



AEROSPACE PROFESSIONAL DEVELOPMENT CENTER

At Wright State University

Information Technology Analysis

Wright State University, Center for Workforce Development Report



Introduction

Over the past 25 years regional economic development strategies have been focused on the strength of industry clusters. These clusters either developed organically or were intentionally cultivated through investments, retention and recruitment strategies. They were defined as groups of interconnected businesses, suppliers, support industries, and related institutions that developed in a regional area. One of the most successful examples of a cluster is Silicon Valley. An area highly concentrated in Technology start-ups and global technology companies, this region captured the growth of information technology and became a hotspot for investors. It also became the model every inspiring community looked to for growth and development. For these reasons and the perpetual growth unique to information technology this particular industry cluster has been identified as a priority in almost every large metropolitan statistical area. As information technology has been integrated in almost every other industry cluster, the time has come to reconsider how many of these regions identify growth areas, metrics, and demand in Information Technology (IT).

This report provides an analysis on IT occupations within the JobsOhio West Region, proposes a new model for considering this particular cluster in context with other industries within the region and provides strategies on how to leverage existing strengths or address gaps within the region.

Analysis of the Current Situation

An analysis conducted by the Business Research Group at the University of Dayton examined the current employment situation in 14 IT related occupations (Table 1) in the 12 county West Ohio JobsOhio Region. Those 14 occupations constitute just 2.1% of total employment in the region and represent a traditional definition of an IT workforce. In later sections, some nontraditional occupations will be analyzed including *Computer and Information Systems Managers* (11-3021), *Computer Operators* (43-9011), *Desktop Publishers* (43-9031), *Electrical Engineers* (17-2071), *Engineering Technicians* (17-3020), *Graphic Designers* (27-1024) and *Machinists* (51-4041).

The location quotient, (occupation percent of local employment/occupation percent of national employment), permits a comparison of the relative importance of the occupation in the regional employment mix relative to the country as a whole. Note that overall, IT occupations are slightly under-represented in the West Ohio region, (LQ 0.89). The region has a slight over representation of *Computer System Analysts*, (LQ 1.08) and *Computer Occupation, Others*, (LQ 1.17). The region has under representation of *Computer Programmers*, (LQ 0.60), *System Software Developers*, (LQ 0.37) *Computer Network Architects*, (LQ 0.67), *Computer Hardware Engineers*, (LQ 0.70) and *Information Security Analysts*, (LQ 0.48).

Table 1: West Ohio Region IT Occupation Breakdown, Absolute and as a Percent of Employment, 2015

Occupation	Description	Employment	Percent of Regional Employment	Location Quotient
15-1132	Software Developers, Applications	2,736	0.387%	0.96
15-1121	Computer Systems Analysts	2,544	0.360%	1.08
15-1151	Computer User Support Specialists	2,378	0.337%	0.92
15-1142	Network and Computer Systems Administrators	1,563	0.221%	1.06
15-1199	Computer Occupations, All Other	1,089	0.154%	1.17
15-1134	Web Developers	955	0.135%	1.04
15-1131	Computer Programmers	845	0.120%	0.60
15-1152	Computer Network Support Specialists	802	0.113%	1.07
15-1133	Software Developers, Systems Software	583	0.083%	0.37
15-1141	Database Administrators	452	0.064%	0.97
15-1143	Computer Network Architects	370	0.052%	0.67
17-2061	Computer Hardware Engineers	223	0.032%	0.70
15-1122	Information Security Analysts	150	0.021%	0.48
15-1111	Computer and Information Research Scientists	105	0.015%	1.05
	Total, 14 IT Occupations	14,795	2.094%	0.89
	Total Regional Employment	706620		

Projected Growth

Forecasted Growth of IT occupations in the West Ohio Region is based on a combination of factors including current and projected industrial structure and current and projected national growth of each occupation within particular industries. Table 2 provides the projected regional and national growth in each of the 14 IT occupations. Overall, regional employment growth in the 14 IT occupations is projected at 14% from 2015 to 2025, which is just slightly below the projected national growth rate of 17%. *Information Security Analysts*, (38%), *Systems Software Developers*, (35%), *Application Software Developers*, (22%) and *Web Developers*, (18%) are all projected to grow at substantially above the 14% growth rate for the 14 IT Occupations as a whole.

