Information Technology (IT)

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IT industries and occupations are widespread, and defy pigeonholing

Someone once said that the only thing harder than herding chickens was trying to park them. And the only thing harder than trying to park chickens may just be trying to herd information technology (IT) into a definable industry, and IT workers into definable and easily measurable cubbyholes.

Everyone knows of the information technology explosion. We cheer or lament our tech stock portfolio depending on the performance of the NASDAQ. We gladly pass technology based school bonds so our kids will have access to the latest and best technology and technology training available. We marvel at our neighbor's son who passes up after-school basketball for an after-school job where he programs computers or manages databases for a local business, all the time making more money than we do. At the root of all this change is, of course, the computer. Perhaps no invention since the automobile has so rent the fabric of our world, and it continues to foment change at a breathtaking pace.

Data collection on information technology as a discrete industry is in its nascent stages. Past industry data has been collected using the Standard Industrial Classification (SIC) coding system. The SIC was last revised in 1987, a lifetime ago in IT years. Future industry data will be published using the new North American Industry Classification System (NAICS), but for the purposes of this article, we must rely on the industry data collected using the SIC.

Even with the new NAICS system, data collection and analysis problems will not become a thing of the past. For the foreseeable future at least, IT workers and the jobs they do will remain widespread, disorderly, and elusive. They are now found in every industry. They cannot be pigeonholed in any single industry. Existing occupations continue to be redefined and whole new occupations mushroom to meet the demands of a world ravenous for information.

In spite of the herding difficulties, we do know some things about these shifty IT chickens. IT employment includes workers employed by IT companies in IT-related industries as well as workers employed in IT occupations irrespective of industry. In this article, we will look at IT-related employment in two ways. First, we will look at the number of workers employed in Alaska's IT-related industries, regardless of whether or not the jobs they perform are IT related. Then, we will look at the number of workers in IT occupations across all industries, regardless of whether they are in an IT identified industry. (See sidebar on page 10.)

IT industry employment

For the purposes of this article, an IT industry is defined as one that supplies the goods and services that support IT-enabled business practices across the economy, as well as the Internet and e-commerce.

What is an IT Industry? What is an IT Worker?

What is an IT industry? *For the purposes of this article, an IT industry is defined as supplying the goods and services that support IT-enabled business practices across the economy, as well as the Internet and e-commerce. These firms fit into four broad categories, including hardware, communications equipment, software/services, and communications services. (A detailed list of industries, including the Standard Industrial Code, is available on request.)*

What is an IT worker? *It depends on whom you ask. A narrow, restrictive, definition of an IT worker would include only core IT occupations, those involved in the design, development, support and management of hardware, software, multimedia, and systems integration services. Nine core IT occupations have been identified for this analysis, including computer programmers, systems analysts, engineering managers, electrical engineers, database administrators, computer engineers, computer support specialists, computer operators, and all other computer scientists. (These are bolded in Exhibit 2).*

A broader definition of IT occupations includes positions involved in creating, operating, and maintaining the IT infrastructure required to facilitate e-commerce and other Internet or network-related activities. Using this broader definition, 16 occupations are included in IT for this analysis. All 25 IT occupations, including the nine core occupations, are listed in Exhibit 2. (The 16 broadly-defined IT occupations are not bolded.)

One important note is that an IT worker is not someone who uses a word processing application to prepare a document or who operates a computer to diagnose an automotive malfunction. Jobs where workers simply use IT are called IT-enabled jobs, and are not covered in this article.

Mergers have reshaped the IT landscape

The composition of the IT-related industry sectors has changed over time and will continue to change. In the middle of the 20th century, telecommunication was not clearly linked to computing. During the 1990s, however, old industry boundaries began to blur. As did the rest of the country, Alaska experienced alliances, mergers, and acquisitions within the telecommunications industry, and these dramatically changed the IT landscape. For example, ACS (Alaska Communication Systems) represents the merging of new with old; although a relatively new creation, ACS contains as one of its core acquisitions ATU, Anchorage Telephone Utilities.

