

Oregon's High-Tech Employment Trends – What is High Tech?

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The high-tech industry is an important and dynamic part of Oregon's economy. During the late 1990s, it experienced rapid employment growth while paying wages that were significantly higher than those of other industries. In 2004, high tech contributed \$4.3 billion in covered payroll to the state's workers and families. The industry represents slightly more than one-third of all manufacturing payroll, predominately in semiconductor manufacturing.

As of February 2006, the state's high-tech industry employed 59,100 people – 1,900 more than in February 2005. During the recession from 2001 to 2003, employment quickly declined. Despite modest growth in 2004 and 2005, the industry is still several thousand jobs below prerecession employment levels (Graph 1).

While Oregon's total nonfarm employment has reached an all-time high, high-tech employment has not followed suit. Many wonder if the industry will ever return to its peak, especially given the large losses in semiconductor manufacturing over the past few years.

What is High Tech?

The high-tech industry is not an official industry sector with one definition or official government code. Instead, it is a mix of service and manufacturing businesses from a variety of industries. High tech means different things to different people and organizations.

The Oregon Employment Department (OED) has its own definition, which corresponds to three North American Industry Classification System (NAICS) codes – computer and electronic product manufacturing (NAICS 334), systems design and related services (NAICS 5415), and software publishing (NAICS 5112). This definition does not include electronic equipment and appliance manufacturing (NAICS 335), which employs less than 2,500 people statewide.

The American Electronics Association (AEA) has a much broader definition of high tech, which it uses annually in its well respected national report, *Cyberstates*. The AEA definition includes at least 50 individual NAICS codes from more than 15 larger industry sectors including high-tech manufacturing, telecommunications services, Internet services, and computer training.

The OED and AEA definitions of high tech are both correct – but just two of many definitions depending on the organization. The important thing to know when one reads or hears about high tech is what is being measured or counted. In 2002, for example, the AEA reported 87,524 high-tech jobs in Oregon; OED reported 61,100 jobs. Both counts are correct. The OED definition of high tech is used in this article, unless otherwise stated.

Systems Design and Related Services

In 2005, systems design and related services accounted for 16 percent of Oregon's high-tech employment or 9,000 jobs (Graph 2). This industry sector's employment was still down by over 21 percent in 2005 compared to 2001. However, 2005 proved to be a good year – adding 800 jobs (+9.8%) since 2004 (Table 1).

This industry comprises establishments primarily engaged in providing information technologies through one or more of the following activities: (1) writing, modifying, testing, and supporting software to meet the needs of a particular customer; (2) planning and designing computer systems that integrate computer

hardware, software, and communication technologies; (3) on-site management and operation of client's computer data processing systems; and (4) other professional and technical computer-related advice and services. Common services include: computer facilities management, computer hardware or software consulting, computer systems integration design, custom computer programming, and software installation.

Software Publishing

In 2005, software publishing accounted for 13 percent or 7,400 jobs of Oregon's high-tech employment. This industry sector's employment was still down almost 20 percent in 2005 compared to 2001. Like Oregon's other high-tech sectors, it prospered in 2005 – adding 700 jobs (10.4%) since 2004.

Companies in this industry are primarily engaged in the design, development, and publishing of computer software. Important products in this industry include operating, utility, and applications programs. Establishments in this industry may also provide user services such as preparation of software documentation; installation of software; and training in the use of the software.

Software publishing is more likely to have a high proportion of self-employed individuals than other high-tech sectors. However, there are some rather large software companies in the state. These software publishers produce software for many industries including banking, payroll, human resources, computer games, and operating systems.

Computer and Electronic Product Manufacturing

The computer and electronic product manufacturing industry is clearly Oregon's largest high-tech employment sector. In 2005, computer and electronic product manufacturing accounted for 71 percent or 41,600 jobs of Oregon's high-tech employment. This industry sector's employment was still down by 7,700 (-16%) jobs in 2005 compared to 2001. Its turnaround came at a slower pace than the other high-tech sectors – it added a net of 600 jobs for 1.5 percent growth in 2005 (Graph 3).