Relative the national growth rate, the projected regional growth rate is relatively high for *Computer Programmers*, (15% vs. 8%), *Systems Software Developers*, (35% vs. 20%) and *Information Security Analysts*, (38% vs. 31%).

SOC	Description	2015 Jobs	2025 Jobs	2015 - 2025 Change	2015 - 2025 % Change, West Ohio Region	2015 - 2025 % Change, National	Growth Relative to National Projected
15-1132	Software Developers, Applications	2,736	3,328	592	22%	22%	0.98
15-1121	Computer Systems Analysts	2,544	2,936	392	15%	22%	0.70
15-1151	Computer User Support Specialists	2,378	2,731	353	15%	19%	0.78
15-1142	Network and Computer Systems Administrators	1,563	1,644	81	5%	11%	0.47
15-1199	Computer Occupations, All Other	1,089	1,072	(17)	(2%)	4%	-0.39
15-1134	Web Developers	955	1,124	169	18%	24%	0.74
15-1131	Computer Programmers	845	971	126	15%	8%	1.86
15-1152	Computer Network Support Specialists	802	824	22	3%	8%	0.34
15-1133	Software Developers, Systems Software	583	788	205	35%	20%	1.76
15-1141	Database Administrators	452	517	65	14%	17%	0.85
15-1143	Computer Network Architects	370	415	45	12%	12%	1.01
17-2061	Computer Hardware Engineers	223	224	1	0%	10%	0.04
15-1122	Information Security Analysts	150	207	57	38%	31%	1.23
15-1111	Computer and Information Research Scientists	105	119	14	13%	15%	0.89
	Total, All IT Occupations	14,795	16,901	2,106	14%	17%	0.84

Regional Competitiveness

A further explanation of what is driving projected growth in the 14 IT Occupations is based on Shift Share Analysis. Forecasted growth in jobs can be broken into three elements, the expected national growth rate in employment, the expected differential growth rate of this occupation, and the expected differential growth rate of regional employment overall. The impact of these three factors at the job level for each of the occupations is delineated in Table 3, (next page). Table 3a, (next page), compares the relative contribution of each effect for each occupation. Note that for professions with small projected job growth the shift share analysis is less useful.

For the 14 IT occupations as a group, the occupational growth rate is expected to add an additional 4.5% to the national growth rate in employment of 12.5%, (last row Table 3a). For the West Ohio region, this is somewhat offset by a negative 2.7% attributed to a slower rate of regional growth than for the country as a whole. Note that the occupational growth effect is very strongly positive for *Computer System Analysts*, (9.3%), *Information security analysts*, (18.6%), *Software Developers, Application*, (9.6%), *Web Developers*, (11.9%) and *Software Developers, Systems Software*, (7.1%).

SOC	Description	2015 Jobs	2025 Jobs	Shift Share Analysis				
				Forecasted 2015 - 2025 Change (2+3-4)	Occupational Growth Effect (2)	National Growth Effect (3)	Expected Change (2+3)	Regional Competitive Effect (4)
15-1111	Computer and Information Research Scientists	105	119	14	3	13	16	(2)
15-1121	Computer Systems Analysts	2,544	2,936	392	237	317	554	(162)
15-1122	Information Security Analysts	150	207	57	28	19	47	10
15-1131	Computer Programmers	845	971	126	(35)	105	70	55
15-1132	Software Developers, Applications	2,736	3,328	592	261	341	602	(10)
15-1133	Software Developers, Systems Software	583	788	205	42	73	115	90
15-1134	Web Developers	955	1,124	169	113	119	232	(63)
15-1141	Database Administrators	452	517	65	20	56	76	(11)
15-1142	Network and Computer Systems Administrators	1,563	1,644	81	(30)	195	165	(83)
15-1143	Computer Network Architects	370	415	45	(1)	46	45	(0)
15-1151	Computer User Support Specialists	2,378	2,731	353	151	297	448	(94)
15-1152	Computer Network Support Specialists	802	824	22	(35)	100	65	(43)
15-1199	Computer Occupations, All Other	1,089	1,072	(17)	(89)	136	47	(63)
17-2061	Computer Hardware Engineers	223	224	1	(5)	28	23	(22)
	All 14 IT Occupations	14,795	16,901	2,106	660	1,845	2,505	(399)

