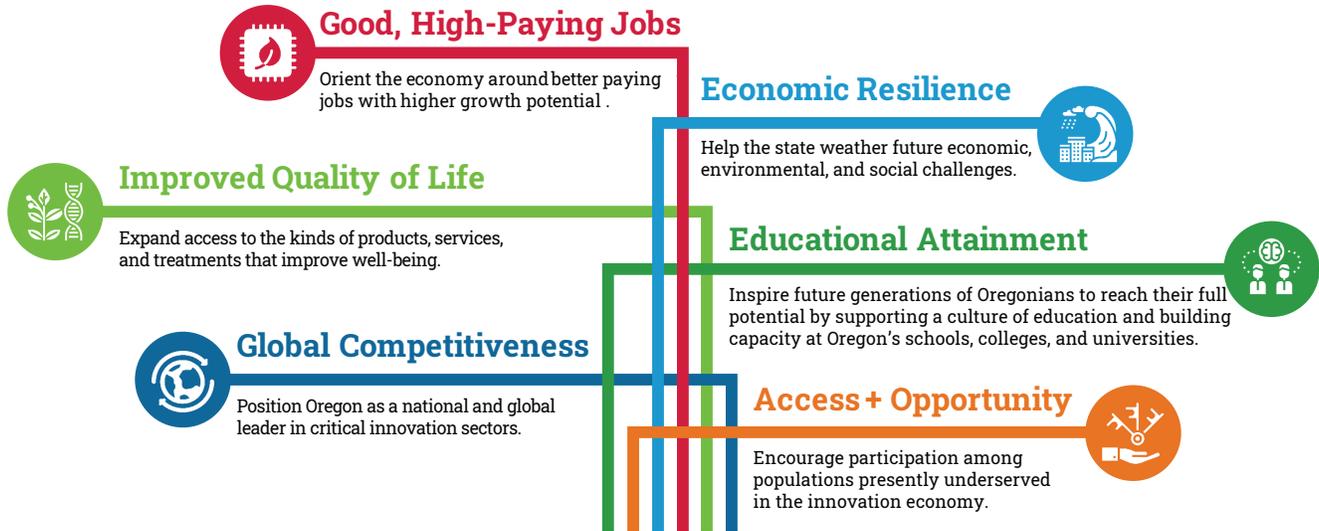
In 10 years, Oregon is globally known as a model for a diverse, inclusive, and resilient economy: a place where innovative people solve the greatest challenges of our times to create novel, sustainable products, processes, and companies that drive economic growth.

To achieve this Vision, Oregon, serving as a steward for all its citizens, will support investments and policies through public-private-philanthropic partnerships that:

- Create and promote a diverse and inclusive innovation ecosystem that cultivates inventors, entrepreneurs, and leaders of innovation-driven enterprises.
- Intentionally ensure that historically underserved groups are fully integrated into the innovation ecosystem and have an equal opportunity to lead and prosper.
- Strengthen Oregon's unique industrial and natural resources.
- Create an unparalleled quality of life by supporting citizens and businesses striving for economic, societal, and environmental resilience.

By achieving this vision, Oregon will help ensure the state’s future economic vitality. Examples of anticipated economic and societal impacts that will be realized through the successful implementation of this 10-year Innovation Plan can be found in Figure 9.

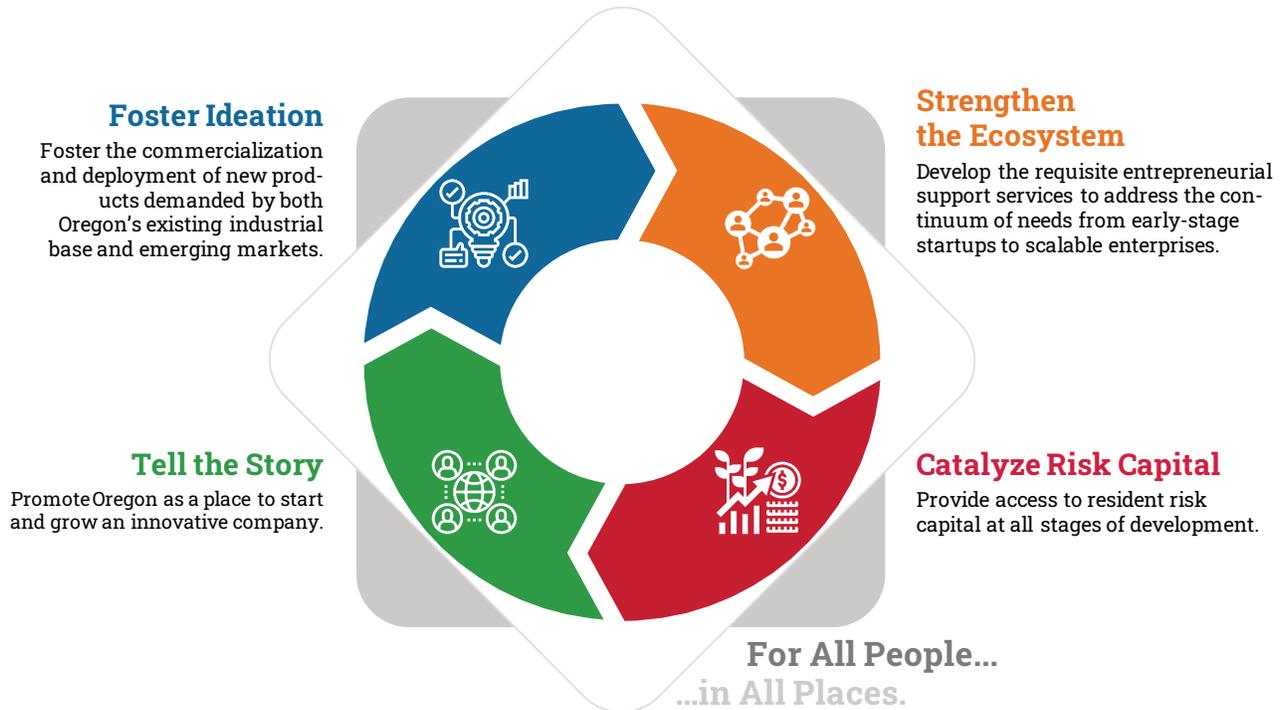
FIGURE 9: IMPACTS OF INNOVATION-BASED ECONOMIC DEVELOPMENT



Source: TEconomy Partners, LLC.

Strengthening an innovation ecosystem does not happen on its own, but rather through a series of intentional, strategic, and proactive decisions. The Innovation Plan has been designed to be driven by public-private partnerships that capitalize on Oregon’s comparative advantages while ensuring that future investments are focused on building the innovation, knowledge, and capital that will help ensure Oregon’s economic vitality for all people in all places for years to come (Figure 10).

FIGURE 10: OREGON'S 10-YEAR INNOVATION PLAN STRATEGIC FRAMEWORK



Source: TEconomy Partners, LLC.

It is proposed that Business Oregon and its strategic partners initiate a set of four strategies and an associated set of 10 actions to leverage and complement existing efforts while seeking to overcome existing innovation/entrepreneurial challenges and help catalyze long-term economic growth across the state (Figure 11). To guide investments, this Innovation Plan is intended to be both an actionable but amendable document, with a wide range of proposed short- and long-term actions to address gaps in Oregon's innovation ecosystem.

FIGURE 11: OREGON'S 10-YEAR INNOVATION PLAN ROADMAP

<p>Strategy 1: Foster Ideation – Catalyze the commercialization and deployment of new products/services within Oregon’s existing traded sectors as well as emerging markets.</p> 	
Action 1:	Support Centers of Innovation Excellence that leverage Oregon’s existing traded-sector strengths and emerging market opportunities.
Action 2:	Leverage and expand sources of nondilutive capital to catalyze the commercialization of new innovations.
Action 3:	Support early-stage innovation within Oregon’s university, college, and other research settings, ensuring opportunities for all people in all places to connect to resources.
<p>Strategy 2: Strengthen the Innovation Ecosystem – Develop a systemic, regionally based entrepreneurial service delivery system.</p> 	
Action 4:	Create Regional Innovation Hub designations that will fund and incentivize collaboration to build and advance innovation-focused ecosystems, ensuring opportunities for all innovation-based businesses throughout Oregon.
Action 5:	Link talent to innovation efforts.
<p>Strategy 3: Catalyze Access to Risk Capital.</p> 	
Action 6:	Foster the further development of Oregon’s risk-capital stack.
Action 7:	Incentivize angel investments in Oregon’s innovation-based firms.
Action 8:	As deal flow increases across the state, focus efforts to drive more of the Oregon Growth Account’s investments to Oregon’s businesses.
<p>Strategy 4: Brand Oregon as The Place for Innovation – Tell Our Story.</p> 	
Action 9:	Develop Oregon’s Innovation Brand and market within the state – the brand should be aligned with and leverage Oregon’s existing strengths.
Action 10:	Develop an external marketing campaign that showcases Oregon’s unique identity and competitive strengths in innovation.

Source: TEconomy Partners, LLC.

The details regarding each strategy and subsequent action are outlined in the narrative that follows.

Strategy 1: Foster Ideation – Catalyze the commercialization and deployment of new products/services within Oregon’s existing traded sectors as well as emerging markets.

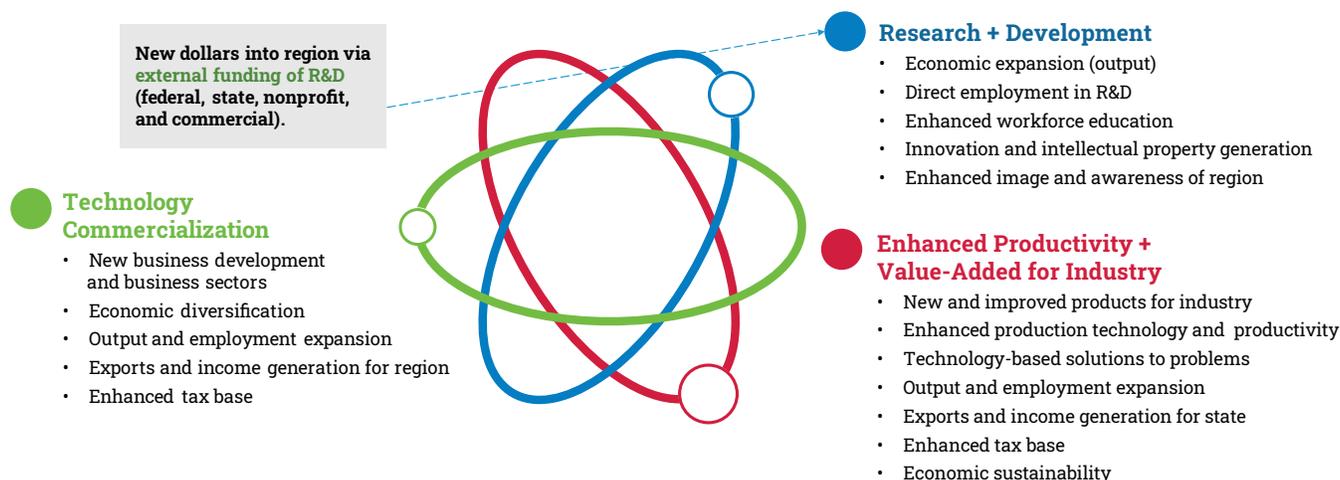
As illustrated in Figure 12, innovation is a key driver of economic growth, the creation of high-quality jobs, and rising standards of living – explaining not only the differences in economic growth among nations, but also at the level of state and regional economies. The World Economic Forum in its highly touted Global Competitiveness Report explains as follows:

“If you want to have good ideas, you must have many ideas”

Linus Pauling
1954 Nobel Prize for Chemistry
1962 Nobel Peace Prize

In the long run, standards of living can be expanded only by technological innovation.... This requires an environment that is conducive to innovative activity, supported by both the public and the private sectors.⁴¹

FIGURE 12: INNOVATION-LED DEVELOPMENT IS A KEY DRIVER OF ECONOMIC GROWTH



Source: TEconomy Partners, LLC.

The U.S. economy has always been carried upon the back of inventiveness and creativity, so the “innovation economy” per se is not a new phenomenon; rather, it is more accurate to say that innovation has increased in importance as the primary impetus of economic growth and competitiveness. Two fundamental forces are driving the preeminent importance of technology and knowledge advancement as the determinant of economic success:

- The first of these is the rapidly accelerating pace of scientific discoveries and the technologies that these discoveries give rise to (advances in genetics, for example, have dramatically accelerated the discovery process in the biosciences). The opportunity to speed the discovery and development processes, in concert with the ability to protect and profit from intellectual property (IP), is leading to an innovation race among competing countries, states, and regions.
- The second fundamental force is the globalization of world markets and the increasing pressure to maintain a high-wage/high-skill employment base through consistently staying ahead in technology and productivity.

⁴¹ World Economic Forum, *The Global Competitiveness Report 2010–2011*, p. 8.

Research institutions that support ideation are committed to fostering entrepreneurial development and facilitating commercialization of market-relevant findings – emphasizing that faculty roles are not limited to education, research, and public service, but include contributing to economic development. It is important to note that R&D will not “magically” pass over the transom from research to market – from university to business. Initiatives must be put in place to facilitate the commercialization of research discoveries.

Unless domain expertise is available to develop an idea or approach, conduct further applied research, undertake due diligence, or expose the research to people with differing perspectives, ideation will not occur. In addition, nondilutive sources of capital, such as prototype-development and proof-of-concept funds, must be available to the domain experts in order to be able to advance the ideas.