For businesses in the computer and electronic product manufacturing sector, manufacturing processes are fundamentally different from those of other machinery and equipment companies. The design and use of integrated circuits and the application of highly specialized miniaturization technologies are common elements in the production technologies of the computer and electronic subsector.

The computer and electronic product manufacturing industry consists of several components. The manufacture of computers, communication equipment, audio and visual equipment, magnetic and optical media, technical instruments, and semiconductors are all part of the industry.

Semiconductors Dominate the Industry

In Oregon, the manufacture of semiconductors dominates the computer and electronic product industry. More than two-thirds of its employment consists of jobs in semiconductor manufacturing (Graph 4). In February 2006, the industry employed 31,200 people.

Semiconductors – also known as integrated circuits or computer chips – are tiny electronic circuits etched on silicon. Their purpose is to electronically process, store, and move information. From the microprocessors that control our car engines to the chips in our digital watches, semiconductors are the heart of the modern technology we take for granted.

Despite its considerable job losses over the past few years, this is not an industry to be ignored as it still has a huge economic impact on the state. In 2004, its total covered payroll to Oregon workers was more than \$2.4 billion. It has become more vulnerable as investment in chip manufacturing has shifted overseas. However, not all is gloom in this sector. A recent article in *The Oregonian* indicated Intel added at least 1,100 to its Oregon workforce in 2005. The article said Intel's current Oregon workforce is almost up to 17,000.

Recession Pummeled Industry

During the late 1990s, Oregon's computer and electronic product manufacturing industry showed remarkable growth, adding 14,400 jobs (+43%) from 1994 through 2000. Peak employment was reached in February 2001 with 50,900 workers.

The industry showed rapid decline from 2001 through 2003. On an annual average basis, it lost 8,700 Oregon jobs, corresponding to an 18-percent decline in two years. Nationally, from peak to trough, the industry lost 30 percent of its employment, or more than 553,700 jobs. As indicated in Graph 4, most of this loss was a result of the rapid decline in semiconductor manufacturing.

In February 2006, overall high-tech manufacturing had 42,600 workers compared to 41,500 workers in February 2004. However, it still has a long way to go before reaching prerecession employment levels.

Very High Wages

One of the most outstanding features of this industry is its relatively high wages. In 2004, high-tech manufacturing paid more than \$3.1 billion to its Oregon workers, for an average of \$77,247 per employee (Table 2). This compares with an average wage of \$46,900 for all Oregon manufacturing workers in 2004. The technical nature of the work accounts for the higher wages. Manufacturing high-tech products requires engineers, designers, computer programmers and technical sales staff. In 2004, the average wage for all workers in all industries statewide was \$35,621.

The computer and electronic product manufacturing industry is arguably one of the most important sectors of manufacturing in Oregon. However, its employment is almost entirely in the Portland metro area. In 2004, 79 percent of the industry employment was in the Portland metro area. Washington County alone accounts for 64 percent of the industry's employment in Oregon.

As for the service side of high tech, systems design and related services as well as software publishing also pay higher-than-average wages. In fact, in 2004, software publishing had the highest annual average wage of the three high-tech sectors at \$87,937. Systems design and related services workers earned an average annual wage of \$69,274. These industries seemed to be spread out in larger areas of the state but were still concentrated around the Interstate 5 corridor. They also had a noticeable presence along Highway 97 in Deschutes and Klamath counties.

Occupations and Wages

Table 3 offers a sampling of occupations most common to semiconductor manufacturing. The high-tech sector overall has similar but slightly different staffing patterns. More than one-half of its occupations require a bachelor's degree or higher. Engineers and engineering technicians make up the bulk of the workers. Several of the occupations listed require an associate's degree or on-the-job training but still manage to command higher-than-average wages.

Semiconductor processors accounted for over 4,500 of the semiconductor workers in 2004, with an annual mean wage in 2005 of \$30,533. However, many of the occupations in the high-tech industry are not high-tech occupations. This industry requires all the other support staff as other industries, including managers, accountants, finance managers, sales people, shipping clerks, and numerous clerical workers. As shown in Table 3, executive secretaries and administrative assistants were among the top 20 most common workers in the semiconductor industry in 2004.

