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The Road Ahead For Information Technology Occupations: A Workforce Strategy for Oregon

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Overview

The capacity to grow Oregon's economy depends on the competitiveness of its businesses and the quality of its workforce. Knowledge-based workers are increasingly the focal point of a state's workforce given their ability to drive innovation or apply technologies and business practices in ways that improve competitiveness. Information technology (IT) workers comprise the largest segment of Oregon's knowledge-workers. As stated in a recent US Department of Commerce report, "The demand for these workers [IT occupations] goes beyond the IT industry, cutting across manufacturing and services, transportation, health care, education and government. The IT professions are among the fastest growing and highest paying jobs in our economy, and despite the downturn in IT-related industries, there is still demand for highly skilled technical workers."

In November 2002, the Oregon Council for Knowledge and Economic Development (OCKED) identified the need for an IT Occupational Roadmap to address one of Oregon's largest workforce sectors. This recommended roadmap is also consistent with the Oregon Workforce Investment Board's 2001 Strategic Plan. The plan notes a strong need for "a well educated, skilled workforce that will keep Oregon's economy competitive in the global marketplace," and "a highly trained workforce skilled in information technologies and problem solving, and ready to adapt to nearly continuous change."

The IT Occupational Roadmap is a two-part project: Phase I of the project gathered input from Oregon Chief Information Officers (CIO's) and IT professionals and combined the input with national best practice research to:

- Determine demand for IT jobs in Oregon, including geographic and industry distribution.
- Identify critical economic and workforce trends that will affect the supply and demand of IT jobs, and the key skills and competencies that will be required over the next 5-10 years.
- Determine IT education and training gaps for producing new qualified graduates and keeping incumbent workers up to date on emerging skills and technologies.
- Develop innovative solutions that can address identified IT needs and establish a framework identifying how the state can support our technology workforce.

Oregon's IT workforce

Oregon has an estimated 71,000 IT workers – over 85% of these workers are employed outside of high tech, with approximately 20,000 IT workers employed outside the Portland Metropolitan Statistical Area. The average IT job pays 80% more than the average state wage with most IT wages ranging from \$42,000-\$62,000 per year. The Oregon Employment Department and a recent survey of 200 Oregon IT employers both indicate a job growth rate more than double the statewide average. Based on primary and secondary research conducted for this report, Oregon is estimated to have 5,000 to 6,000 annual openings (new and replacement jobs) for IT workers in each of the next three years. Many of these jobs will require new skills or knowledge with respect to emerging IT tools and methodologies.

Continuous training and life-long learning is a prerequisite, not an option, for IT workers. Accordingly, the ability to receive quality training in a timely and cost-effective manner – within Oregon – will play a significant role in the employability of these workers.

IT jobs examined in this study are available for all levels of education. Entry-level (lower skilled) jobs with a high school diploma or GED and short-term training can be found for a small percentage of IT jobs. Jobs requiring an associate's degree can be found in approximately one third of IT jobs. These jobs are typically located in network, data center operations, technical support and some aspects of web development and quality assurance functions. Bachelor's degrees are the most common educational requirement for IT jobs, with over half of all IT jobs requiring at least a four-year degree. Virtually all workers interested in jobs relating to IT management, programming, software development, systems architecture, application integration and security and compliance will require at least a four-year degree.

People with vendor-specific or professional certifications along with their degree are viewed as more employable as compared to counterparts with similar work experience and no additional certifications. Certifications with no accompanying degree or relevant work history have limited value in the job market.

When the growth rate for IT occupational clusters (shown at the end of this document) are compared to the educational requirement typical for those jobs we find that 56% will require a bachelor's degree, 35% of jobs will require an associate's degree, and 9% would require less than an associate's degree. Given a base rate of 6,000 annual openings, we can project that 3,360 new and replacement hires would require a bachelor's degree, 2,100 would require at least an associate's degree, and 540 IT jobs would require less than an associate's degree.