The following six key tactics will be necessary to accomplish this Innovation Plan over the next 10 years:

- **Build connections** among and between research institutions and industry. Oregon’s research assets and resources are considerable; but, because they are spread across multiple regions and organizations, they are not always optimized nor are potential partners aware of them. Building a world-class reputation and stature in key fields and ensuring that the research agendas of these institutions address industry interests require increased connectivity among and between higher education and private research organizations and industry. State investments should require evidence of consortium building across regions, institutions, and other organizations. Performance will be judged not only by the concrete research and commercial results of the respective organization, but also by the inclusiveness and broad participation of regions and industries in their day-to-day operations.
- **Focus investments** in core technology competencies. Oregon’s fiscal situation alone indicates that the state cannot and must not simply invest in more funds for higher education indiscriminately in all fields and areas. As Oregon’s economy improves, further investments to improve the state’s higher education base are needed. In the short- to mid-term, the state must focus its limited resources on those areas in which its research enterprises – public and private – can (1) excel as world-class institutions and (2) contribute to and address the research and technology competitiveness issues involving the common core technology areas critical to Oregon’s industry base, now and in the future. These sectors can also be used as a lens to drive inclusive economic growth, particularly through the involvement of intentional efforts to connect diverse researchers and entrepreneurs with capital, customers, and resources. Core technology competencies can also inform skills and talent development and the support for higher-wage, middle-skill occupations.
- **Establish means to better ensure commercialization capabilities** to drive the research agenda. To differentiate Oregon’s approach to innovation investments, they must (1) be integrally tied to and require establishment of mechanisms, approaches, tools, and programs that link industry to research problems; and (2) have seamless efficient systems to pull research and its associated technologies quickly into the private marketplace to address real needs. This, of course, is more likely if industry is involved initially in problem definition. But, this differentiation also requires that financial support be provided for market assessments of research, adequate nondilutive risk capital be available around which to form firms with breakthrough prospects, and licensing and technology transfer is predictable and realistic.
- **Encourage building of multiple, reinforcing relationships** among institutions and firms. Collaboration through multidisciplinary research teams is increasingly driving the research enterprise in both higher education and industry. Individuals with backgrounds and expertise in diverse fields are being brought together to address transdisciplinary fields. Higher education institutions building stature and reputation are recruiting interdisciplinary teams of talent and expertise. To the extent that this expertise can be brought together across higher

education institutions and between higher education and industry, Oregon can more quickly build its capacity in certain core technology areas through collaboration. “Networks” of collaborators can result from these efforts, which contribute to building a critical mass of research expertise and, ultimately, a critical mass of technologies, product expertise, and clusters of firms. Concentrations of research knowledge and related industry strengths already have begun to form, and further state investments can further speed and scale these efforts.

- **Provide discretionary funding** support to encourage institutional partners to seek and secure new opportunities. The state’s investments in building research capacity also must include support to encourage education/industry joint ventures to seek and secure federal and private funds and designations that create centers, institutes, and major programs in Oregon. Having planning funds to put together joint ventures and encouraging private-public partnerships can help Oregon secure federal centers, institutes, and further discretionary funding.
- **Differentiate, to the extent necessary, approaches to support the building of emerging, new industries and improve the competitiveness of existing industries.** Oregon’s focus should be on product innovation. This means that Oregon does more to encourage product development, product design, and market distribution functions in the state’s firms. It also means further strengthening Oregon’s traditional capabilities in manufacturing production and natural resource processing. A strong link exists between design and development and manufacturing; however, the ways in which firms link to these activities will vary and the state’s role and support also will vary. If Oregon is to truly become the applied innovation state, it is important that these functions be integrally linked and that no artificial silos be created between product design and development and product manufacturing.

It is proposed that Oregon pursue three targeted actions to catalyze the commercialization and deployment of new products/services within Oregon’s existing traded sectors as well as emerging markets.

Action 1: Support Centers of Innovation Excellence that leverage Oregon’s existing traded-sector strengths and emerging market opportunities.

Oregon has a history of supporting Centers of Innovation Excellence, whether it be through its Signature Research Center (SRC) program or through stand-alone investments in initiatives such as the Oregon Manufacturing Innovation Center (OMIC) (see Appendix 1). These centers serve as a pillar of the state’s innovation-based economic development efforts and were created as public-private partnerships that concentrate their efforts on developing the talent, funding, facilities, and support services in industry sectors where Oregon has a competitive advantage. However, changes to the SRC program over the years has caused some concerns that the SRC’s efforts have diminished as shifting priorities have led to uncertainty of mission and intent. In addition, no new centers have been brought on line in a number of years, leading others to question if emerging opportunities are being supported.

It is recommended that Centers of Innovation Excellence be reinvigorated to award new designations and re-envisioning existing efforts, building off the existing SRCs and other successful models like OMIC. The Centers of Innovation Excellence are designed to be specialized innovation centers focused on one of Oregon’s existing traded-sector strengths or an emerging global market opportunity. As such, they will do the following:

- Undertake applied R&D around the identified core innovation platform critical to Oregon’s traded-sector strength or emerging global market opportunity.
- Include industry-led applied research programs that are supported by a broad consortium of private-sector members.
- Partner with higher education institutions, including research universities, smaller colleges and universities, and research organizations in the projects and programs they undertake.

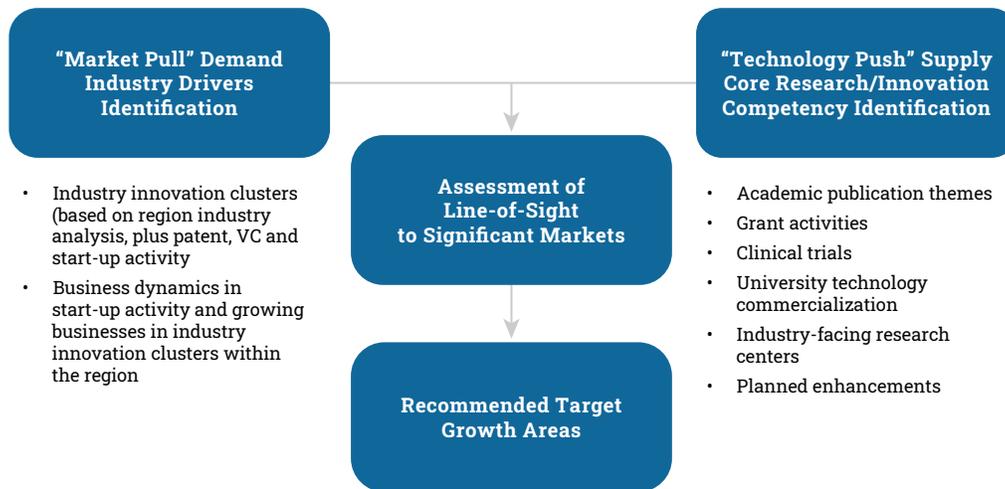
- Provide access to domain experts with market knowledge that can guide products/services through the commercialization continuum and successful market entry, regardless of location.
- Provide access to shared-use equipment that is commonly needed by the industry sector but is cost-prohibitive to startups and small companies.
- Provide nondilutive early stages of risk-capital funding, and also have the ability to take small equity stakes in the startups they help to create.
- Play an important role in building the state's educated talent base in the multidisciplinary fields required by the innovation platform work by offering new curricula, internships, and work-study opportunities, as well as increasing the pipeline of graduates.
- Help promote inclusive economic growth by intentionally collaborating with relevant and culturally specific organizations to support diverse entrepreneurs, promote talent development, and cultivate innovation-oriented, community-based partnerships.
- Deliver services statewide to meet opportunities wherever they are found.
- Leverage state funds over time with multifold increases in federal and industry support.

Importantly, the success of all Centers of Innovation Excellence will depend on Oregon's ability to appropriately address this plan's critical dependencies: access to broadband and high-quality digital infrastructure, connections to skills and talent, and a robust R&D enterprise. It is recommended that Centers of Innovation Excellence be created through peer-reviewed competitions. The following key criteria and evidence must be submitted with center applications to be considered for designation:

- Proposed existing traded-sector strength or emerging global market opportunity focus including evidence of market niches and market opportunities from this focus.
- Industrial consortium membership composed of key anchors and emerging firms, including evidence that the center has been designed to meet industry needs, including industry driving the research agenda and industry-desired services and functions being provided to turn research into market-driven innovation.
- Collaborative approaches proposed to make the consortium a reality, including evidence that applicable resources from various research institutions across the state have been brought together to maximize the speed at which scale can be established in the identified innovation area.
- Ability to promote diversity, equity, and inclusion within the sector, as well as approaches to encouraging innovation and economic development in areas outside of the Portland metropolitan area.
- Innovation and commercialization efforts and approaches and the likely result in benefits to Oregon's economy.
- Leverage of nonstate resources, including plans to increase funding match over time, recognizing that some ongoing state financial support will be needed even in the long term.

While Oregon could choose to hold an open competition with no additional guidance, it might behoove the state to first undertake a targeted innovation opportunities assessment to help guide its strategic investments in the Centers of Innovation Excellence. The intent of the opportunities assessment would be to identify the greatest strategic innovation/technology opportunities for Oregon by conducting a line-of-sight assessment that considers the "technology push" of research capabilities found across Oregon's research institutions and how they align with the "market pull" of industry innovation drivers found more broadly across the state (Figure 13).

FIGURE 13: TARGETED INNOVATION OPPORTUNITIES ASSESSMENT



Source: TEconomy Partners, LLC.

It is recommended that the line-of-sight opportunities assessment would include three specific steps:

- Step One: Assess industry-facing core research competencies across Oregon’s research institutions.
- Step Two: Conduct a detailed assessment of the innovation needs of Oregon’s existing traded-sector firms as well as areas of emerging market opportunities.
- Step Three: Identify innovation targets upon which investments in Centers of Innovation Excellence should be made. Once the targeted areas are identified, peer-reviewed competitions could be held to award Innovation Center designations.

It is also recognized that, for very early-stage emerging opportunities, it might be difficult to develop competitive proposals. It is recommended that consideration should be given to rethinking/restructuring the current High Impact Opportunity Projects as a means to “seed” potential future centers through pilot projects. The specifics of program implementation should be informed by identified needs, emerging best practices, and an evaluation of what worked well and what has not with pre-existing programs.

Finally, the performance of Centers of Innovation Excellence should be consistently and regularly monitored, with funding renewal dependent upon performance and economic impact. Initially, each center would receive an award for five years subject to ongoing adequate performance. However, the initial award would be for three years, with an assessment of each center during its third year; if assessed as adequate, the center would receive a two-year renewal. If inadequate, conditions of approval and/or a reduction in or elimination of funding could occur. An outside, independent evaluation could be commissioned at the beginning of the fifth year of operation to examine a center’s performance.

The primary consideration in this review is the extent to which the center has contributed across the state to commercial economic impact, industry competitiveness, innovation adoption, new firm creation, and ultimate job and wealth creation within its innovation focus area. If viewed as having performed within or beyond expectations, two-year renewals would be ongoing with an expectation that nonstate match would be increasingly leveraged as the center illustrated increasing success to the private and philanthropic partners.

Action 2: Leverage and expand sources of nondilutive capital to catalyze the commercialization of new innovations.

The presence of Centers of Innovation Excellence is critical for states seeking to grow their innovation-based economies. Research institutions generate knowledge and technology that provide the basis for creating firms and introducing products into the marketplace. Generating new discoveries, however, is necessary but not sufficient for growing innovative economies.

Research institutions find that potential market applications often go unrealized unless funding is available to develop an idea or approach, conduct further applied research, undertake due diligence, or expose the research to people with differing perspectives. As a result, it has become increasingly common for states and/or universities to provide funding for activities needed to determine the commercial potential of a discovery and to advance the technology to the point at which a commercial partner can be found. Proof-of-concept funds support prototype development, testing and validation, and marketing research and are usually provided in the form of a grant that does not require any repayment (nondilutive).

Oregon currently has two programs in existence that provide nondilutive capital to promising opportunities. Oregon's Innovation Plan recommends that funding be provided to do the following:

- **Support the SBIR Support Program.** The SBIR Support Program helps small businesses access federal nondilutive funding through a national, competitive grant program, and also helps fill gaps in the federal funding for companies that receive federal awards. The program has two grants to assist companies: application support grants and matching grants.
- **Support the University Venture Development Fund** to help ensure that start-up companies based on university research can access nondilutive funding during the critical "proof-of-concept" stage. Individuals and corporations may contribute to the University Venture Development Fund. Donors receive a 60 percent state tax credit, up to \$600,000 per year.

In addition, Oregon has invested in the Commercialization Gap Fund, which makes available capital to support commercialization of disruptive early-stage technologies coming from science and research by utilizing equity investing with the state serving as a Limited Partner. The fund was only recently created, and as a result, it is still too early to tell its effectiveness. However, it will be important to measure its performance over time. Depending on its performance, the Innovation Plan recommends that ways to enhance/expand the Commercialization Gap Fund might include the following:

- Requiring a 1:1 match secured by the fund manager for future state investments into the fund.
- Opening the fund to university and research endowments as potential partners to ensure a focus on supporting the commercialization of early-stage technologies being developed within Oregon's research base.
- Requiring the fund to include nondilutive investments.

Finally, the Innovation Plan recommends that Oregon create two new nondilutive sources of funding:

- **Proof-of-concept grants** to be administered through the Centers of Innovation Excellence. It is recommended that Oregon dedicate funding to support proof-of-concept projects at each Center of Innovation Excellence. These proof-of-concept funds could provide grants of up to \$50,000 that could be used to support early-stage commercialization activities of companies working with the different centers.

- **Traded-sector matching grant program** should be created that will match investments by Oregon's private, traded-sector companies in Oregon startups. Building connections among and between industry and entrepreneurial endeavors is an important component of advancing sector-specific innovation efforts. The program would develop grants that would provide a 1:1 match for a private company investment in a startup as a way to commercialize technologies. This would help to create "stickiness" of Oregon's startup firms, encouraging them to stay in Oregon due to the linkages/partnerships that are developed with major industry players. It would also serve as another source of capital to help launch innovative ideas.