Future Trends

The Oregon Employment Department forecasts modest growth of 6.1 percent for computer and electronic product manufacturing over the 10 years from 2004 to 2014. This compares to overall employment growth projected at 15 percent. However, Oregon is one of only a few states nationwide to continue to add manufacturing jobs including high-tech jobs.

A more promising future for Oregon's high-tech industry is in its service sectors. Systems design and related services is expected to grow by 30.1 percent and the software publishing industry is projected to grow at a rate of 22.7 percent from 2004 to 2014. Both are well above the statewide growth rates.

No one knows for sure what the future holds for this dynamic industry. Early in the recession, many believed this was a typical downturn in the business cycle. However, since the official recovery started in June 2003, economists wonder if it signals a major structural change in Oregon's manufacturing industry. Regardless, high tech is a key industry for Oregon's economy. Its rapid growth during the 1990s enhanced Oregon's ability to compete in the global high-tech economy. High tech continues to be one of the state's largest exporters, along with agriculture and wood products.

Table 1
High-Tech Employment and Wages in Oregon

Industry Sector	2005 Employment	2004 Covered Payroll	2004	2005	2001 to 2005 Employment Change
			Average Annual Wage	Job Growth Rate	
Total High-Tech Employment	58,000	\$4,296,748,021	\$77,339.45	3.8%	-17.0%
Computer Manufacturing (NAICS 334)	41,600	\$3,145,714,124	\$77,247.00	1.5%	-15.6%
Systems Design & Services (NAICS 5415)	9,000	\$569,504,496	\$69,274.36	9.8%	-21.1%
Software Publishing (NAICS 5112)	7,400	\$581,529,401	\$87,937.31	10.4%	-19.6%

Table 2
Computer and Electronic Product Manufacturing (NAICS 334)
Geographic Profile and Wages, 2004

Area	Employment	Payroll	Average Payroll
STATEWIDE	40,723	\$3,145,714,124	\$77,247
Portland PMSA (Oregon Portion)	32,116	\$2,638,048,032	\$82,141
Washington County	26,210	\$2,297,602,025	\$87,661
Clackamas County	3,090	\$189,734,819	\$61,403
Multnomah County	2,553	\$140,520,308	\$55,041
Lane County	1,723	\$88,258,642	\$51,224
Salem MSA	1,360	\$62,473,447	\$45,936
Marion County	1,040	\$48,291,597	\$46,434
Josephine County	405	\$14,698,706	\$36,293
Deschutes County	265	\$12,037,074	\$45,423
Yamhill County	256	\$9,906,316	\$38,697
Jackson County	250	\$8,157,896	\$32,632
Linn County	193	\$5,017,238	\$25,996
Klamath County	35	\$777,729	\$22,221

Table 3

Statewide Employment in Semiconductor Manufacturing – Top 20 Most Common Occupations

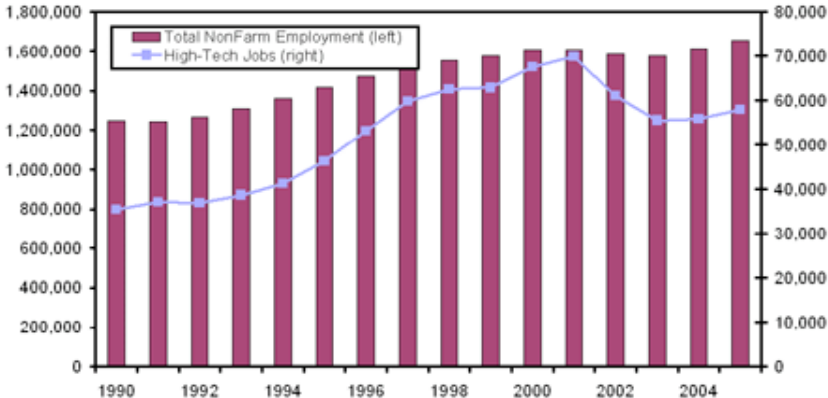
Standard Occupational Code Title	2004	Annual	Minimum Education Required
	Semiconductor Employment	Mean Wage 2005*	
Semiconductor Processors	4,537	\$30,533	Associate