The regional competitive effect while negative for the 14 IT occupations overall, (-2.7%), is positive for *Information security analysts*, (6.7%), *Computer Programmers*, (6.5%), and *Software Developers, Systems Software*, (15.5%).

		Projected Growth Rate, 2015-2025				Percent Contribution to Projected Growth Rate			
		Forecasted 2015 - 2025 Change (2+3-4)	Occupational Growth Effect (2)	National Growth Effect (3)	Regional Competitive Effect (4)	Forecasted 2015 - 2025 Change (2+3-4)	Occupational Growth Effect (2)	National Growth Effect (3)	Regional Competitive Effect (4)
15-1111	Computer and Information Research Scientists	13.3%	2.8%	12.5%	-1.7%	100.0%	21.2%	93.5%	-13.1%
15-1121	Computer Systems Analysts	15.4%	9.3%	12.5%	-6.4%	100.0%	60.4%	80.9%	-41.5%
15-1122	Information Security Analysts	37.9%	18.6%	12.5%	6.7%	100.0%	48.9%	32.9%	17.6%
15-1131	Computer Programmers	14.9%	-4.1%	12.5%	6.5%	100.0%	-27.7%	83.6%	43.9%
15-1132	Software Developers, Applications	21.6%	9.6%	12.5%	-0.4%	100.0%	44.1%	57.6%	-1.8%
15-1133	Software Developers, Systems Software	35.2%	7.1%	12.5%	15.5%	100.0%	20.3%	35.5%	44.1%
15-1134	Web Developers	17.7%	11.9%	12.5%	-6.6%	100.0%	67.1%	70.4%	-37.1%
15-1141	Database Administrators	14.4%	4.4%	12.5%	-2.5%	100.0%	30.6%	86.7%	-17.3%
15-1142	Network and Computer Systems Administrators	5.2%	-1.9%	12.5%	-5.3%	100.0%	-37.1%	240.6%	-102.3%
15-1143	Computer Network Architects	12.2%	-0.3%	12.5%	-0.1%	100.0%	-2.6%	102.6%	-0.5%
15-1151	Computer User Support Specialists	14.8%	6.3%	12.5%	-4.0%	100.0%	42.7%	84.0%	-26.7%
15-1152	Computer Network Support Specialists	2.7%	-4.3%	12.5%	-5.4%	100.0%	-158.4%	454.8%	-195.8%
15-1199	Computer Occupations, All Other	-1.6%	-8.2%	12.5%	-5.8%	100.0%	526.0%	-798.6%	371.9%
17-2061	Computer Hardware Engineers	0.4%	-2.1%	12.5%	-10.1%	100.0%	-473.7%	2782.1%	-2246.3%
	All 14 IT Occupations	14.2%	4.5%	12.5%	-2.7%	100.0%	31.3%	87.6%	-18.9%

Average Wages

Median Hourly Earnings by 6 digit IT occupation is shown in Table 7 for the West Ohio region and the United States. Occupations are sorted by regional median earnings as a percent of national median earnings, low to high. Overall, median earnings for the 14 IT Occupations the region is at 88.8% of what they are in the nation as a whole. The greatest differentials emerge *for Computer Hardware Engineers*; regional median earnings are at 75.7% of national. The least differential emerges for *Computer System Analysts* whose regional median earnings are just above national median earnings, (102.3%).