WHAT OTHERS DO: PROOF-OF-CONCEPT MODELS

Georgia Research Alliance (GRA) Ventures was created to move university technologies out of the lab and into the marketplace and to grow university-based startup companies in Georgia. To accomplish these goals, GRA awards the following:

- Phase I grants (up to **\$50,000**) to university researchers to answer the question, "Is it commercially feasible to build a company around this technology?"
- Phase II grants (up to **\$100,000**) to university researchers to continue prototype development and formulate a company.
- Phase III loans (up to **\$250,000**) to companies that have a fully executed license from the university. These companies must also have Georgia-based management. The noncollateralized loan has favorable repayment terms and conditions.

Since 2002, GRA has evaluated the commercial potential of more than 400 inventions or discoveries at universities. The most promising of these were awarded grants to help fund the technology research necessary to further develop the invention or discovery. This process has led to the formation of more than 150 early-stage companies that employ more than 1,300 people and have generated more than \$140 million in revenue.

The North Carolina Biotechnology Center (NCBiotech) is at the forefront of leadership in life sciences cluster development of North Carolina. Among many programs and initiatives offered by NCBiotech that span the tech-based economic development chain is the **Biotechnology Innovation Grant or "BIG" program**.

The BIG program is designed to support preliminary translational life science research studies that explore the potential commercial applications of early-stage inventions at North Carolina's universities. These studies are often the basis for strategic "go/no-go" decision-making regarding the pursuit of intellectual property protection and/or further commercial product development. Additionally, BIG awards are intended to strengthen the entrepreneurial culture within universities and nonprofit research institutes.

The grant provides funding up to \$100,000 for researchers to explore commercial applications of their inventions through both of two projects:

- Technical research project that extends the scientific research; and
- A concurrent commercial development project, in partnership with a Commercial Development Advisor examining commercial development aspects of the technology such as the IP landscape, potential markets and competition, mapping out product development milestones, and other key aspects for commercial potential.

The center views a "successful" BIG project as one that uncovers technical and commercial opportunities or weaknesses; provides go/no-go decision points regarding continued development of IP claims and protection; and positions the technology for further commercial development. A BIG project that leads to a clear decision whether to support continued investment or not is considered a successful outcome.

Action 3: Support early-stage innovation within Oregon's university, college, and other research settings, ensuring opportunities for all people in all places to connect to resources.

While the first two actions are focused on driving innovation within Oregon's existing traded-sector strengths and emerging market opportunities, as these sectors are viewed as having the greatest potential for economic impact, that fact remains that economies with strong research universities that are performing world-class research are a critical foundation for innovation-led economic development. As discussed as a critical dependency, academic R&D helps build the local STEM pipeline. R&D is, by nature, STEM intensive – approximately 95 percent of academic R&D is in science and engineering fields. A UMETRICS analysis of workers supported by some of the largest research projects from the U.S. Department of Health and Human Services and NSF, which account for roughly two-thirds of academic R&D expenditures, finds that the majority of personnel are somewhere in the training pipeline, defined as undergraduate, graduate, or postdoctoral students.⁴² Furthermore, these workers are likely to remain located near their research university upon graduation, the authors find.

Furthermore, academic R&D is essential in driving new technology-oriented business formation. When institutions of higher education develop new intellectual property, it is often moved into the marketplace via academic startups and other external entrepreneurial entities.

Finally, strong industry support for academic research pays considerable economic benefits.⁴³ ITIF finds as follows:

- Industry research funding is linked to stronger university technology output, with a correlation of 0.26 between industry share of university R&D funding and academic patents.
- A positive relationship exists between the share of university research supported by industry and its strength in key innovation variables such as high-tech startups (0.15), venture capital (0.28), high-tech jobs (0.14), and scientists and engineers (0.19).
- Interaction with industry as a STEM graduate student is associated with significantly greater likelihood of producing intellectual property, such as patents or invention disclosure.

The Innovation Plan recommends the following:

- **Support the University Innovation Research Fund (UIRF).** Recognizing the importance of a strong academic research base, the Oregon Legislature created UIRF to support grants to public universities and OHSU to match competitive federal research awards, thereby increasing the competitiveness of Oregon universities for federal research funds, leveraging federal grants that require matching funds, and supporting innovation and research capacity. Grants are prioritized for Oregon's existing traded-sector strengths. In addition, preference is given for large collaborative grants among multiple universities. The Innovation Plan recommends continued funding for UIRF in order to maximize the amount of federal R&D dollars attracted to the state in targeted industry sectors.
- **Create the Oregon Corps Program** by further leveraging the NSF's Innovation Corps (I-Corps™) program. The federal I-Corps™ program uses experiential education to help researchers gain valuable insight into entrepreneurship, starting a business, and industry requirements and challenges. Through I-Corps training, researchers can reduce the time to translate a promising idea from the laboratory to the marketplace. NSF is developing and nurturing a national innovation network by partnering with institutions across the nation to guide scientific research toward the development of marketable solutions. Currently, the NSF I-Corps program is a sponsor of Oregon State University's Advantage Accelerator. There are a few states, however, that are working

⁴² Bruce Weinberg, Ohio State University Professor, "No more artifacts: Who feels the pain of science research budget cuts?" Salon, April 2017.

⁴³ Robert Atkinson, *Industry Funding of University Research: Which States Lead?* Information Technology and Innovation Foundation, 2018.

to leverage the federal funding into a more robust statewide network instead of singular institutions. This idea has also been vetted by academic institutions within Oregon, and the Oregon Corps has been conceived but not yet launched. Oregon Corps would assist faculty and graduate students from across all Oregon universities, colleges, and research institutions in validating the market potential of technologies and launching startup companies. The Innovation Plan recommends providing statewide funding to Oregon Corps. Oregon's ability to leverage federal NIH or NSF I-Corp dollars can further maximize the impact of this statewide effort.

- **Further expand the InventOR Program**, which successfully assists college and university students in prototyping novel inventions and honing their entrepreneurial skills. As a way to continue its support for early-stage innovation among Oregon's student entrepreneurs, Oregon should continue efforts to scale the program by strengthening partnerships with community colleges and additional universities and exploring additional pathways for student inventors and entrepreneurs.

WHAT OTHERS DO:

MidWest I-Corps Node, established in January 2017, aims to spur innovation, collaboration, and economic impact in the Midwest region. Supported by a grant from NSF, this alliance forms the backbone for a network that educates, supports, and connects academic researchers to the entrepreneurial ecosystem across the region. By bringing together the expertise of the University of Michigan, University of Illinois Urbana-Champaign, Purdue University, and the University of Toledo, the Midwest I-Corps Node (MWIN) offers customized, experiential training programs, connections with industry, and SBIR technical assistance.

The **Upstate New York I-Corps Node** is a regional program covering a significant portion of New York State, led by Cornell, the University of Rochester, and Rochester Institute of Technology. UNY I-Corps features a variety of diversity and inclusion initiatives, including targeted training courses for the deaf community (building around Gallaudet University and Rochester Institute of Technology's and National Institute for the Deaf). In partnership with Women Entrepreneurs (W.E.) Cornell and Black Entrepreneurs in Training, UNY I-Corps has also developed customized I-Corps regional courses for women and underrepresented minorities in STEM fields.

I-Corps@Ohio is a statewide program, funded in part by the Ohio Department of Higher Education, developed to assist faculty, staff, and students from Ohio universities, colleges and community colleges in validating the market potential of technologies and launching startup companies. I-Corps@Ohio is modeled after the NSF I-Corps program, which has been proven to increase innovation, entrepreneurship, and industry collaboration. The I-Corps@Ohio program incorporates lean launch, customer discovery and business model innovation methodologies to assess technologies, enhance the business acumen of research faculty and students and expand their entrepreneurial network relationships. Two cohort tracks are offered in Science & Engineering and Medtech, with each designed to offer both common and subject matter specific content. The long-term objective of I-Corps@Ohio is to systematically build a steady and predictable pipeline of high-quality, high-growth startups from technology developed at the state's colleges, universities, and research institutions, that contribute to economic development in Ohio.

Strategy 2: Strengthen the Innovation Ecosystem – Develop a systemic, regionally based entrepreneurial service delivery system to help diversify the state’s economy, take advantage of innovation-based opportunities, and drive broader participation among underserved communities.

“Oregon is showing the way forward with partnerships that help our students and businesses alike to prepare for the future and to lead the way in innovation.”

Hon. Jeff Merkley
U.S. Senator

Entrepreneurial activity is critically important to state-wide economic development because it drives industrial innovation and new business formation. Almost by definition, the founders of startup companies are innovators – focused on capitalizing on commercial opportunities arising from introducing a new product; enhancing a service; making a delivery system or production process more efficient, more user friendly, or less expensive. It is, therefore, not surprising that entrepreneurial activity and innovation are strongly correlated.

However, with a few notable exceptions such as Boston and Silicon Valley, the entrepreneurial climate necessary to generate high-growth enterprises has not developed fully and sustainably through market forces alone. Building a critical mass of entrepreneurial management talent in a locality depends on providing the resources that must be amassed, and the services needed to successfully build a company.

As a result, catalyzing entrepreneurial activity is a challenge for many states. It is often stated that entrepreneurship is a “contact sport,” and the barriers and obstacles to being able to scale a firm are significant, particularly highly innovative firms. In addition to risk capital that is addressed under the next strategy, the three areas that Oregon’s innovative entrepreneurs indicated are their greatest obstacles are access to experienced managerial talent, networks, and sales. Of these, the most significant obstacle to creating and growing entrepreneurial companies is insufficient experienced management talent. For Oregon, there simply is a lack of experienced, serial entrepreneurs/mentors who know how to turn an idea or a product into a successful venture. Such serial entrepreneurs are needed not only to lead new ventures, but also to serve as mentors to help fledgling entrepreneurs develop their skills and increase their chances of success. Serial entrepreneurs/mentors have contacts in the investor community, can recognize quality deals, and help to generate deal flow that helps firms access capital markets.

The second challenge facing entrepreneurs is the lack of a cultural environment that cultivates value-added networking. One of the characteristics that distinguishes regions/states with high levels of entrepreneurial activity is the networking that occurs among companies and between researchers and the venture community. Networking is an extremely important way in which entrepreneurs can learn from others who have encountered similar obstacles. Indeed, research indicates that the extent of social networks is one of the most important factors in encouraging entrepreneurship in any region. Across the stages of the innovation continuum, conversations uncovered various disparities in access to resources. Within rural areas, population density limits connectivity to domain experts and alternative types of technical mentors. Challenges are also magnified for businesses in under-resourced communities, and especially those started by women and BIPOC entrepreneurs. While the planning process highlighted Oregon’s collaborative and entrepreneurial culture as a strength, it also uncovered that this culture was not always inclusive.

The third challenge that entrepreneurs face is the ability to find customers and markets. Entrepreneurial assistance programs usually focus primarily on providing financial resources, business planning, and physical space to startup companies to increase their chance of survival. And indeed, startup companies face many obstacles. But just because a startup company remains in existence doesn't mean that success has been achieved. For many of these companies, the real challenges come when they are ready to grow. Once they have a management team and an organization in place, have obtained financial capital, and are ready to move to the next level, fewer resources are available to assist these companies in finding customers, identifying new markets, and generally increasing sales – all factors that will determine the level of their contribution to the economic health of the communities in which they reside. In addition, firms have difficulty keeping up with the competition, being aware of new discoveries that may affect their markets, and supporting continued product development – obstacles that can be lessened through closer interactions with universities and their researchers.

Overall, the discussions with subject matter experts suggest that there is a need to develop a systemic continuum of support services and assistance to support all innovation-based startups throughout the entrepreneurial development process. Currently, Oregon has too many siloed efforts that are not building a critical mass of activity. Furthermore, efforts need to be tailored to each region's unique innovation-based opportunities, which often dictate the types of services and resources required to help catalyze scale-up. Developing a systemic, regionally based entrepreneurial service delivery system to help diversify the state's economy, take advantage of innovation-based opportunities, and encourage broader participation among underserved communities must be a cornerstone of Oregon's efforts to build and sustain its innovation ecosystem. It is proposed that Oregon pursue two targeted actions to strengthen its innovation ecosystem.

Action 4: Create Regional Innovation Hub designations that will fund and incentivize collaboration to build and advance innovation-focused ecosystems, ensuring opportunities for all innovation-based businesses throughout Oregon.

Oregon has a history of supporting small businesses throughout the state, whether it be through partnerships with the federal government to support the network of Oregon Small Business Development Centers and the Oregon Manufacturing Extension Partnership, or targeted programs related to business lending efforts. In addition, the state has supported numerous regional efforts through the Rural Opportunity Initiative and the Technical Assistance for Underrepresented Businesses program in an effort to support regional initiatives tailored to meet the unique needs identified within various communities. While many of Oregon's regions have established or are proposing to establish entrepreneurship centers/programs/referral networks, there is considerable variance in the scope, scale, coverage, focus, and resources to carry out these tasks. In addition to often being under-resourced, the efforts are also often siloed, disconnected from larger statewide efforts, and often treat entrepreneurship as a one-size-fits-all model – not understanding the unique needs of innovative traded-sector firms. Consistent throughout the discussions is the perception that the state and regional efforts in entrepreneurship fall short of the mark if Oregon wants to use entrepreneurship as a way to build a more innovation-driven economy.

To address these unmet innovation-based entrepreneurial needs felt throughout the state of Oregon, it is recommended that Innovation Hubs be created in every region of the state to incentivize collaboration and build an innovation ecosystem throughout Oregon. The Innovation Hubs will be expected to do the following:

- Build a sufficient scale of talented serial entrepreneurs in the region who can provide intensive, in-depth help and assistance to innovative firms. This will include providing access to business experts (through mentorship networks, Entrepreneurs-in-Residence, etc.) who can guide startups through market entry to growth/scalability.
- Connect entrepreneurial efforts to existing regional industrial base and emerging opportunities, thereby tailoring each effort to leverage the region's comparative advantages.