Approximately 2.5 percent of Alaska's wage and salary workers, or 6,915 workers, were employed in the IT industries in 2000. IT employment in Alaska represents a smaller percentage of the overall wage and salary workforce than in Washington, California, or the nation (4.3%, 6.0%, and 3.7% respectively).

IT transforms operations for traditional businesses

More significant than actual IT-related industry employment, however, are the transforming effects IT has on more traditional businesses that produce the majority of Alaska's economic output. Examples of increased productivity and efficiency resulting from new and innovative uses of information technology can be seen throughout Alaska. Alaska's commercial and sport fishers rely on sophisticated global positioning systems (GPS) to more accurately target fish and recover fishing gear. 3D seismology, a product of high-speed computing advances, has helped the oil industry improve productivity through increased oil recovery rates.

IT occupations

The IT occupations selected for this article are a diverse group. Nine of the occupations are core computer-related jobs that are identified easily as belonging in any discussion concerning IT occupations. These include occupations such as computer programmers and database administrators.

The other 16 IT occupations selected for this article are not as easily identified as being computer-related, but are included because they meet other criteria. For the purposes of this article, we are including occupations that develop, use, and maintain systems driven by information technology. The U.S. Department of Commerce, in consultation with the Bureau of Labor Statistics, (BLS) compiled a list of occupations that meet this definition. They include such occupations as data entry keyers and switchboard operators.

Not only do duties and tasks differ between these two groups, but they differ within groups as well; wages, outlook, and the education needed and training pathways vary considerably for each occupation.

IT related jobs, for the most part, are good ones

Overall Alaska occupational employment is projected to increase 16.6%, from 292,431 to 341,090, between 1998 and 2008. (This includes an estimate of self-employed workers.) Alaska employment for IT occupations is expected to increase 26.8% from 7,952 to 10,086 for the same period. The nine core IT occupations are projected to grow even more rapidly over the forecast period, with a projected average growth rate for the group of 43.7%. (See Exhibit 2.)

Growth rates for these core IT occupations range from an increase of over 70 percent for systems analysts and computer support specialists to a decline of nearly 25 percent for computer operators. The stunning growth for systems analysts is expected as firms use these workers to plan reengineering efforts and to apply the latest technologies to business applications. Computer support specialists will match that growth with expected increases in computer and data processing services, overall growth in the use of computers, and the development of more sophisticated systems requiring more technical support.

Computer programmers will post an increase of 12.8% through 2008. This relatively modest growth rate is partially due to the expected decline of programmers working in the government sector. The number of computer programmers needed by state government is projected to decline by 26 percent through 2008. Growth for programmers will also be limited by trends to consolidate computer applications, by the increasing popularity of packaged software, and by the development of new programming tools and languages.

The projected decline in demand for computer operators will be largely due to the declining use of mainframe computers. The work previously done by these machines is now being done with PCs, and other computer workers are increasingly performing functions previously handled by computer operators.

Systems analysts will rise to top of the list

Based on DOL's most recent forecast, computer programmers are expected to fall from the largest IT occupation in 1998 to number three in 2008. Though programmers will increase from 1,100 to 1,241 through the period, they will be supplanted as the largest IT occupation in the state by systems analysts, which will swell from 836 workers to almost 1,450 by 2008. Computer support specialists will experience similar growth, ballooning from 773 workers in 1998 to about 1,340 by 2008.

In 1998, IT occupational employment was spread across all of Alaska's major industries, with a high concentration in the communication/utilities (22 percent) and government (4.2%) industry sectors. The relatively high share of employment held by IT occupations in these sectors reflects Alaska's heavy reliance on telecommunications and the high concentration of scientific and technology occupations in state and federal agencies. IT occupations in these industries are expected to grow faster than their respective industry occupational averages between 1998 and 2008, further emphasizing information technology's importance.

Not only does the percentage of IT jobs vary by industry, but growth rates for IT jobs often differ from the overall industry average. (See Exhibit 1.) For example, IT jobs in the service industry sector are projected to increase by nearly 60 percent between 1998 and 2008, nearly twice as fast as the expected average growth rate for all service industry occupations. At 20 percent, the IT jobs in the mining and construction industry sector are projected to post a much higher rate of growth than the industry occupational average of 4.4%.