It is worth noting that regional wages are low relative to national wages for several of the IT occupations where regional completions are low relative to annual projected openings. These include *Computer Hardware Engineers, Software Developers - Systems Software, Software Developers - Applications* and *Network and Computer Systems Administrators*.

Table 7: IT Occupation Median Hourly Earnings, West Ohio Region vs. U.S.

Occupation	Description	West Ohio Region	United States	Regional Median Earnings as a Percent of National	Ratio of Completions to Openings
17-2061	Computer Hardware Engineers	\$38.32	\$50.59	75.7%	0.39
15-1152	Computer Network Support Specialists	\$23.99	\$29.58	81.1%	2.02
15-1131	Computer Programmers	\$29.40	\$34.80	84.5%	4.94
15-1133	Software Developers, Systems Software	\$41.94	\$48.33	86.8%	0.92
15-1132	Software Developers, Applications	\$39.16	\$44.97	87.1%	0.90
15-1142	Network and Computer Systems Administrators	\$31.80	\$36.01	88.3%	0.77
15-1134	Web Developers	\$21.52	\$24.00	89.7%	3.28
15-1143	Computer Network Architects	\$42.52	\$47.39	89.7%	3.28
15-1151	Computer User Support Specialists	\$20.57	\$22.78	90.3%	1.84
15-1122	Information Security Analysts	\$38.62	\$42.74	90.4%	3.28
15-1141	Database Administrators	\$35.99	\$38.31	93.9%	0.83
15-1111	Computer and Information Research Scientists	\$49.30	\$52.10	94.6%	0.58
15-1199	Computer Occupations, All Other	\$37.71	\$38.72	97.4%	0.98
15-1121	Computer Systems Analysts	\$38.82	\$37.93	102.3%	1.00
	Total	\$32.83	\$36.97	88.8%	1.68

The Case for a Different Perspective

A driver industry is a critical regional industry that generates high-paying jobs within the industry and throughout a robust supply chain. Several factors can be used to identify driver industries including the number of jobs, the location quotient, the regional competitiveness determined by the shift share analysis and the average wages. By each of these measures it is tough to make the case that the IT as an industry overall is a driver of economic growth in the JobsOhio West Region. However, changing the paradigm in how the region evaluates the importance of these occupations may encourage productive strategies that can lead to economic growth across multiple industries.

In a biological ecosystem a keystone species can arise. This species is so critically important to the growth and development of the rest of the ecosystem that were it removed, the ecosystem would be devastated. This report proposed that IT as a group of occupations are critically important to the growth and development of other industries. It may not be a driver, but it is a **keystone industry**.

IT Occupation jobs are diffused throughout the West Ohio Region industrial structure. The eight industries with the largest IT employment concentrations, (Computer Systems Design Services, (14.9%), Custom Computer Programming Services, (12.1%), Internet Publishing and Broadcasting and Web Search Portals, (5.2%), Software Publishers, (4.8%), Federal Government, Civilian, Excluding Postal Service, (4.6%), Corporate, Subsidiary, and Regional Managing Offices, (4.2%), Local Government, Excluding Education and Hospitals, (2.5%) and Colleges, Universities, and Professional Schools, (2.3%) **account for just half of the IT occupation jobs** in the West Ohio Region.

Twenty three different industries are required to account for 72% of the IT occupation jobs.

There are 10 industries in that group of 23 that account for a substantially larger share of IT occupation jobs in the region than they do for the nation as a whole. *Internet Publishing and Broadcasting and Web Search Portals*, (5.2% vs. 1.5%), *Federal Government, Civilian, Excluding Postal Service*, (4.6% vs. 2.2%) and *All other insurance related activities*, (1.8% vs. 0.1%) are prominent examples, (see greyed rows).

In almost all of the 23 industries, IT occupations' share of employment in those industries in the region is very similar to its share of industry employment for each industry at the national level. The prominent exception to this is *All other insurance related activities*, where IT occupations account for 9.8% of that industry's employment in the region but only 4.0% at a national level.