- Deliver services throughout the region in coordination with existing efforts, academic assets, and other key stakeholders. Consideration should be given to co-locate the hub in or in close proximity to the regional business school and/or community college.
- Consider how best to address the need for physical infrastructure/place-making to catalyze an entrepreneurial culture within the region.
- Address the need for more robust, value-added inclusive networking throughout each region and across the state, which is not currently happening at the level of scale necessary to create a pervasive entrepreneurial culture.
- Provide linkages/vetting to Centers of Innovation Excellence (Action 1) to ensure the technical domain expertise needs are met for all innovative firms within the region, regardless of the area of technology.
- Provide access/vetting to the risk-capital stack (Strategy 3) that will be developed to support innovative firms throughout the state.
- Ensure programming is culturally specific and accessible to rural and historically underserved populations.

It is recommended that Regional Innovation Hubs be created through peer-reviewed competitions. The following key criteria and evidence must be submitted with hub applications to be considered for designation:

- Develop a cohesive vision and a plan to support, strengthen, and integrate the region's ecosystem components to facilitate the support of innovation-based entrepreneurs.
- Define, through a collaborative process, the region by examining existing regions as a starting point, but also including stakeholder participation and assessing existing and potential innovation sectors for alignment.
- Coalesce, coordinate, and convene existing partners to leverage existing assets and serve traded-sector entrepreneurial efforts within the region.
- Coordinate local initiatives and resources, and provide regional matching funds to leverage state and federal support over time.
- Align efforts with existing or emerging regional priorities to ensure continuity among stakeholders, including industry, workforce and education, finance, and policy makers.
- Report on various performance metrics, including diversity and equity outcomes.

It is important to note that, while Innovation Hubs are needed in every region of the state, it does not mean that every region will be awarded a designation. It will take true collaboration at the regional level to be able to coordinate and corral the existing efforts to work cohesively together so that the hub is greater than the sum of the individual parts. However, until Oregon's existing silo mentality is truly overcome, a critical mass of activity capable of advancing the innovation ecosystem will not be achieved. The state funding is to serve as an incentive for dedicated and forward-thinking regions to coalesce around a larger vision for their economic future. Ideally, this application process would expose areas where competing entities in a region have opportunities to partner, as well as instances where the critical dependencies around broadband, talent, or R&D can be strengthened.

Action 5: Link talent to innovation efforts.

Ensuring that all Oregonians have the pathways to develop the skills needed to pursue entrepreneurship or engage in the innovation economy is a critical dependency of this Innovation Plan. As previously noted, Oregon's STEM Investment Council recently approved its 2021-2025 Education Plan that aims to address the disconnect between the in-demand skills and talent sought after by Oregon's employers. The plan notes that the current number of young Oregonians emerging from the education system who possess such skills and talent is a threat to the competitive capacity of Oregon's economy. Recognizing the need for a path to readiness for highly skilled, high-paying jobs in an evolving economy, the STEM Education Plan identifies student learning benchmarks and calls out the urgent need and opportunity to effectively engage more students in STEM, especially students from communities of color and families in poverty.

To align with Oregon's STEM Investment Council, it is important that Business Oregon support the development of talent pathways and pipelines by helping build partnerships between industry and educational institutions. As noted in a recent report by the Council on Competitiveness, many Americans do not necessarily consider themselves a part of the innovation economy, and perhaps worryingly, do not see their potential as innovators.⁴⁴ They note that "a growing community of educators has recognized that experiencing invention, innovation and the fundamentals of entrepreneurship across the K-12 and higher education journey can enhance learning, particularly around STEM, design and adjacent disciplines; open minds and possibilities by fostering student creativity, self-efficacy, and a sense of belonging; and prepare students with the mindsets and skill sets that CEOs are seeking in their future workforce, while further cultivating future inventors and entrepreneurs. Industry partnerships, and the range of resources that they bring, will be key to realizing this goal."

Within professional degree programs, there is a long tradition of including field experiences as a way to build practitioner skills and facilitate the move from theory to practice. Two of the most common forms of workplace learning are cooperative education (co-op programs) and internships. In co-op programs, students alternate periods of paid work with campus study or split their time between the workplace and the campus. An internship provides students with relevant work experience over a shorter, set period of time.

WHAT OTHERS DO: OHIO THIRD FRONTIER ENTREPRENEURIAL SIGNATURE PROGRAM

The Ohio Third Frontier began investing in entrepreneurial services through its Entrepreneurial Signature Program (ESP) in 2008. Ohio divided the state into six regions and awarded the ESP Hub to one technology intermediary organization. The goal of the ESP is to significantly increase the technology-based entrepreneurial commercialization outcomes throughout a defined geographical region and to focus the effort on strategic technology-based sectors that offer exceptional economic-development prospects for the region.

Each ESP represents a comprehensive, coordinated network of high-value services and assistance providers that is visible and easily accessible to technology-based entrepreneurs and small tech-based companies throughout its region. Each ESP provides an approach that tightly integrates sources of deal flow, entrepreneurial support, and capital to effectively grow the technology-based entrepreneurial commercialization outcomes throughout its region.

The Regional Hub designation in Northeast Ohio was awarded to a nonprofit entity, JumpStart. As such, JumpStart receives state grant funding that is matched 1:1 by the region to deliver direct business assistance to high-growth innovative entrepreneurs throughout the region. JumpStart has developed a series of business assistance programs and initiatives and maintains both a mentorship network as well as Entrepreneurs-in-Residence on staff to provide value-added services to the most innovative and promising entrepreneurs across Northeast Ohio. Value-added services include providing assistance with forming a business team of managers to assist with market research and identification of potential clients; providing subject matter experts to assist with technical evaluations, regulatory issues, and commercialization assistance; as well as providing in-depth counseling and advice to prepare the entrepreneur to present investment-grade plans to investors.

JumpStart partners with a series of regional organizations to ensure that these services are provided across the region at the highest quality, and that entrepreneurs also have access to physical space within the various communities JumpStart serves. Since the organization's inception, JumpStart has engaged more than 6,500+ companies. In 2019 alone, JumpStart engaged 1,150 companies, of which 51 percent were led by women and 42 percent were led by people of color. As of October 2020, JumpStart has invested more than \$61 million into 125 Ohio tech startups since its inception. Approximately 44 percent of total investment capital has been deployed into companies led by women and people of color.

⁴⁴ Council on Competitiveness' National Commission on Innovation & Competitiveness Frontiers, *Competing in the Next Economy: The New Age of Innovation*, December 2020.

Both co-op programs and internships are structured and supervised experiential learning opportunities that provide students with practical experience in their chosen fields. Co-op programs and internships illustrate classroom relevance in the professional world. Beneficial for both students and employers, they offer career exploration and skills application for students and provide employers with creative, enthusiastic workers who are able to assist with projects and open for mentorship. Transitioning students into full-time employees is also a proven time- and cost-saving recruiting method.

While prevalent among large industrial players, co-op programs and internships are not as prevalent with startup companies. However, experiential education can certainly help students gain the following:

- An appreciation for entrepreneurial endeavors as viable career choices.
- A deeper understanding of subject matter than is possible through classroom study alone.
- The capacity for critical thinking and application of knowledge in complex situations.
- The ability to engage in lifelong learning, including learning in the workplace.

The hardest part of developing co-op programs and internships is gaining the participation of employers. This is why there are not many formalized programs with early-stage companies. Large corporations with significant in-house human resource departments have the staff time and resources to manage such a program. Early-stage companies typically do not.

To overcome this barrier, **Oregon's Innovation Plan recommends supporting experiential learning opportunities (internships, co-ops, apprenticeships, etc.) to help retain Oregon's talent (particularly within STEM fields) by linking students to exciting innovation-based endeavors** by doing the following:

- Providing a marketplace to attract students to Oregon's post-secondary educational opportunities and connect students with entrepreneurial employment opportunities by making students aware of innovative entrepreneurs and helping innovative entrepreneurs recruit their future workforce.
- Targeting students across the postsecondary continuum (from associate degrees through postdoctoral degrees), and ensuring that programs seek to engage students presently underserved in the innovation economy, such as women, BIPOC, and those outside of the Willamette Valley.
- Providing matching grants to offset costs of internship/co-op students (it is expected that all students would receive financial compensation).
- Supporting unique programs such as InventOR or regional efforts targeting key traded-sector industry clusters, such as the Yamhill Carlton School District's support of the viticulture industry.

WHAT OTHERS DO: CONNECTICUT'S TECHNOLOGY TALENT BRIDGE

Connecticut's Technology Talent Bridge Internship Program provides an opportunity for Connecticut small businesses to receive grant funding that can be used to hire student interns. The program's primary objective is to develop a talent "bridge" between the small business and the student, with the downstream objective of creating jobs. The program:

- Stimulates job creation through innovation.
- Provides stronger links between Connecticut companies and university students, reducing the likelihood that graduates will leave Connecticut.
- Facilitate postgraduation hiring of students by Connecticut companies.

This in turn helps to reduce the net outmigration of young talented workers by exposing them to the opportunities that can be found within the state of Connecticut.

By providing Oregon students with meaningful experiences within exciting innovative companies, students will be more likely to either remain in the state pursuing job opportunities with these firms or be encouraged to start an entrepreneurial endeavor of their own. Efforts should focus on providing a marketplace to connect students with entrepreneurial employment opportunities by making students aware of innovative entrepreneurs and helping innovative entrepreneurs recruit their future workforce.

Strategy 3: Catalyze Access to Risk Capital.

States with thriving innovation ecosystems share one important characteristic – they are home to a risk-capital community that is both oriented toward early-stage financing and committed to resident investment.

Entrepreneurs require access to capital at each stage of their development, from early-stage, proof-of-concept and prototype development to Series A and B venture financing to debt financing. States that have a limited risk-capital stack in which to invest end up leaving their entrepreneurial companies on the “runway”

unable to take off and reach their growth potential. States wishing to grow entrepreneurial companies have used a variety of mechanisms to encourage investment in risk capital and to address market gaps.

“For sustainable economic growth in both urban and rural Oregon, we must continually look for ways to give small business and entrepreneurs a leg-up.”

Hon. Kate Brown
Governor of Oregon

Ongoing trends in risk capital are making it even more imperative that regions have resident funds for the growth of innovative firms. These resident funds help in identifying promising innovations and technology advances, providing the initial funding to validate these opportunities, supporting the formation of new ventures, and providing the on-the-ground capacity to support these new ventures and facilitate their connection to later-stage venture capital and debt markets.

Oregon, through its support of the Oregon Growth Board, has long realized the need to invest in risk capital for its most promising innovative firms. However, the realignment of national markets since the global recession has shifted capital markets downstream, leaving many Oregon companies without access to early-stage investments. This issue is further exacerbated by the perception of a “closed-network” of private Oregon funders to which it is difficult to gain access. If this investment climate is not corrected, Oregon’s most promising companies are in danger of leaving the state in pursuit of capital.

In interviews with key stakeholders, there was broad consensus on the need for active efforts in Oregon to continue to increase the level of resident risk capital in the state to promote increased deal flow, including the following:

- Continue the efforts of the Oregon Growth Board to provide early-stage capital.
- Create a working capital loan program.
- Create an angel investor tax credit program.
- Create stronger linkages to the later-stage national risk-capital markets, leveraging the efforts of the Oregon Growth Account.

Action 6: Foster the further development of Oregon's risk-capital stack.

While Action 2 focused on providing the very earliest stages of nondilutive sources of innovation capital such as proof-of-concept and prototype development grants, this action focuses on angel, pre-seed, and seed funds, and working capital loans that are also desperately needed by innovation-based entrepreneurs. While further downstream from the funds recommended under Action 2, these additional early stages of funding constitute a critical private-sector market gap for investment dollars as the size is usually too small for larger venture funds or traditional sources of capital to consider.

Having dedicated, locally managed, resident early-stage sources of funding is absolutely essential for building the “farm team” of firms, which, as they gain experience and need additional funds to expand, become candidates for “major league” funding from larger, more diversified venture funds. The presence of strong resident investment funds is needed to attract outside regional and national funds to invest in Oregon's growing pipeline of deal flow in the coming decade.

Recognizing that building a critical mass of innovative firms is unlikely without early-stage financing, many states have developed programs to increase the availability of early-stage capital. States have taken various approaches such as capitalizing funds that make direct investments in companies, investing in privately managed venture funds, investing pension funds in venture capital, and using tax incentives to encourage investment in venture capital. In some cases, universities and foundations are investing a portion of their endowments in seed and pre-seed funding. A number of states have used state dollars to create such investment funds (see textbox).

The Oregon Growth Board has helped to improve the risk-capital climate of the state. However, now is the time to double down on the risk-capital investment scene. The board's investments have been successful, but the level of deal flow is not yet sufficient to ensure a robust innovation ecosystem. Additional sources of risk capital must be made available, with a blend between public and private sources of funds. It is also important to note that the Growth Account needs to be focused on catalyzing early-stage investment funds, not just the Growth Fund.

The Innovation Plan recommends that the Oregon Growth Board commit some of its resources to **create additional angel, pre-seed, and seed funds** in Oregon managed by resident private fund managers. The investment funds would require a 3:1 match, which could increase over time to reflect how the success of the initial rounds has helped

WHAT OTHERS DO: OHIO THIRD FRONTIER PRE-SEED/SEED PLUS FUND CAPITALIZATION PROGRAM

The state of Ohio, through the Ohio Third Frontier, has also made significant investments to build its resident risk-capital base through the Ohio Third Frontier Pre-Seed/Seed Plus Fund Capitalization Program (PFCP). As a result of its program, the Ohio Third Frontier has helped establish Ohio as a leading location for early-stage risk-capital investment through the capitalization of multiple Ohio-based Pre-Seed Funds. The goals of the Ohio Third Frontier PFCP are as follows:

- Increase the number of professionally managed Pre-Seed Funds investing throughout Ohio.
- Increase the amount of early-stage capital being invested in Ohio technology-based companies.
- Create a risk-capital climate that supports the development, retention, and attraction of investable technology companies in Ohio.
- Build a pipeline of technology company deal flow that increasingly attracts the resources of venture capital firms both within and outside of Ohio.