In addition to core IT occupations, almost every job requires the use of computers, technology and creative problem-solving, making the educational foundation for IT an important aspect to a vast number of other occupations. Therefore, investing in IT training leverages education and training for the more than 70,000 direct IT jobs as well as the tens of thousands of other jobs that use information technology.

IT trends

IT workforce development is obviously shaped by key trends in information technology. While there are many influencers, national studies and interviews with Oregon IT professionals suggest five trends with significant long-term impact:

- **Outsourcing:** Outsourcing and offshore development are cited as a major influencer of future IT employment as occupations like computer programming become more of a commodity.
- **Technology standardization:** After a decade of explosive growth in IT spending, organizations are focused on standardizing software applications and reducing the overall technology assets requiring support.
- **Return on investment (ROI):** ROI criteria are being strictly applied to new IT spending; projects that enable application integration or provide better alignment with core business processes are being given priority.
- **Integration of technical and business skills:** In addition to required technical competencies, future IT jobs will have more of a business analysis and process optimization flavor. Having an understanding of business fundamentals and solid communications skills are essential.
- **Disruptive technologies:** Another trend with implications for workforce training is the rapid pace of change and innovation in technology. Being able to quickly identify the risks, benefits and needed training for new technologies can provide a competitive advantage for companies and workers.

Given these trends, the IT jobs that remain in the United States and Oregon will have a strong business process and operational orientation and will be found either in creating or applying new cutting-edge technologies or in “less glamorous” technical support and infrastructure positions. More standardization means that workers will be expected not only to be proficient in specific platforms or applications, they will also be expected to understand connectivity, integration and messaging technologies and tools. A team approach to IT development with frequent interaction between technical and non-technical workers means that soft skills like teamwork and communication as well as knowledge of business operations and project management are now considered baseline skills for technology employees.

Employment across all Oregon industries

The demand for information technology (IT) jobs is often underestimated because they exist in an array of industries instead of being concentrated in one sector of our economy. According to the Oregon Employment Department, the top industries in Oregon that employ IT workers include: business services, wholesale trade, manufacturing (electronics, machinery, instruments), engineering and management services, depository institutions, health services, educational services, insurance carriers, and government. In addition to industry sectors, IT employers can be categorized by their primary use of information technologies.

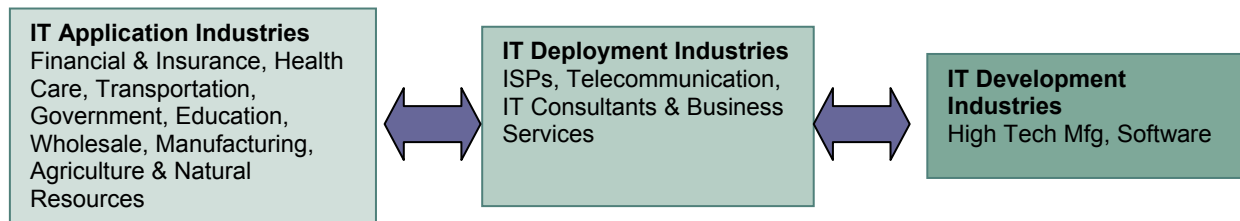
- **IT application industries:** The vast majority of IT employers are industries that apply IT as a way to more effectively manage data and to find timely and cost-

effective ways to use that information. Examples of these industries include financial & insurance, health care, transportation, government, education, wholesale, manufacturing, agriculture and natural resources.

- **IT deployment industries:** There is a smaller subset of industries that provide the infrastructure for the application of IT technologies. These include Internet service providers, telecommunication companies and IT consultants. They do not develop the technology, yet they are critical to the deployment of IT services.
- **IT development industries:** About 20 percent of IT jobs are found in companies that develop the technology (hardware and software) for IT. These companies include software and high tech manufacturers. These companies have the highest skilled workers and must stay on the bleeding edge to be competitive.

When information about IT employment, education needs and trends are synthesized by the types of IT employers, certain patterns appear that help education and workforce development organization effectively target their programs. The following chart summarizes key findings from the IT report.