Table 4: IT Occupational Share by Industry, West Ohio Region, 2015

NAICS	Industry	IT Occupation Jobs in Industry (2015)	% of IT Occupation Jobs in that Industry (2015)			IT Occupation Jobs as % of Total Jobs in Industry (2015)		
			West Ohio Region	United States	Ratio	West Ohio Region	United States	Ratio
541512	Computer Systems Design Services	2,200	14.9%	13.6%	1.09	54.9%	59.2%	0.93
541511	Custom Computer Programming Services	1,795	12.1%	13.8%	0.88	56.7%	59.8%	0.95
519130	Internet Publishing and Broadcasting and Web Search Portals	766	5.2%	1.5%	3.56	26.5%	27.3%	0.97
511210	Software Publishers	705	4.8%	3.8%	1.24	43.3%	47.0%	0.92
901199	Federal Government, Civilian, Excluding Postal Service	683	4.6%	2.2%	2.08	4.3%	4.4%	0.97
551114	Corporate, Subsidiary, and Regional Managing Offices	627	4.2%	4.7%	0.90	10.2%	9.2%	1.10
903999	Local Government, Excluding Education and Hospitals	368	2.5%	1.7%	1.42	1.5%	1.4%	1.09
611310	Colleges, Universities, and Professional Schools	347	2.3%	1.5%	1.59	3.5%	3.5%	0.99
561320	Temporary Help Services	326	2.2%	2.2%	1.01	3.0%	3.3%	0.89
541513	Computer Facilities Management Services	284	1.9%	1.1%	1.77	57.5%	59.9%	0.96
524298	All Other Insurance Related Activities	263	1.8%	0.1%	16.77	9.8%	4.0%	2.48
622110	General Medical and Surgical Hospitals	263	1.8%	1.2%	1.47	1.2%	1.2%	0.99
541712	Research and Development in the Physical, Engineering, and Life Sciences (e	260	1.8%	1.2%	1.41	10.4%	11.7%	0.89
902612	Colleges, Universities, and Professional Schools (State Government)	256	1.7%	2.3%	0.76	4.2%	3.9%	1.07
518210	Data Processing, Hosting, and Related Services	235	1.6%	2.9%	0.55	29.9%	34.4%	0.87
524114	Direct Health and Medical Insurance Carriers	223	1.5%	1.0%	1.53	11.4%	10.7%	1.06
517110	Wired Telecommunications Carriers	218	1.5%	2.0%	0.73	10.5%	12.5%	0.84
541330	Engineering Services	178	1.2%	1.5%	0.78	5.2%	6.4%	0.80
541519	Other Computer Related Services	170	1.1%	1.9%	0.59	56.1%	59.6%	0.94
903611	Elementary and Secondary Schools (Local Government)	163	1.1%	1.3%	0.87	0.6%	0.8%	0.76
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	140	0.9%	0.4%	2.64	27.2%	37.2%	0.73
541611	Administrative Management and General Management Consulting Services	110	0.7%	1.3%	0.59	5.1%	6.0%	0.85
903612	Colleges, Universities, and Professional Schools (Local Government)	105	0.7%	0.5%	1.37	2.6%	3.2%	0.81
	All Others	4,113	27.8%	36.3%				
	Total	14,795	100%	100%				

A comparison of the West Ohio region's relative concentration of IT occupation jobs by industry compared to Ohio overall and major Ohio MSAs is noteworthy. At the 4 digit NAICS code level there are several industries that account for a more significant percent of IT occupation jobs in West Ohio than for Ohio overall, (see greyed rows). *Other Information Services*, (5.2% vs. 1.3%), *Software Publishers*, (4.8% vs. 1.9%) and *Federal Government, Civilian*, (4.6% vs. 1.5%) are all much more important industries for IT occupation jobs in West Ohio than for Ohio overall.