The Ohio Third Frontier had invested approximately \$65 million in over 44 pre-seed and seed funds across the state of Ohio. These funds, in return, have leveraged over \$3 billion in follow-on funding and have created nearly 5,000 jobs.

to mitigate future risk. By building on the success of the Oregon Growth Board's investments, additional risk capital can be created in the state at this critical level to increase the number of "at bats" within the ecosystem.

Consideration should also be given by the Oregon Growth Board to **develop sector-specific risk-capital sources of funding**. As Centers of Innovation Excellence come on line and develop a pipeline of deal flow, providing sector-specific funds that align with targeted areas of innovation will become necessary, particularly if the targeted areas are not traditional investment platforms. The match ratio for these funds will be determined in part of the private market risk tolerance for each individual sector.

Finally, the Innovation Plan recommends that Oregon InC **create a working capital loan program** for traded-sector startups that do not choose or are not a fit for private equity investments, but still have capital needs that are going unmet. It is intended that the loan program would provide working capital to Oregon businesses with limited access to funding from conventional financing sources due to technical and commercial risk factors associated with the development of new products or services within targeted traded sectors. It is envisioned that the loan fund would finance up to 75 percent of allowable project costs with loans typically ranging in size from \$250,000 to \$2 million.

Action 7: Incentivize angel investments in Oregon's innovation-based firms.

As Action 6 details, access to early-stage risk capital is a critical factor in building an innovation economy. One characteristic shared by leading states is that they are home to a network of successful entrepreneurs who act as angel investors, willing to invest in very early-stage startup companies as well as serve as an important source of management advice and contacts for entrepreneurs. However, building a base of angel investors actively involved with resident companies can be a challenge for many states.

Oregon must do more to organize and encourage angel investments. There is a need to both increase the vibrancy as well as the number of resident angel networks. One way to increase the number of resident angels investing in Oregon startups is by providing angel investment tax credits, thereby catalyzing investors to "get off the sidelines" and focus on Oregon opportunities. According to recent empirical research on the 31 states with established angel investment tax credits, results have been positively associated with an increase in both the number of angel investors and the amount of angel investment in a state, and that this is amplified when these programs impose fewer restrictions and when the supply of alternative capital is more limited.⁴⁵ In line with other states, the Innovation Plan recommends that an **angel investment tax credit** be created that would provide a qualified investor with an income tax credit equal to 25 percent of an eligible investment in an eligible Oregon company.

Another way to catalyze angel networking is by providing funding to offset costs of professional fund management, network administration, and due diligence. Leveraging the recommendation of Action 6, it is recommended that angel networks be encouraged to form by providing 3:1 matching grant dollars through the Oregon Growth Board to catalyze the creation of angel networks across Oregon. The matching dollars could be used in part to help defray the costs of professional management that would undertake the screening and review of opportunities for presentation to the angel networks, seek and secure the involvement of additional angel investors, and provide linkages to Oregon's Regional Innovation Hubs to access deal flow.

⁴⁵ Matthew Denes, Sabrina T. Howell, Filippo Mezzanotti, Xinxin Wang, and Ting Xu; *Investor Tax Credits and Entrepreneurship: Evidence from U.S. States*; NYU Stern School of Business; August 20, 2020. Available at SSRN: <https://ssrn.com/abstract=3596342> or <http://dx.doi.org/10.2139/ssrn.3596342>.

WHAT OTHERS DO:

More than 430 startup businesses have received over \$418 million in investment through **Minnesota's Angel Tax Credit** since the program's inception in 2010. Administered by the Minnesota Department of Employment and Economic Development (DEED), the program offers a 25 percent tax credit for investments in small emerging businesses, with a maximum credit of \$125,000 and a focus on high-tech businesses or those with a proprietary product, process, or service in select industries. Notably, of the \$10 million in credits available in 2019 and 2021, \$5 million is reserved for minority and women-owned and -managed businesses, and businesses located outside of the Minneapolis–St. Paul Metropolitan Area.

Ohio TechAngel Funds (OTAF) is one of the largest angel networks in the United States. More than 300 high net worth, accredited investors have joined one or more of the five funds. OTAF makes initial investments of \$150,000 to \$325,000 in participating preferred stock or convertible notes and makes follow-on investments in the best-performing ventures. OTAF members can make sidecar investments in amounts ranging from \$10,000 to \$100,000 per venture. OTAF participates in syndications of \$500,000 to more than \$2 million by co-investing with other leading angel investors and angel funds, regional venture capital funds, and family offices. The Ohio Third Frontier provides matching grant funding.

Since 2004, Ohio TechAngels' five funds have invested more than \$16 million in 55+ Ohio-based technologies. The goal of the funds is to build wealth in Ohio by helping build great companies that can rapidly scale and attract the interest of strategic acquirers within three to five years. OTAF members have also made more than \$16 million in sidecar investments in those same companies.



Action 8: As deal flow increases across the state, focus efforts to drive more of the Oregon Growth Account's investments to Oregon's businesses.

Complementing the focus on early-stage innovation capital, it is recommended that Oregon help ensure access to follow-on venture funding by leveraging the Oregon Growth Account. As the pipeline of investable deals increases through the successful implementation of the proceeding actions, consideration should be given to ensuring that the Oregon Growth Account has policies and guidelines in place to help make certain that out-of-state capital partners have a meaningful Oregon connection/presence. It will also be important to seek to build relationships with resident early-stage funds, angel investment community, and Centers of Excellence in order to source deal flow and encourage syndication.

WHAT OTHERS DO: MODELS FOR FUND OF FUNDS

Colorado Venture Capital Authority (VCA). The VCA was established in 2004 to make seed- and early-stage capital investments in businesses. The VCA was allocated \$50 million in premium tax credits, which it subsequently sold to insurance companies. The VCA selected fund manager High Country Venture, LLC, and established Colorado Funds I and II, each with nearly \$25 million. The minimum and maximum investment sizes generally range from \$250,000 to \$3.375 million. Thirty-one emerging companies received investments across the two funds of nearly \$46 million, leading to the creation of over 1,200 jobs. The VCA was intended to manage the money as an evergreen fund, meaning that the distributions received from Colorado Funds I and II are to be reinvested in future venture capital funds that meet the requirements of the VCA statute. In 2018, the VCA invested proceeds from Colorado Funds I and II into a third fund, the Greater Colorado Venture Fund. The Greater Colorado Venture Fund invests in early-stage startups headquartered in rural Colorado outside of the Front Range.

Utah Capital Investment. Formerly known as the Utah Fund of Funds, this venture capital initiative in the state of Utah is a \$300 million economic-development program aimed at providing access to alternative or nontraditional capital for Utah entrepreneurs. Utah Capital Investment invests in venture-capital and private-equity funds that commit to establishing a working relationship with Utah's startup and business community and to making investments in qualifying companies. A number of venture capital funds targeting life sciences have received funding, including 5AM, Frazier Healthcare Ventures, NEA, SV Health Investors, TriVentures, and UpStart Ventures. To date, 78 Utah companies have received investments by Utah capital portfolio funds, and 8,538 new Utah jobs have been added.

The Maryland Venture Fund—InvestMaryland. Through an auction of premium tax credits to insurance companies, the state of Maryland raised \$84 million to invest in qualified private-venture funds to further catalyze the state's local venture-capital community. Those funded have committed to invest in emerging technology companies in Maryland in the areas of life sciences, software, communications, and cybersecurity, with the goal of investing in 150 or more companies and generating 5,000 jobs created or retained.

Strategy 4: Brand Oregon as The Place for Innovation – Tell Our Story.

“It’s not enough to do good things. You have to let people know what you’re doing.”

Phil Knight
Co-Founder, Nike
Co-Founder, Phil and Penny Knight Campus
for Accelerating Scientific Impact

Developing a strong, ongoing innovation-based economy requires that Oregon sees itself and is seen by others as a dynamic hub: a place with many job opportunities, a constant flow of innovation, and a supportive business environment. To obtain this reputation, more and more states are undertaking a branding/marketing campaign that communicates to key audiences, both internal and external, the depth and breadth of the state’s assets and the unique resources and opportunities that the state provides for advancing innovative companies.

The desire of Oregon’s innovation economy to garner more national attention came up frequently throughout this analysis. First, there was a desire among many stakeholders in Oregon’s innovation economy to better communicate the uniqueness of the state to national and global audiences. The state’s high quality of life, in conjunction with the importance of sense of place to talent attraction and retention, was generally viewed as an opportunity to help fuel economic growth.

Second, there was sense that the inability to effectively tell Oregon’s story was a missed opportunity, especially considering the strengths of the state’s marketing, branding, and communications sectors. Given the number of global branding campaigns stemming from the state, there was a desire among many stakeholders throughout this process for Oregon to “just do it,” and be more braggadocious and proactive in storytelling.

Importantly, there is also considerable concern that the experience of place and what this means for the innovation economy was different for segments of the population, such as those new to the region, women and BIPOC, or those living outside of the Willamette Valley. Elevating these voices in the innovation ecosystem is critical, and approaches to amplify these entrepreneurs in storytelling should be explored.

Successfully telling Oregon’s story as an innovation-based economy can help attract new firms. For example, research by faculty at Cleveland State University finds that factors associated with economic and place image play a role in the strategic location of firms. Although economic considerations such as costs, regulatory factors, and available labor-force eliminate options that are infeasible, place image helps determine the final selection decision. “When the list of place options is between the final two or three choices, emotion becomes the basis for the decision and that is where place image is key to winning the bid,” the authors find.⁴⁶ The authors also suggest that this is also true at the individual level, and that sense of place (the experience of visiting and interacting with a place) and identity (the character of a place’s residents) are important factors that help retain talent in a region.

In establishing an internally and externally focused branding/marketing campaign, a series of coordinated activities must occur. At the time of writing there is pent-up enthusiasm among Oregon’s innovation ecosystem to reconvene and network in-person, when the time is appropriate. It is important that the state can effectively tell the story of Oregon’s innovation economy through in-person events, as well as online and in other mediums. Together, these actions can help position Oregon and communicate key messages on the depth and breadth of its innovation base.

⁴⁶ Ashutosh Dixit, Candice Clouse, and Nazli Turken; “Strategic Business Location Decisions: Importance of Economic Factors and Place Image”; *Rutgers Business Review*, 4. No. 1; 2019.

Action 9. Develop Oregon's innovation brand and market within the state – the brand should be aligned with and leverage Oregon's existing strengths.

Developing and retaining talent, entrepreneurs, capital, and innovation businesses within the state requires that Oregon must first be perceived by its own citizens as a dynamic, innovative hotbed of activity before this image can be projected to the rest of the world. To do this, the state needs to implement an innovation image and brand campaign through marketing, public relations, and signature events. The Governor and other key policymakers, as well as private sector, philanthropic, and academic partners, will need to be actively engaged in these efforts. The areas that Oregon must address as part of this effort include the following:

- **Leverage Oregon's strengths in marketing and communication, as well as its pre-existing functions for tourism and visitor attraction, to develop a shared statewide brand for innovation and entrepreneurship.** The process for establishing this brand must be as inclusive as possible, touching all sectors, populations, and geographies throughout the state to ensure their stories are a part of broader messaging. The statewide brand should include an appropriate logo, color-theme, and tagline. Branding materials should be made freely available to help facilitate their widespread distribution.
- **Encourage ecosystem partners to advance this branding as part of their overall marketing efforts.** The success of a shared brand depends on the input going in and the willingness among community partners to "carry the torch" and tell the story. In addition to leveraging the strength of the current Business Oregon network, it is also recommended that this exercise target additional entrepreneurial support services that emerge from Strategies 1 and 2.
- **Develop an Innovation Ecosystem Ambassador program to elevate the voices of champions for innovation and entrepreneurship.** Using the stakeholder engagement processes as a guide, it is recommended that 'brand champions' are identified – those who are able to positively advocate on behalf of the innovation ecosystem; draw attention to important issues, events, and resources; and make virtual connections across the state.
- **Generate excitement through in-person events that celebrate innovation and entrepreneurship.** Throughout the ongoing economic recovery, efforts to rebuild the innovation ecosystem through in-person events that celebrate entrepreneurship are needed. It is recommended that the state provide small matching grants (up to \$500) to support networking events related to innovation and entrepreneurship. These grants should emphasize the importance of strengthening networks in rural areas, and among individuals who are currently underserved in the innovation economy, such as women and people of color. While these networking grants should be relatively free from stipulations, it could be encouraged that giveaways or refreshments associated with events should patronize Oregon small businesses.

Action 10. Develop an external marketing campaign that showcases Oregon's unique identity and competitive strengths in innovation.

Once Oregon's brand as an innovative hotbed of activity is developed, adopted, and embraced internally across the state, Oregon then needs to undertake a marketing campaign that will communicate to key audiences, both nationally and internationally, the depth and breadth the unique resources and opportunities that Oregon provides for advancing the innovation economy. This should include the following efforts:

- Update (or create a new) website for Oregon's Innovation and Entrepreneurship programs and initiatives to encourage online connectivity across the ecosystem. This website should act as an entry-point for entrepreneurs hoping to access the innovation ecosystem, as well as a repository for resources to aid the storytelling process. For entrepreneurs, the website should be easily navigable, with clear access points depending on the individual's geography, industry sector, and stage of business development. Additionally, the website should



be populated with the social media feeds of the ambassadors referenced in Action 9, as well as populated with events and resources made available by Oregon's ecosystem partners.