IT workforce needs by type of employer



Distribution of IT Workforce		
60-65%	10-15%	20-25%
Distribution of Firms		
All parts of the state	Throughout the state with larger firms in metro areas; smaller firms in rural areas	Concentrated in Portland region with smaller clusters in Central & Southern Oregon
IT Business Goal		
Competitive Edge	Leading Edge	Bleeding Edge
Priority IT Occupations		
Application Services Database IT Management Network External Support & Call Center	Computing Envir. & Data Center Network Security, Compliance & QA Internal Support & Help Desk Creative & Web Services	Software Development Marketing & Sales Technical Writing External Support

Importance of Four-Year Technical Degree		
Medium	Medium to High	High
Importance of Certification		
Medium to High Often used as a differentiating factor in hiring; More focused on professional certification	Medium to High Tends to be more vendor specific or focused on issues like security	Low to Medium Technical degrees matter most
Incumbent Worker Training Needs		
High	Medium to High	Medium

The challenge for Oregon

For Oregon employers and IT workers to keep up to date with a rapidly changing set of technologies and skills requires an IT training and education system that is responsive and flexible. Employers and IT professionals noted the following training gaps in Oregon:

- For many high-end technologies and business methodologies, IT workers must travel out of state to find quality training.
- Distance learning and web-based training appear to under-utilized, especially in rural areas. In addition, there is little consistency in the technologies being used for e-learning.
- Incumbent workers and recent graduates are believed to have the necessary technical foundation skills but lack the project management and business process expertise required in today's environment.
- There appears to be no systematic, broad-based forum to identify and discuss the business risks and value of disruptive technologies (wireless, Web services, open source, etc.) and to identify associated training needs.
- An array of IT and computer science degree programs are available with apparent capacity to train IT workers. Yet employers question the degree to which curriculum is consistent across campuses and aligned with current industry standardization. Further, employers perceive disconnects between certification and degree programs in post-secondary education, and question the rationale for differences in community college terminal and transfer degrees.

Based on IT trends, hiring projections, focus group discussions and identified training gaps, a set of strategic directions have been developed. These recommendations are intended to provide guidance for further exploration of specific workforce and training programs and are not inclusive of all options, but rather provide the foundation for developed of refined action plans.

The strategic directions found in this report share a set of common characteristics including:

- An awareness of the rapid rate of change within IT and IT occupations and the associated need to be responsive and scalable in training delivery.
- An emphasis on active private sector involvement in the development and delivery of training.

- An understanding of the need to marshal resources and avoid duplication of effort, and
- An appreciation for the large number of high quality, family wage IT jobs found outside of technology firms or “high-profile” software engineering occupations.

Strategic directions

The recommendations that follow are intended to provide strategic direction and focus for the development of priorities and more detailed plans in Phase II of this project. These recommendations are meant to serve as the foundation for targeted discussions among education and training providers, the Governor’s workforce advisors, state agencies, industry associations and local/regional workforce boards who share a common interest in the development and delivery of coordinated actions based on identified industry demand.

A. Aggregate training for incumbent workers: Training content is widely available for both generic and highly specialized IT needs. The primary issue in Oregon is aggregating demand at a level sufficient to deliver cost-effective and high quality training.

- Aggregate demand for highly specialized technologies or methodologies across industry sectors to attract intensive “A-level” training seminars to Oregon. (i.e., training that workers must currently travel out of state to obtain.)
- Aggregate demand for generic platform and vendor specific applications as well as project management skills in rural regions and industry sectors to reduce costs of and improve access to training.

B. Enhance post-secondary programs to align with changing industry trends

- Develop “business-enriched” computer science and information management systems programs with a core set of business fundamentals, project management and work flow analysis skills, including stronger connections with business schools.
- Provide seamless educational progression for IT programs. Increasing IT standardization suggests the need for curriculum at each level of education that is consistent among educational institutions, and can be articulated from one level to the next. Better connections between certification and degree programs should be explored since professional certification in combination with a degree is the new norm for IT workers.
- Increase real-world work experience for students by enhancing efforts to engage employers in work-based experiences, and increasing the use of technical or business solution teams (teams of students and faculty teamed with a company) throughout the post-secondary education system.