Table 4a: IT Occupational Share by Industry, West Ohio Region, 2015 Relative to Ohio and Other Ohio Areas							
		West Ohio Region	Ohio	Ratio, West Ohio to Ohio	Cincinnati MSA	Cleveland MSA	Columbus MSA
NAICS	Industry	% of Occupation Group in Industry (2015)					
5415	Computer Systems Design and Related Services	30.1%	28.0%	1.07	25.4%	28.5%	29.2%
5191	Other Information Services	5.2%	1.3%	3.93	0.6%	1.0%	1.0%
5112	Software Publishers	4.8%	1.9%	2.45	2.8%	1.4%	1.1%
9011	Federal Government, Civilian	4.6%	1.5%	3.03	0.9%	2.2%	1.1%
5511	Management of Companies and Enterprises	4.3%	10.3%	0.42	14.3%	9.9%	10.9%
9039	Local Government, Excluding Education and Hospitals	2.5%	2.2%	1.15	1.5%	3.0%	1.7%
5242	Agencies, Brokerages, and Other Insurance Related Activities	2.4%	1.1%	2.30	0.7%	0.8%	1.2%
5613	Employment Services	2.4%	3.1%	0.78	3.2%	3.2%	3.2%
6113	Colleges, Universities, and Professional Schools	2.3%	1.4%	1.70	0.5%	2.4%	0.8%
5241	Insurance Carriers	2.2%	4.3%	0.50	4.9%	4.0%	5.8%
5417	Scientific Research and Development Services	2.1%	1.4%	1.50	1.1%	0.8%	2.3%
9036	Education and Hospitals (Local Government)	2.1%	1.8%	1.21	1.4%	2.2%	1.2%
9026	Education and Hospitals (State Government)	1.8%	2.9%	0.62	2.3%	0.4%	4.9%
5416	Management, Scientific, and Technical Consulting Services	1.8%	2.3%	0.76	2.6%	3.0%	1.7%
6221	General Medical and Surgical Hospitals	1.8%	1.9%	0.96	1.8%	2.9%	1.1%
5182	Data Processing, Hosting, and Related Services	1.6%	2.0%	0.78	1.2%	1.8%	2.9%
5222	Nondepository Credit Intermediation	1.5%	0.7%	2.16	0.5%	0.5%	0.9%
5171	Wired Telecommunications Carriers	1.5%	1.9%	0.77	1.4%	1.8%	1.9%
5413	Architectural, Engineering, and Related Services	1.4%	1.5%	0.95	1.9%	1.5%	1.3%
4234	Professional and Commercial Equipment and Supplies Merchant	1.3%	2.1%	0.59	2.2%	1.8%	2.3%
3341	Computer and Peripheral Equipment Manufacturing	0.9%	0.3%	3.15	0.0%	0.1%	0.3%
5221	Depository Credit Intermediation	0.9%	1.3%	0.71	1.6%	1.6%	1.2%
3363	Motor Vehicle Parts Manufacturing	0.8%	0.5%	1.70	0.4%	0.4%	0.3%
3364	Aerospace Product and Parts Manufacturing	0.8%	0.8%	0.91	2.6%	0.8%	0.0%
3345	Navigational, Measuring, Electromedical, and Control Instrument	0.8%	0.7%	1.14	0.7%	0.9%	0.5%
3335	Metalworking Machinery Manufacturing	0.7%	0.3%	2.61	0.2%	0.3%	0.1%
3339	Other General Purpose Machinery Manufacturing	0.6%	0.3%	2.19	0.2%	0.4%	0.1%
4541	Electronic Shopping and Mail-Order Houses	0.5%	0.9%	0.57	1.2%	0.5%	1.1%
5611	Office Administrative Services	0.5%	0.9%	0.55	0.9%	0.7%	1.1%
5614	Business Support Services	0.5%	0.8%	0.59	0.8%	0.6%	0.7%
6211	Offices of Physicians	0.5%	0.3%	1.46	0.3%	0.3%	0.3%
	Percent of Total in Selected Industries	85.1%	80.5%	1.06	80.0%	79.7%	82.2%

There is not another set of related jobs that are as crosscutting as these 14 jobs making IT strategic priority for the health and growth of the region's other industry clusters. This change in perspective with regard to IT jobs may be useful in developing strategies to address gaps in IT workforce supply compared to business demand, venture investments, start-up opportunities, and other academic and economic opportunities.