Growth rates for IT occupations also vary by education and training. Higher skilled IT workers generally hold a degree, while lower level IT workers rely on on-the-job training. Over 40 percent of Alaska's IT jobs require at least a four-year degree and an additional 35 percent require some post-secondary vocational or higher level training.

Growth occupations require the most training

Occupations requiring a bachelor's degree or above have an expected average growth rate of 38.7% through 2008, while those requiring an associate or post-secondary certificate are projected to grow an average of 36.7% for the same period. Occupations attained through on-the-job training will not fare so well. This group is projected to decline 8.5%.

It should be noted that for all occupations in general, and for IT occupations especially, some workers get jobs in ways other than the normal education or training pathway. In order to fill the fast growing high-skill IT occupations, many employers have been more interested in what an applicant knows than in degrees or certificates earned.

Employment opportunity is driven by more than occupational growth; it is also influenced by the need to replace workers who retire or change occupations. Although actual occupational retirement rates are difficult to predict, the average age of incumbent workers provides a broad estimate of workforce replacement needs. Exhibit 2 indicates the percentage of workers 45 years of age and older, by IT occupation. In 2000, the percentage of IT workers 45 + years of age varied significantly by occupation, from approximately 22 percent for data entry keyers to over 57 percent for commercial and industrial electronics repairers.

1 IT Occupations Share of Employment
By industry–1998 and 2008 projected

	Percent of industry employment 1998	Projected growth 1998-2008	
		IT occupations	All occupations
Agriculture	0.9%	37.5%	26.6%
Mining & Construction	2.6%	20.0%	4.5%
Manufacturing	0.9%	4.9%	3.1%
Transportation	1.5%	14.3%	35.9%
Communications & Utilities	22.0%	24.5%	20.6%
Wholesale & Retail Trade	0.7%	16.5%	17.7%
Finance, Insurance, & Real Estate	3.2%	1.0%	8.0%
Services	2.7%	59.6%	29.7%
Government	4.2%	0.4%	-4.5%
All Industries	2.8%	26.9%	17.0%

Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

Information Technology Occupations 2
By education/training level

	1999 Statewide Average Wage	1998 Estimated Employm't	2008 Projected Employm't	Percent Growth Rate	Replacement Needs (% of Workers 45 and over)	Worker Availability Nonresident Workers %
Bachelor's Degree and Above		**3,258**	**4,520**	**38.7%**		
Computer Programmers	$25.95	1,100	1,241	12.8%	37.2%	8.2%
Systems Analysts, Electronic DP[1]	$27.85	836	1,448	73.2%	38.4%	9.4%
Engineering Managers[2]	$36.66	679	920	35.5%	56.3%	10.8%
Electrical Engineers[3]	$28.49	298	350	17.4%	44.2%	15.8%
Database Administrators	$26.25	132	182	37.9%	42.6%	1.6%
Computer Engineers[4]	$28.43	113	184	62.8%	27.6%	18.1%
All Other Computer Scientists	$25.03	100	195	95.0%	25.1%	15.3%
Associate Degree/Postsec. Voc. Train.		**2,812**	**3,844**	**36.7%**		
Computer Support Specialists	$17.99	773	1,340	73.4%	22.1%	5.3%
Electrical Power-Line Install/Repair	$29.71	474	560	18.1%	45.0%	13.0%
Electrical/Electronic Engineering Tech.	$27.19	454	502	10.6%	46.0%	25.7%
Phone/Cable TV Line Install/Repair	$19.94	453	616	36.0%	40.2%	21.1%
Broadcast Technicians[1]	$13.33	177	200	13.0%	n/a	9.5%
Electronics Repair, Commercial/Ind. Equip.	$28.79	176	184	4.5%	57.2%	10.6%
Central Office and PBX Install/Repair	$27.03	166	248	49.4%	43.1%	6.0%
Data Processing Equipment Repairers	$16.61	139	194	39.6%	36.3%	3.7%
On-the-Job Training		**1,882**	**1,722**	**-8.5%**		
Computer Operators	$17.26	492	370	-24.8%	32.5%	10.5%
Data Entry Keyers[5]	$11.36	465	500	7.5%	22.1%	18.4%
Switchboard Operators	$11.30	246	230	-6.5%	33.2%	8.5%
Directory Assistance Operators[1]	$12.88	162	115	-29.0%	n/a	n/a
Billing, Posting, Calculating Machine Op.	$13.85	145	144	-0.7%	31.2%	7.5%
Duplicating Machine Operators[6]	$9.66	133	164	23.3%	27.7%	5.4%
All Other Office Machine Operators[6]	$9.66	88	65	-26.1%	n/a	5.4%
Central Office Operators[7]	$11.30	72	67	-6.9%	n/a	8.5%
All Other Communications Equipment Op.	n/a	43	32	25.6%	n/a	10.3%
Mail Machine Op., Prep. & Handling	$9.58	36	35	-2.8%	28.5%	7.4%
TOTAL - ALL IT OCCUPATIONS	**n/a**	**7,952**	**10,086**	**26.8**	**n/a**	**n/a**
TOTAL - ALL STATEWIDE OCCUPATIONS	**$15.90**[8]	**292,431**	**341,090**	**16.6**	**n/a**	**n/a**