- Establish a digital marketing campaign to further highlight Oregon's unique strengths. Develop additional storytelling materials for the website, and for other external sources. Examples of materials should include items such as video testimonials from successful entrepreneurs, vignettes describing innovative traded-sector industry clusters, and infographics that showcase key facts about Oregon's innovation economy. The ambassadors identified in Action 9 can help signal-boost this digital campaign.
- Develop a consistent and active media presence in major business and innovation publications with announcements of company accomplishments and generally raising the awareness of Oregon's branding in innovation/entrepreneurship.
- Undertake an active earned-media campaign directly after release of this Innovation Plan. Having articles appear in newspapers and magazines nationwide describing Oregon's plans will play a key role in changing the state's image. The placement of such articles, however, will require an active public relations effort to develop news stories and to reach key publications.
- Build upon the state's reputation by hosting international and national innovation conferences. One way for Oregon to improve its national and international image is to have the higher education institutions join forces and schedule and host annually at least one international conference that would focus on innovation topics.

IMPLEMENTING THE INNOVATION PLAN

As previously stated, the goals/objectives in developing Oregon's 10-Year Innovation Plan are as follows:

- Foster ideation by catalyzing the commercialization and deployment of new products/services within Oregon's existing traded sectors as well as emerging markets.
- Strengthen the state's innovation ecosystem by developing a systemic, regionally based entrepreneurial service delivery system to help diversify the state's economy, take advantage of innovation-based opportunities, and encourage broader participation among underserved communities.
- Catalyze greater access to a more robust resident risk-capital stack.
- Brand Oregon as the place for innovation by telling the state's innovation story.

To meet these objectives, an implementation plan for the effective rollout of this strategy is laid out in the following pages.

ORGANIZING FOR SUCCESS

As previously noted, as a result of the years of investments Oregon has already made in its innovation ecosystem, the state has made significant strides that can be leveraged. To help ensure that the investments to date are working to position the state's economy for economic growth, it will be critical to create a systemic service delivery model that integrates the various components of Oregon's innovation ecosystem. Much of the success of this Innovation Plan is predicated on building a critical mass of resources to significantly increase the level of deal flow in order to differentiate Oregon from the ever-increasing number of global competitors for innovation and entrepreneurship. Only through a systemic model that builds this critical mass through strong collaborations and partnerships can a robust innovation ecosystem be achieved. This will require breaking down any current silos and closed doors that represent the present-day ecosystem.

To implement the Innovation Plan and achieve its vision, the level of funding for Business Oregon's innovation investments, overseen by Oregon InC and the Oregon Growth Board, must increase. In addition, significant investment and coordination through public-private partnerships will be required if the Innovation Plan is to be implemented to its full potential. Leadership in the face of economic recovery and intensifying global competition requires new ways of thinking and new models for action. A crucial element of this is the idea of "network governance," a systems-oriented approach to organizing relationships in lieu of traditional, bureaucratic, or formalized structures. In their book, *The New Localism*, which features case studies highlighting successful examples of this approach, authors Bruce Katz and Jeremy Nowak note as follows:⁴⁷

⁴⁷ Bruce Katz and Jeremy Nowak; *The New Localism: How Cities Can Thrive in the Age of Populism*; Washington, D.C.; Brookings Institution Press; 2018.

Successful network governance models show the complex and varied interplay of the public, private, and civic [sectors]. The models eviscerate the cartoon version of an efficient private sector taking the place of an inept and incompetent public sector. Rather, network governance combined the entrepreneurial capacity and capital of business and philanthropy with the legitimacy and broader concerns of local government.

Governance during times of uncertainty or economic hardship is incredibly essential. For example, academic research finds that, during the Great Recession, many local economic development networks contracted.⁴⁸ Faced with resource constraints, many abandon their systems and instead focus on self-preservation. Instead of fostering broader partnerships, many places seek to subsidize their way out of economic decline.

The strength of any plan lies not in the underlying analysis but the interests, networks, and capabilities of those implementing. For Oregon's Innovation Plan to be as successful as possible, it must invoke an implementation and leadership model that emphasizes transparency, accountability, and flexibility. Central to this is the commitment from stakeholders across Oregon and across sectors to come together around a common goal: strengthening Oregon's economy by encouraging innovation.

TIMING AND PRIORITIZATION OF ACTIONS

Recognizing that not all actions can be undertaken immediately, Table 1 identifies two areas for each strategy and its subsequent actions:

- The classification of priority: *Critical* applies to those actions that are essential for the success of the strategy, significant to those actions that can make a major impact in advancing the strategy, and important to those actions that can contribute to the success of the strategy.
- The classification of timing: *Short-term actions* should be undertaken in the first two years; *mid-term actions* should be undertaken in the third and fourth years; and long-term actions should be implemented in years five through 10.

⁴⁸ Twyla B. Larnell, "Governance networks and local economic development policy during the Great Recession in the US," *Local Government Studies*, January 2020.

TABLE 1: OREGON'S INNOVATION ECOSYSTEM ROADMAP

Strategy/Action	Priority	Timing
<p>Strategy 1: Foster Ideation – Catalyze the commercialization and deployment of new products/services within Oregon's existing traded-sectors as well as emerging markets.</p>		
<p>Action 1. Support Centers of Innovation Excellence that leverage Oregon's existing traded-sector strengths and emerging market opportunities.</p>	<p>Critical</p>	<p>Short-term – Support existing centers and evaluate new opportunities. Mid-term – Bring on line new centers and realign existing centers if needed. Long-term – Consistently and regularly monitor centers' performance, realigning if needed, and evaluate new opportunities as they emerge.</p>
<p>Action 2. Leverage and expand sources of nondilutive capital to catalyze the commercialization of new innovations.</p>	<p>Critical</p>	<p>Short-term – Support funding for the SBIR Support Program. Short-term – Support the University Venture Development Fund. Mid-term – Enhance and expand the Commercialization Gap Fund, if performance indicates it is a solid investment, by requiring 1:1 match, university and research endowments as potential partners, and nondilutive investments. Mid-term – Create a proof-of-concept grant program administered through the Centers of Innovation Excellence. Long-term – Create a traded-sector matching grant program.</p>
<p>Action 3. Support early-stage innovation within Oregon's university, college, and other research settings, ensuring opportunities for all people in all places to connect to resources.</p>	<p>Critical</p>	<p>Short-term – Support funding for UIRF. Short-term – Scale the InventOR Program to ensure it reaches all corners of the state. Mid-term – Create Oregon Corps.</p>
<p>Strategy 2: Strengthen the Innovation Ecosystem – Develop a systemic, regionally based entrepreneurial service delivery system to help diversify the state's economy, take advantage of innovation-based opportunities, and drive broader participation among underserved communities.</p>		
<p>Action 4. Create Regional Innovation Hub designations that will fund and incentivize collaboration to build and advance innovation-focused ecosystems, ensuring opportunities for all innovation-based businesses throughout Oregon.</p>	<p>Critical</p>	<p>Short-term – Develop planning grants for regional hubs that not only support businesses, but also are responsible for inclusive talent development. Mid-term – Bring regional hubs online. Long-term – Consistently and regularly monitor hubs' performance, realigning if needed.</p>

Strategy/Action	Priority	Timing
Action 5. Link talent to innovation efforts.	Critical	<p>Short-term – Scale current programs.</p> <p>Mid-term – Create new experiential programs to fill gaps.</p> <p>Long-term – Work to ensure all STEM students have opportunity to link to Oregon firms and/or pursue entrepreneurship.</p>
Strategy 3: Catalyze Access to Risk Capital.		
Action 6. Foster the further development of Oregon's risk-capital stack.	Critical	<p>Short-term – Create additional resident angel, pre-seed, and seed funds. It is not envisioned that these funds would be created only in the first two years, but instead that funding would be available over the course of the entire 10 years as opportunities to leverage 3:1 match present themselves.</p> <p>Short-term – Create a working capital loan program and fund loans throughout the entire 10 years of the Innovation Plan</p> <p>Mid-term – Create sector-specific risk-capital sources of funding. It is not envisioned that these funds would be created only in the third and fourth year, but instead that funding would be available over the course of the entire 10 years as opportunities to leverage match presented themselves.</p>
Action 7. Incentivize angel investments in Oregon's innovation-based firms.	Significant	Mid-term – Create an angel investment tax credit program and fund throughout the entire 10 years of the Innovation Plan.
Action 8. As deal flow increases across the state, focus efforts to drive more of the Oregon Growth Account's investments to Oregon's businesses.	Important	Short-term – While plans and policies should be developed in the short-term, changes will be mid-term after increased deal flow has been developed.
Strategy 4: Brand Oregon as The Place for Innovation – Tell Our Story.		
Action 9. Develop Oregon's Innovation Brand and market within the state – the brand should be aligned with and leverage Oregon's existing strengths.	Significant	Short-term
Action 10. Develop an external marketing campaign that showcases Oregon's unique identity and competitive strengths in innovation.	Important	Mid-term

ANTICIPATED IMPACTS GENERATED BY OREGON'S 10-YEAR INNOVATION PLAN

An economic development approach that focuses on encouraging a strong innovation ecosystem can result in a wide range of economic benefits. Some of these metrics are related to inputs, or activities that happen to encourage innovation. For example, R&D expenditures are a critical input for the development of new ideas, businesses, or services. Other metrics are related to outputs, or items that happen because of innovation. This includes impacts such as increased tax bases or enhanced productivity for companies. It is the long-term goal of Oregon's 10-Year Innovation Plan to positively influence Oregon's overall economy by doing the following:

- Helping to increase prosperity, as measured by the following:
 - Increased median personal income at a geographic (statewide and regional) and demographic level
 - Positive net migration flows of skilled talent (measured both by retention and attraction of skilled talent)
 - Positive shifts in Oregon's industry-occupational mix.
- Catalyzing the further growth of Oregon's targeted industry clusters, as measured by the following:
 - Increased GDP relative to the nation within traded sectors and subsectors
 - Increased productivity (value-added per worker) within traded sectors and subsectors
 - Shifts in traded-sector cluster performance (increasing location quotient/specialization of targeted industry clusters) at a statewide and regional level.
- Improving economic resiliency, as measured by the following:
 - Increased academic STEM-related research funding per capita
 - Increased industrial research funding per capita
 - Increase in level of business churn (ratio of firm births to firm deaths)
 - Increased percentage of workforce in STEM occupations at a geographic (statewide and regional) and demographic level.

The reality is that investments such as those envisioned within this plan take time to influence the broad economy. As a result, it will be critical to ascertain the level of programmatic success being achieved as the Innovation Plan is implemented in the short-term so that adjustments can be made as the state confronts an ever-evolving landscape. To measure the progress being made by the actions implemented, the following micro-level measures (or proximate measures of success) are provided for consideration:

- Companies that received assistance:
 - Number of companies receiving assistance from ecosystem partners, including number of companies owned by underserved populations and located in underserved geographies.
 - Number of companies assigned to mentor networks, including number of companies owned by underserved populations and located in underserved geographies.
 - Number of companies assigned to EIRs, including number of companies owned by underserved populations and located in underserved geographies.
 - Money invested in companies receiving entrepreneurial assistance, including money invested in companies owned by underserved populations and located in underserved geographies.
 - Follow-on investments received by companies provided entrepreneurial assistance, including money invested in companies owned by underserved populations and located in underserved geographies.
 - Product sales of companies provided entrepreneurial assistance, including companies owned by underserved populations and located in underserved geographies.

- Jobs created over time in companies provided entrepreneurial assistance, including in companies owned by underserved populations and located in underserved geographies.
- Risk-capital ROI:
 - Nondilutive capital investments, including money invested in companies owned by underserved populations and located in underserved geographies:
 - Dollar value of investment
 - Dollar value of leverage
 - Dollar value of follow-on funding
 - Dollar value of subsequent sale
 - Product sales of portfolio companies
 - Annual revenue growth of portfolio companies
 - Jobs created over time in portfolio companies.
 - Angel investments, including money invested in companies owned by underserved populations and located in underserved geographies:
 - Number of angels actively investing through network
 - Number of companies receiving angel investments
 - Dollar value of angel investments
 - Dollar value of follow-on funding
 - Product sales of portfolio companies
 - Annual revenue growth of portfolio companies
 - Jobs created over time in portfolio companies.
 - Pre-seed/seed funds, including money invested in companies owned by underserved populations and located in underserved geographies:
 - Dollar value of investment
 - Dollar value of leverage
 - Dollar value of follow-on funding
 - Product sales of portfolio companies
 - Annual revenue growth of portfolio companies
 - Jobs created over time in portfolio companies.
 - Later-stage investments, including money invested in companies owned by underserved populations and located in underserved geographies:
 - Dollar value of investment
 - Dollar value of leverage
 - Dollar value of follow-on funding
 - Product sales of portfolio companies
 - Annual revenue growth of portfolio companies
 - Jobs created over time in portfolio companies.
- Talent:
 - Number of students placed in internships/co-ops, including students in underserved populations and living in underserved geographies.
 - Number of students who accept permanent job offers, including students in underserved populations and living in underserved geographies.

- Dollar value of wages of jobs created/retained, including students in underserved populations and living in underserved geographies.
- Branding/marketing:
 - Number of ecosystem partners using shared branding on their outreach materials.
 - Number of Ecosystem Ambassadors engaged, *including* number from underserved populations and living in underserved geographies.
 - Attendance at in-person innovation celebrations, including number of attendees from underserved populations and living in underserved geographies.
 - Engagement rates on new website.
 - Engagement rates on digital marketing campaign.
 - Number of positive news stories in local markets.
 - Number of positive news stories in national/international markets.