Engineers, All Other	3,402	\$76,886	Bachelor's
Engineering Technicians, Except Drafters, All Other	3,264	\$41,732	Associate
Electrical and Electronic Equipment Assemblers	2,367	\$26,274	Short-term on-the job training
Computer Software Engineers, Applications	1,364	\$81,668	Bachelor's
Electronics Engineers, Except Computer	1,159	\$71,063	Bachelor's
Electrical and Electronic Engineering Technicians	868	\$45,501	Associate
Engineering Managers	821	\$105,409	Bachelor's
Industrial Engineers	818	\$68,591	Bachelor's
First-Line Supervisors/Managers of Production and Operating Workers	622	\$48,544	Related work experience
Executive Secretaries and Administrative Assistants	536	\$36,235	Moderate-term on-the job training
Electrical and Electronics Repairers, Commercial and Industrial Equipment	529	\$46,866	Postsecondary training
Sales Engineers	504	\$79,819	Bachelor's
Managers, All Other	499	\$75,920	Bachelor's
Market Research Analysts	425	\$74,256	Bachelor's
Inspectors, Testers, Sorters, Samplers, and Weighers	410	\$30,527	Moderate-term on-the job training
Network Systems and Data Communications Analysts	377	\$63,778	Bachelor's
Maintenance and Repair Workers, General	352	\$33,335	Long-term on-the-job training
Industrial Production Managers	313	\$79,291	Bachelor's
Computer Systems Analysts	306	\$64,564	Bachelor's

* Average wage for these occupations in all industries.

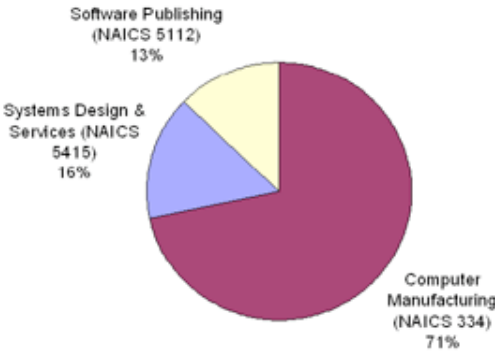
Graph 1

Oregon: High-Tech Jobs Versus Total Nonfarm Employment Trends, 1990 to 2005



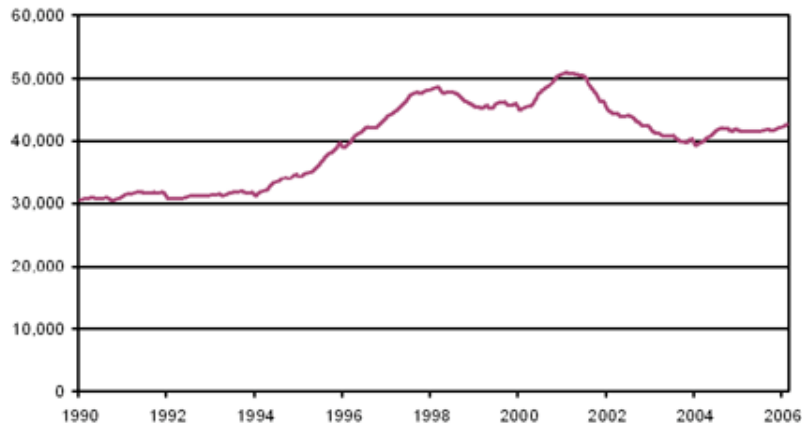
Graph 2

Oregon: High-Tech Jobs by Major Industry Sector in 2005



Graph 3

**Oregon: Computer and Electronic Product
Manufacturing (NAICS 334) Employment 1990-2006**



Graph 4

**Oregon: All Computer and Electronic Product
Manufacturing Versus
the Impact of Semiconductor Manufacturing
Employment Trends 1990 to 2005**