Bolded occupations are indentified as core IT occupations.

[1] National wage; statewide not available
[2] Employment may include Computer and Natural Science Managers
[3] Employment may include Electronic Engineers
[4] Includes Computer Software Engineers, Applications; may not include Computer Hardware Engineers
[5] Employment may include Data Keyers, Composing
[6] Wages for Office Machine Operators, Except Computer
[7] Wages for Switchboard Operators, Including Answering Service
[8] Approximately 50% of total employment for all occupations earn more and 50% earn less than this figure.
n/a = Not Available

Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

The relatively high percentage of the IT workforce that, based on age, may be considering retirement within the next decade, suggests future occupational opportunity not captured in current or projected employment figures.

Non-residents capture many of the best jobs

Exhibit 2 also lists the percentage of IT workers that were non-residents of the state. Non-resident employment in high-wage/high-growth occupations, such as computer engineers (18 percent non-resident employment) and electrical/electronic engineering technicians (nearly 26 percent non-resident employment), represents lost opportunities for Alaska's workers.

Wages

IT worker earnings are generally higher than average[1], but for specific occupations, earnings vary based on skill levels and education attainment. IT occupations requiring a college degree pay more than do those requiring short term on-the-job training. For example, computer programmers, who typically have a bachelor's degree, earn on average $25.95 an hour. In contrast, the average hourly wage for data entry keyers is $11.36.

Of the IT occupations identified as attainable through on-the-job training, only computer operators, the single IT core occupation in this group, earn more than the state average for all occupations. These workers earn $17.26 per hour.

Conclusion

The proliferation of information technology has significantly altered Alaska's labor market. Although the economic importance of information technology is accepted, accurately quantifying that importance remains difficult.

Not only has IT given rise to new occupations such as database administrators and computer support specialists, but it has expanded the duties of established occupations such as telephone/cable television line installers and repairers.

IT occupations are, in general, quality jobs, paying higher than average wages and offering good employment opportunities.[2] Wages and opportunities are best for those occupations requiring more than on-the-job training. Far too often these good jobs are filled with non-resident workers. Opportunities exist for these jobs to go to Alaska residents. Future opportunities should become available as needs arise to replace IT workers as they retire.

Notes:

[1] The average wage for all Alaska wage and salary workers based on quartile salaries is about $15.90 per hour.

[2] Projections are statewide. Many of Alaska's labor markets are small and do not offer the same employment opportunities as the state as a whole.

Correction

Following is a copy of the corrected paragraph for the Seniors article in the December 2001 *Trends*, page 4, formatted so it can be photocopied, cut, and pasted over the erroneous paragraph.

More seniors are poor; more of the poor are women

According to the U.S. Census 2000, 8.4% of seniors age 65 and over, and nine percent of the entire state population, fell below the poverty line. This is a slight increase for seniors from 1990 when 7.6% fell below the poverty line. For the state as a whole, Alaskans falling below the poverty line remained the same at nine percent. (corrected)