C. Develop a unique IT market niche for Oregon

- Encourage and support a broad-based forum for understanding and rapidly adapting to disruptive technologies that can become a barrier or a competitive edge, depending on how well and how fast a company can identify the business value or potential risk. Being able to identify the impact of these

- technologies and then quickly deploying appropriate training could offer Oregon a differentiating niche for both workforce and economic development.
- Create a standardized statewide training infrastructure that supports rapid development and delivery of new content using both instructor-led training and consistent and scalable distance learning tools. In addition to having “the right people with the right skills,” Oregon has an opportunity to differentiate itself by using its relatively small market size to be nimble and responsive and build a reputation for excellence in specific IT areas.

D. Improve the effectiveness of workforce development funds and programs

- Provide specific short-term training to unemployed IT workers to increase their immediate productivity to a new employer. Targeted uses of workforce development funds such as Individual Training Accounts (ITAs) or training partnerships with employers could significantly improve unemployed worker skills and be beneficial to hiring employers.
- Help career guidance counselors and instructors at all levels (high school, colleges and workforce organizations) to understand today’s IT skills and to attract people with the right “fit.” The typical IT worker has evolved from the quiet programmer in the corner to a problem-solving communicator with a blend of technical, business and people skills.

E. Establish a statewide focus on IT issues

- Establish an Oregon IT Skills Panel led by employers and aligned with the Governor’s Workforce Development Strategy. Since technology workers are employed in so many industries, a statewide, multi-industry forum should be established to identify critical technology and workforce issues that are key to the competitiveness of Oregon businesses and the success of Oregon technology workers.
- Standardize IT applications within educational systems and government agencies. State agencies and post-secondary education systems should explore ways to standardize IT applications to provide consistent IT delivery to customers, minimize IT infrastructure costs, and maximize investments in IT training.

IT jobs taxonomy

For the purposes of this study we explored IT occupations in five major occupational clusters based on national skills standards (Career Clusters, Focusing Education on the Future; U.S. Department of Education, Education Development Center, Information Technology Association of America, National Alliance of Businesses). We further divided these five clusters into twelve common job categories with shared skills and training requirements. The five major clusters and the twelve sub-categories, along with example job titles are shown below.

A. IT Management, Marketing & Sales Management	B. Network & Infrastructure Services Network	C. Database & Applications Database
CIO / CTO IT Director IT Manager (General) Chief Security Officer Computer Operations Manager Telecommunications Manager IT Training Manager IT Program Manager IT Project Manager (General) Technical Recruiter IT Budget / Finance Officer	Network Design & Administration Communications Analyst Data Communications Analyst Network Administrator Network Analyst Network Operations Analyst Network Specialist Network Technician Network Engineer	Data Administrator Data Analyst Data Architect Database Developer Database Manager DSS (Decision Support Services) Database Librarian Data Warehousing Specialist
Marketing & Sales	Computing Environment & Data Center	Software Development
IT Marketing Account Manager IT Sales IT Consulting Sales Technical Sales Manager Technical Sales Support	Systems Administrator Information Systems Administrator Information Systems Operator Information Technology Engineer Release Management & Staging Specialized Hardware Support (e.g. Imaging) Technical Support (Level 2/3)	Technical Lead Systems Analyst Computer/Software Engineer Computer Programmer Programmer/Analyst Embedded Systems Developer Operating Systems Designer Operating Systems Programmer
	Security, Compliance & Quality Assurance	Application Services
	Security Administrator Security Analyst Business Continuity Planner IT Auditor QA Specialist Software/QA Tester Test Engineer	Enterprise Architect Application Integrator Business Systems Analyst Application Systems Analyst Project Manager Software Applications Specialist (CRM, ERP, etc.)

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