POTENTIAL SOURCES OF FUNDING

As previously noted, as Oregon implements actions in the Innovation Plan, the level of funding for Business Oregon's innovation investments must increase. In addition, significant investment and coordination through public-private-philanthropic partnerships will be required if the Innovation Plan is to be implemented to its full potential. As a result, it is recommended that Oregon InC and other stakeholders in the state's innovation ecosystem explore funding opportunities beyond its traditional sources. Across the nation, there are several innovative approaches to funding economic development that are worthy of consideration. While each of these may be limited in their replicability in Oregon due to the state's unique regulatory structure, these examples are intended to serve as a starting point for creative funding mechanisms:

- **Tax increment financing for industry clusters:** Tax Increment Financing (TIF) is a value capture revenue tool that uses taxes on future gains to pay for new infrastructure improvements. Oregon could explore how a TIF model could be applied to the state's advanced industry clusters.
- **Bonding revenue:** In 2017, Maine voters approved a special referendum to issue \$50 million in bonds to fund greater investment in research, development, and commercialization across the state's targeted industry sectors via the Maine Technology Institute (MTI). Since its founding by state statute in 1999, MTI has distributed nearly \$270 million via a variety of programs to more than 2,500 projects throughout Maine. Other states such as California, Texas, and Ohio have also passed significant bond measures to support innovation-based economic development.
- **Alternative recurring revenue streams:** JobsOhio, the state's private nonprofit economic development organization, is wholly funded by an independent private source – the profits from the JobsOhio Beverage System (JOBS) liquor enterprise. Since its inception in 2011, the organization has benefited from considerably larger budgets and much more flexibility in comparison with its peers.
- **Venture development funds:** Currently, Oregon's University Venture Development Fund program helps commercialize university research, rewarding donors to the fund with an extraordinary 60 percent Oregon income tax credit in addition to the federal charitable gift deduction. The state could explore creating a new mechanism that would offer the same benefits to investors, but could fund other innovative companies in the state's industry sectors, including those outside of universities.

- **Innovation-based opportunity funds:** Many communities throughout the country are targeting investment in Opportunity Zones, designated census tracts that are generally lower income and suffering from a lack of investment. A qualified Opportunity Fund is the required vehicle to invest into Opportunity Zones; and, while most have been formed for a single purpose such as a particular real estate development, there is significant potential for a venture capital model with a portfolio of shares in innovative entrepreneurial companies. This could potentially drive investment in under-resourced communities and in a more diverse range of entrepreneurs.

In addition to state sources of funding, consideration needs to also be given to creating public-private-philanthropic partnerships to fund a number of these initiatives. Throughout the Innovation Plan, requirements for matching funds to leverage state investments have been recommended, which would include investments by Oregon's private industry and philanthropy. Examples include the following:

- Danforth Foundation in St. Louis funding the Donald Danforth Plant Science Center, the anchor of the St. Louis BioBelt Initiative. The foundation's \$225 million investment provided the pivotal funding for the Donald Danforth Plant Science Center, which was founded in 1998 to improve the human condition through plant science. Besides seeking to improve nutrition and feed the world's hungry, Danforth Center researchers are working to develop renewable sources of energy and other sustainable products that will preserve and enhance the environment and make St. Louis the world center for plant science, in terms of both research and commercial development.
- The North Carolina Research Campus is a public-private research center in Kannapolis, N.C. The campus was envisioned by David H. Murdock, owner of Dole Food Company, as a center for improving human health through research into nutrition and agriculture. The campus was formed and operates as a partnership with the state of North Carolina and the University of North Carolina system. Murdock has donated more than \$500 million since the creation of the research campus.
- The Lilly Endowment in Indiana has spent hundreds of millions of dollars over the last several decades investing in efforts to strengthen communities across Indiana, including significant investments in the Central Indiana Corporate Partnership, the Regional Opportunity Initiatives in partnership with Indiana University and the Naval Surface Warfare Center at Crane, the Wabash Heartland Innovation Network in partnership with Purdue University, and the Labs for Industry Futures and Transformation (LIFT) Network in partnership with Notre Dame University.
- Flinn Foundation in Arizona has invested significant funds to support the state's Bioscience Roadmap since its inception.

SUMMARY

As previously discussed, it is recognized that Oregon is making significant investments in innovation programs through Business Oregon, Oregon InC, the Oregon Growth Board, and numerous higher educational and regional initiatives. The actions that have been proposed in this strategy, and the resources that will be required, should not operate as separate activities that constitute new investments. Instead, the state and its various programs will need to align its current activities to this new vision for Oregon. This will entail developing new and improved public-private-philanthropic partnerships.

CONCLUSION

Innovation, widely understood to have been the economic engine of the United States over the past century, is in a state of decline as global competitors increasingly overtake the United States in total R&D spending and innovation productivity. Different studies over the past several years all point to the same conclusion – the decline in U.S. innovation is impeding economic growth.

Oregon has a number of efforts in place to support the innovation ecosystem. Through its historic investments, Oregon's state leadership has demonstrated an understanding that a vibrant and high-functioning innovation ecosystem is necessary for the state's economy to reach its full potential. Still, even with these investments, Oregon faces significant challenges across a number of critical factors of its ecosystem, including the following:

- The lack of a statewide entrepreneurial culture stymies the innovation ecosystem and represents a limiting factor to Oregon's ability to scale companies.
- The agglomeration of national risk-capital markets is threatening Oregon's ability to finance its deal flow.
- While levels of R&D are quite high, and commercialization is growing, more can be done to ensure the pipeline of deal flow is robust and "sticky" to the Oregon economy.
- The lack of "buzz" or image regarding Oregon as a desirable location for innovative companies is hindering the development of the ecosystem.

These challenges, however, are not insurmountable; and, with a renewed and re-oriented focus toward addressing these barriers, the state's innovation ecosystem can thrive.

The challenges identified stand as strategic priorities that, if effectively addressed, will enable Oregon to ignite the growth of its economy and create a robust, inclusive innovation ecosystem for all people in all places. To advance this end goal, four strategies have been identified as priorities:

- Oregon must have traded-sector industries that **constantly innovate**, not only the products that they make but also the technological processes that they use to make them.
- Oregon must foster a robust **innovation ecosystem**, ensuring the requisite entrepreneurial support services to address the continuum of needs from early-stage startups to scalable enterprises.
- Oregon must have **financial capital markets** receptive and prone to investing in innovative firms and entrepreneurs that are developing and applying cutting-edge technologies to products and processes.
- Oregon must **promote** itself as a place to start and grow an innovative company.



By implementing the strategies and actions outlined in this Innovation Plan, Oregon will help ensure that it is working to position the state's economy for economic growth. Now is the time for Oregon to double down and leverage its existing investments to develop a vibrant and high-functioning innovation ecosystem to ensure that, in 10 years, Oregon is globally known as a model for a diverse, inclusive, and resilient economy: a place where innovative people solve the greatest challenges of our times to create novel, sustainable products, processes, and companies that drive economic growth.

APPENDIX A:

OREGON'S HISTORY OF INNOVATION AND ECONOMIC DEVELOPMENT

Innovation-based economic development is not a new concept in Oregon. It is essential to understand the history of innovation in Oregon, including legislatively directed investments, in order to catalyze the state's innovation and entrepreneurship ecosystem in the future.

Oregon's high-technology industry dates back generations, but the role of the U.S. Forest Service Radio Lab in Portland from the 1930s through the 1950s cannot be overstated.⁴⁹ Established to communicate across isolated fire lookouts, the lab attracted inventive technologists interested in the natural environment – an area of strength for Oregon to this day. Although the lab never employed more than eight researchers at a given time, it acted as an important hub for research, education, and value-added networking around radio engineering. Importantly, two innovators attracted by the lab's activities would become principals of Oregon's prominent, early high-tech companies: Electro-Scientific Industries, a leader in impedance bridges; and Tektronix, among the world's premier manufacturer of oscilloscopes and Oregon's largest private employer.

During the latter half of the 20th century, Oregon's state government implemented several policies that propelled the growth of innovation-oriented sectors.⁵⁰ For example, Governor Mark Hatfield and Portland civic leaders established the Oregon Graduate Center (OGC) in 1963, dedicated to creating a major hub for education, research and development (R&D), and manufacturing in what was then an underdeveloped part of Washington County. Designed as an early innovation hub with support from the government, private sources, Tektronix, and philanthropic foundations, the institution was founded with grand aspirations and successfully drew many entrepreneurs, researchers, and students to the region. However, the financial model to sustain OGC's operations struggled; it was eventually merged into Oregon Health & Science University in 2001.

Abundant water, inexpensive land and electricity, and an educated workforce led Intel to open its first Oregon plant in 1976. As Intel began to expand its presence in the state, its development coincided with Oregon's abolition of the unitary tax in 1984. This was a tax levied against worldwide profits of companies operating in Oregon, regardless of whether they were headquartered in the state. With no unitary tax, several foreign-owned, high-tech firms (including Japanese companies such as Nippon Electric Company, Fujitsu, and Epson) located in the state, spurring a trend of innovative partnerships with the Pacific Rim. To this day, Oregon remains a hub for export-oriented innovative businesses: Nearly 6,000 Oregon firms exported more than \$21 billion in goods in 2018, and of these, more than 88 percent were small firms.⁵¹

49 Heike Mayer, "Forest Service Radio Lab," *The Oregon Encyclopedia*, March 2018.

50 Craig Wollner, "Silicon Forest," *The Oregon Encyclopedia*, March 2018.

51 U.S. Small Business Administration Office of Advocacy, *2020 Small Business Profile (Oregon)*.

Like all entrepreneurial endeavors, many aspects of innovation-based economic development in Oregon started by taking a risk. In 1984, the state's residents approved the Oregon Lottery with a mission of creating revenue to support the state's struggling economy.⁵² In 2019, Business Oregon distributed \$94 million in Oregon Lottery funds for economic development, and the Oregon Lottery has allocated more than \$3.0 billion to support economic growth since its inception.⁵³ However, while this funding has provided a critical source of capital to support economic development – 26 percent of Oregon Lottery funds are directed toward economic development – the size of these funds has fluctuated over time, and the distribution has become increasingly skewed toward other environmental, educational, and social programs.

Oregon Lottery funding has shaped innovation-based economic development in the state for roughly 35 years. In 1986, the state formed the Oregon Resource and Technology Development Corporation (ORTDC) as a state venture fund to address the lack of early-stage capital in Oregon.⁵⁴ In 1995, the state formed the Oregon Growth Account, which provides financial support for institutional investment vehicles and pre-institutional investment vehicles. The ORTDC was eventually merged into the OGA in 2001, and the administration of the OGA itself was transferred to the Oregon Growth Board (OGB) upon its creation in 2012.

In the early 2000s, Oregon began exploring more intentional support for innovation-based economic development. Oregon Governor John Kitzhaber signed a variety of bills in 2001 to encourage these activities.⁵⁵ Many of the bills signed in the 2001 session helped facilitate university support for R&D, commercialization, and technology transfer. Senate Bill (SB) 832 dedicated more than \$30 million from the state's National Tobacco Settlement to construct university facilities such as research labs. Two bills (SB 101 and SB 102) offered support for university technology transfer offices and new short-term mechanisms to allow universities to hold equity in the products and companies created by their research. Kitzhaber also signed House Bill (HB) 3968, which combined the Oregon Resource and Technology Development Account into the Oregon Growth Account, enabling the OGA to provide seed capital for new companies developed out of university research.

The 2001 session (SB 273) also created the Oregon Council for Knowledge and Economic Development (OCKED), a public-private partnership developed to appropriate public policy to ensure future growth and competitiveness in Oregon. In December 2002, the OCKED presented its initial recommendations to the legislature. Notably, the OCKED provided the impetus behind the state's Signature Research Centers (SRCs), a pillar of the state's innovation-based economic development strategy to this day. These centers would concentrate people, funding, facilities, and support in sectors where Oregon had a competitive advantage.

In 2005, Oregon's legislature and Governor Ted Kulongoski agreed to fund multiple proposals directly informed by OCKED recommendations, including two pieces of legislation that paved the way for the state's innovation-based economic development strategy.⁵⁶ SB 838 brought together more than 40 leaders from the private sector, research universities, and government to create a new way to infuse innovation into the state's economic development activities. Building on OCKED, the result of this legislation was the Oregon Innovation Council (Oregon InC), a public-private partnership that helps create new jobs and new companies, diversify Oregon's economy, and attract federal research dollars back to the state.⁵⁷ Signed concurrently, SB 853 authorized the state's universities to establish venture development funds to facilitate technology commercialization.⁵⁸ This bill also authorized a tax credit to facilitate donations to these funds.

⁵² The Oregon Lottery, "Economic Growth," 2020.

⁵³ *Ibid.*

⁵⁴ https://oregoncf.org/Templates/media/files/jobs_and_economy/oregon_capital_scan.pdf.

⁵⁵ State Science & Technology Institute (SSTI), "Oregon Charts Course for Tech-Based ED," August 2001.

⁵⁶ SSTI, "Oregon Governor Signs Bill to Create Innovation Council," October 2005.

⁵⁷ *Ibid.*; See also, Oregon SB 838, 2005.

⁵⁸ SSTI, Oregon Legislature Passes University Venture Development Funds Bill," July 2005.

The next year, Oregon InC unveiled a slew of proposals to boost innovation, all of which were included in the Governor's proposed budget.⁵⁹ This included ongoing and new funding for what became the state's SRCs:

- The Oregon Nanoscience and Microtechnologies Institute (ONAMI), the state's first SRC, focused on nanotechnology and microtechnology (SB 5508). Today, ONAMI focuses on all deep science or research-based innovation with potential intellectual property and which addresses an important problem, ranging from semiconductor materials to optics to medical devices.
- The Oregon Translational Research and Development Institute (OTRADI), a partnership of four state universities to develop and commercialize new drugs to fight infectious diseases (HB 5035). Today, OTRADI operates Oregon's only nonprofit collaborative bioscience discovery laboratory, as well as the state's first and only bioscience-specific incubator.
- The Built Environment and Sustainable Technologies Center (now known as VertueLab), which focuses on R&D in clean energy, bio-based products, and green building materials. Today, VertueLab provides funding and holistic entrepreneurial support to early stage cleantech startups that help fight climate change.

These centers have historically provided value-added services and risk capital to the entrepreneurs innovating in these targeted industries. Since their establishment, the three SRCs have combined to create more than 1,100 jobs through a wide range of mentor connections, access to capital, and domain expertise and have leveraged more than \$1 billion in follow-on funding for portfolio companies.⁶⁰

Another activity supported by Oregon InC in its early years includes the development of the nation's first commercial-scale wave energy park, building on pre-existing wave energy research conducted at Oregon State University. Additionally, Oregon InC provided funds to support enhanced training and R&D resources in value-added manufacturing processes. Like many states, innovation-based economic development activities saw reduced funding from budgets during the onset of the Great Recession and the years that followed. While Oregon InC maintained financing for various activities, its programmatic focus began to shift in certain areas. Today, the council still provides funding to accomplish its goals related to growing entrepreneurial traded-sector businesses. Oregon InC's current programs include the following:

- Signature Research Centers (SRCs), which focus on emerging industry sectors where Oregon has innate advantages and are potential high-growth sectors in the future.
- High Impact Opportunity Projects (HIOPs), discrete projects that support the growth of industry sectors by removing barriers, supporting product development/testing, or expediting technology commercialization of other aspects of industry innovation.
- Small Business Innovation Research (SBIR) Support Program, which helps small businesses access federal non-dilutive, but very competitive, funding and helps fill gaps in the federal funding for companies that receive federal awards. The program has two grants to assist companies: application support grants and matching grants.
- Commercialization Gap Fund, which provides early-stage risk capital to innovation-based companies with the potential for high growth.
- University Innovation Research Fund, which provides Oregon's universities with matching grants to increase the state's competitiveness in accessing federal funds for R&D and economic development.

Finally, while not funded through Oregon InC, the state of Oregon supports the Oregon Manufacturing Innovation Center (OMIC), hosted by Oregon Institute of Technology. OMIC is a collaborative environment bringing together industry, higher education, and government in partnership to develop new tools, techniques, and technologies to address near-

⁵⁹ SSTI, "Oregon Sets Sights on Innovation Plan," December 2006.

⁶⁰ Business Oregon, "Oregon InC: Signature Research Centers," 2020.

term manufacturing challenges through applied research and advanced technical training. OMIC is modeled after the University of Sheffield Advanced Manufacturing Research Center (AMRC) with Boeing in Sheffield, England. Since its founding, the industry-university center has brought together the expertise of more than 30 multi-national companies and three of Oregon's public universities to support the state's metals manufacturing industry.

Understanding how the legislatively directed investments have sought to catalyze the innovation/entrepreneurial ecosystem in the face of declining national trends is critical to informing future investments in Oregon's innovation/entrepreneurial initiatives.

Separate and distinct from Oregon InC, the Oregon Growth Board (OGB) was created in the 2012 Legislative Session in an effort to spur economic growth in Oregon, with a focus on increasing the state's ability to grow companies from early stage to large, locally headquartered firms. An important focus was placed on leveraging state resources to improve the availability of capital for high-growth companies. Since its establishment in 2014, the OGB has been in charge of overseeing two pools of capital: the Oregon Growth Account (OGA) and the Oregon Growth Fund (OGF).

The OGA is a unique attempt by the state to recycle lottery proceeds into funding for education programs by investing in return-earning opportunities that may stimulate the local startup ecosystem. The OGA has invested in early-stage venture capital fund managers, playing a role in growing current staples like the Oregon Angel Fund, Portland Seed Fund, Cascade Seed Fund, and others. With the goal of potentially generating jobs across the state, OGA has also invested in larger national private-equity funds with investment pipelines in Oregon. Today, the OGA has a private investment portfolio worth over \$100 million. When HB 4040 created the OGB, it also established the OGF as a second funding vehicle. While the OGA's constitutional mandate was to earn returns for the education programs within the Education Stability Fund, the primary purpose of the OGF is economic development. This clear distinction allows the OGF to take on higher levels of risk by investing in new fund managers and help them institutionalize to the point at which they are eligible to receive capital from the OGA. Additionally, the OGF has the flexibility to provide grants for venture capital conference development and to give out to underserved entrepreneurs. Like the OGA, the OGF does not invest in individual companies, rather through investment funds or intermediaries.

In addition, Business Oregon serves as contract administrator for partner organizations to provide services to small businesses and manufacturers. Through a partnership with the federal government that leverages federal funding, Business Oregon today is working with sheltered startups as well as Oregon's manufacturers through two important programs:

- **Small Business Development Centers:** The Oregon Small Business Development Center Network (OSBDCN) consists of 19 centers located across the state as well as a number of smaller satellite offices. The centers provide one-on-one counseling to clients including assessments, business plan preparation, financial management, personnel management, and marketing; they are a critical part of the state's economic development ecosystem. In addition, centers help facilitate access to capital by bridging the gap between small businesses seeking capital and lenders looking for qualified buyers. Located on university or community college campuses, SBDCs are embedded in places where collaboration is at a premium.
- **Oregon Manufacturing Extension Partnership:** The Oregon Manufacturing Extension Partnership (OMEP) is dedicated to serving small and medium-sized manufacturers. OMEP is part of the national Manufacturing Extension Partnership, a nationwide program in every U.S. state. OMEP helps manufacturing leaders and their teams identify, develop, and implement new business strategies; use company financials to influence effective decision making; leverage the power of a lean continuous improvement business model to increase profitability, scale capacity and support growth and more.

Additionally, Business Oregon focuses its efforts on a wide range of other initiatives to support economic development in the state. These include targeted programs related to business lending, rural opportunity, technical assistance, and broadband.

- **Business Oregon Lending and Loan Guarantee Programs:** Business Oregon administers numerous loan and loan guarantee programs. The Oregon Business Development Fund provides direct loans that leverage private capital and provide incentives for businesses to expand or locate in Oregon; the Oregon Royalty Fund provides direct loans to help early-stage (post-R&D and prototyping), scalable and high-margin small businesses obtain short-term working capital to support rapid growth; the Entrepreneurial Development Loan Fund offers direct loans to help startups, microenterprises, and small businesses expand or become established in Oregon; and the Credit Enhancement Fund provides loan guarantees to financial institutions in order to increase capital availability to small businesses.
- **Rural Opportunity Initiative:** The Rural Opportunity Initiative (ROI) is Business Oregon's strategic effort to empower rural communities to support entrepreneurs and small business growth. Through financial support, innovative partnerships, network expansion, and access to business development resources, ROI helps strengthen and consolidate entrepreneurial ecosystems within and across Oregon's rural communities, with a particular emphasis on diverse populations and low-income people.
- **Underrepresented Small Business Technical Assistance (TA) Grant Program:** The Small Business TA grant program was designed to support culturally-specific or culturally-competent nonprofits, community-based organizations, and chambers of commerce with resources to allow them to fulfill an unmet need among underserved businesses for small business technical assistance. The goal of the Small Business TA grant program is to ensure that all businesses have access to the technical resources that can and often do mean the difference between success and failure and that they are delivered by people who look, sound, and share similar experiences.
- **Broadband:** Business Oregon advances access to broadband across the state through numerous efforts including management of the Oregon Broadband Advisory Council (OBAC) and the associated Broadband Advisory Council Fund. The mission of OBAC is to encourage coordination and collaboration between organizations and economic sectors to leverage the development and utilization of broadband for education, workforce development, and telehealth and to promote broadband utilization by citizens and communities. Business Oregon also administers rural broadband grants as directed by the Oregon Legislature.

APPENDIX B:

LIST OF OREGON STAKEHOLDERS PARTICIPATING IN INNOVATION PLAN

Luann Abrams	CEOX
Ron Adams	Oregon State University
Emmanuel Akporiaye	Veana Therapeutics
Jennifer Alix-Garcia	Oregon State University
Jeff Allen	Forth
Erik Andersson	Strategic Economic Development Corporation
Sam Angelos	Oregon State University
Juan Barraza	Portland State University Center for Entrepreneurship
Nicole Bassett	The Renewal Workshop
Matt Beaudet	InVivo Biosystems
Sally Bernstein	Sustainable Northwest
Len Blackstone	Blackstone Inc./ONAMI
Greg Block	Sustainable Northwest
Liisa Bozinovic	Oregon Bioscience Association
John Brewer	Oregon Nanoscience and Microtechnologies Institute (ONAMI)
Claire Campbell	Oregon Health Authority
Craig Campbell	Oregon Manufacturing Innovation Center
Emma Clark	Beaverton Chamber of Commerce
James Coonan	Entrepreneur, Retired
Caroline Cummings	Oregon RAIN
Mitch Daugherty	BUILT Oregon
Lisa Dawson	Northeast Oregon Economic Development District
Maribel De Leon	Adelante Mujeres
Kate Delhagen	Oregon Sports Angels
Andrew Desmond	Oregon Business Council
Christine Drazan	Oregon State Legislature

Rachel Dreilinger	NeuraMedica Inc.
Dave Edlund	Element 1 Corp.
Micah Elconin	Eugene's Table
Heather Ellis	OTRADI/Oregon Bioscience Incubator
Rick Evans	Organization for Economic Initiatives/Oregon Government Contract Assistance Program (GCAP)
Jesse Fittipaldi	Arcimoto
Kathleen Flanagan	The Ford Family Foundation
Aaron Fox	Oregon Manufacturing Extension Partnership
Jennifer Fox	Autodesk
Diane Fraiman	Voyager Capital
Corey Frazier	Intel Corporation
Melissa Freeman	Oregon Community Foundation
Michelle Fusak	Oregon Manufacturing Extension Partnership
Nels Gabbert	Wallowa Resources
Peter Galen	Hemex Health
Gudrun Granholm	Box One, Inc./University of Oregon
Nicholas Green	City of John Day
Stephen Green	A Kids Book About
Mark Gregory	Oregon Small Business Development Centers
Charmaine Guillory	Supply Design
Chris Harder	Coraggio Group
Ashley Henry	Business for a Better Portland
Gregory Hinckley	Portland State University
Marcus Hinz	Oregon Coast Visitors Association
Andrew Hoan	Portland Business Alliance
Gordon Hoffman	Northwest Technology Ventures/OTRADI
Tom Insko	Eastern Oregon University
Angela Jackson	Portland Seed Fund/Portland State University
Jake Jacobs	Oregon Aviation Industries
Rachel Jagoda Brunette	The Lemelson Foundation
Joseph Janda	Portland State University
Tyler Janzen	Association of Oregon Counties
Amy Jermain	XXcelerate
Bill Johnson	Eastern Oregon Border Economic Development Board
Dwayne Johnson	Civic Software Foundation
Shane Johnson	Coast to Crest Fund

Sayer Jones	Sayer Jones Consulting
Julie Keniry	Rural Engagement and Vitality Center
David Kenney	VertueLab
Douglas Keszler	Oregon State University
Don Krahmer Jr.	Schwabe Williamson Wyatt
Adam Krynicki	Oregon State University-Cascades, Innovation Co-Lab
Bill Kuhn	First Interstate Bank
Hannah Kullberg	Pacific Northwest Packaged Food & Beverage Group
Steve Lawn	Pendleton UAS Range
Annette Liebe	Office of Governor Kate Brown
Mark Lieberman	Oregon State University Advantage Accelerator
Nathan Lillegard	University of Oregon
Iain Macdonald	TallWood Design Institute
Jon Maroney	Oregon Venture Fund
Aditi Martin	Oregon Health & Science University
Joe Maruschak	Coast to Crest Fund
Janice Mason	Philippine American Chamber of Commerce of Oregon
David McFeeters-Krone	Intellectual Assets
Dennis McNannay	Curadite
Jessica Metta	Mid-Columbia Economic Development District
Lynn Meyer	Community LendingWorks
Marceau Michel	Black Founders Matter Fund
Brian Moreland	Marion County Economic Development
Cassandra Moseley	University of Oregon
Cal Mukumoto	The Mukumoto Consultancy
Karl Mundorff	Oregon State University Advantage Accelerator
Kari Naone	TiE Oregon
William Newman	Northwest Technology Ventures/OTRADI
Laura Nissen	Portland State University
Amanda Osborne	Oregon Entrepreneurs Network
Colleen Padilla	Southern Oregon Regional Economic Development Inc. (SOREDI)
Dmitri Palmateer	Oregon State Treasury
Elliott Parker	Additive Care
James Parker	Oregon Native American Chamber
Himalaya Rao-Potlapally	Black Founders Matter Fund
Tobias Read	Oregon State Treasury
Bryson Robertson	Oregon State University/Pacific Marine Energy Center

Mark Ronay	Liquid Wire
Skip Rung	Oregon Nanoscience and Microtechnologies Institute (ONAMI)
Kat Rutledge	Klamath IDEA/Klamath Community College Small Business Development Center
Rob Schneider	The Lemelson Foundation
Pat Scruggs	Scruggs & Associates
Gregg Semler	InPipe Energy
Tim Seydel	Eastern Oregon University
Nita Shah	Micro Enterprise Services of Oregon
Eddie Sherman	Hilltop Solutions
Cara Snow	Technology Association of Oregon
David Stone	Oregon State University Food Innovation Center
Ivo Trummer	Port of Portland
Erik Tucker	Aronora
Dexter Turner	OpConnect
Bryan Tweit	Launch Pad Baker
Jane Ullman	Silicon Valley Bank
Jacob Vandever	Oregon House Republican Minority Office
Mike Vanier	Oregon Manufacturing Extension Partnership
Brian Vierra	Economic Development for Central Oregon
Brian Wall	Oregon State University
Andrew Watson	Oregon Health & Science University
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