Gap Analysis

In a recent survey of Ohio technology entrepreneurs and executives, talent recruitment was determined to be the highest priorities by Dayton participants. In this report, the top three priorities for Dayton participants listed address issues in talent development and availability. What is interesting about the trend across the state in this survey is the lack of priority for internship funding in each region except Cincinnati. This seems to imply that the participants are interested in job-ready talent and are not finding this supply from college programs or out of state recruitment efforts.

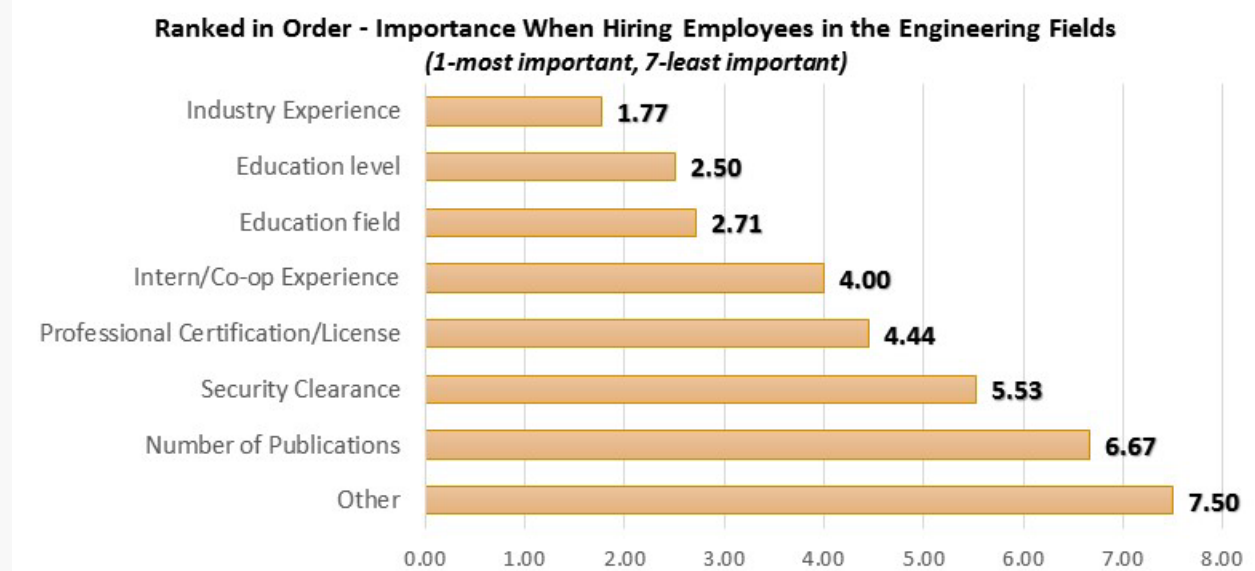
REGIONAL PRIORITIES

Relative Rankings of Regional Priorities	Cincinnati	Cleveland	Columbus	Dayton	Toledo
Increasing college enrollments in IT disciplines	3	1	5	1	4
Supporting attraction of IT workers from other states	5	5	2	3	2
Increased amount of investment funding	2	2	3	5	3
Favorable tax opportunities for tech R&D investments	4	3	4	4	7
State sponsored programs to increase software development talent	8	6	7	2	5
Tax credits or funding for interns	1	7	8	7	8
Increased support for start-up tech firms	6	8	1	8	1
Periodic meetings between tech companies and state legislators	7	4	6	6	6

Source: 2015 Tech Issues Report

This idea that companies are searching for job-ready talent is supported by a soft skills survey conducted by Wright State's Center for Urban and public affairs. More than 500 companies responded which were selected to participate based on their potential to support the Aerospace and Defense industry. Within the survey, these companies were asked to rank order what is most important when hiring in engineering fields. The responses are on the following page. While intern/co-op experience occurs in a higher priority position, it still ranks below preference for industry experience. This trend continues in every field surveyed.

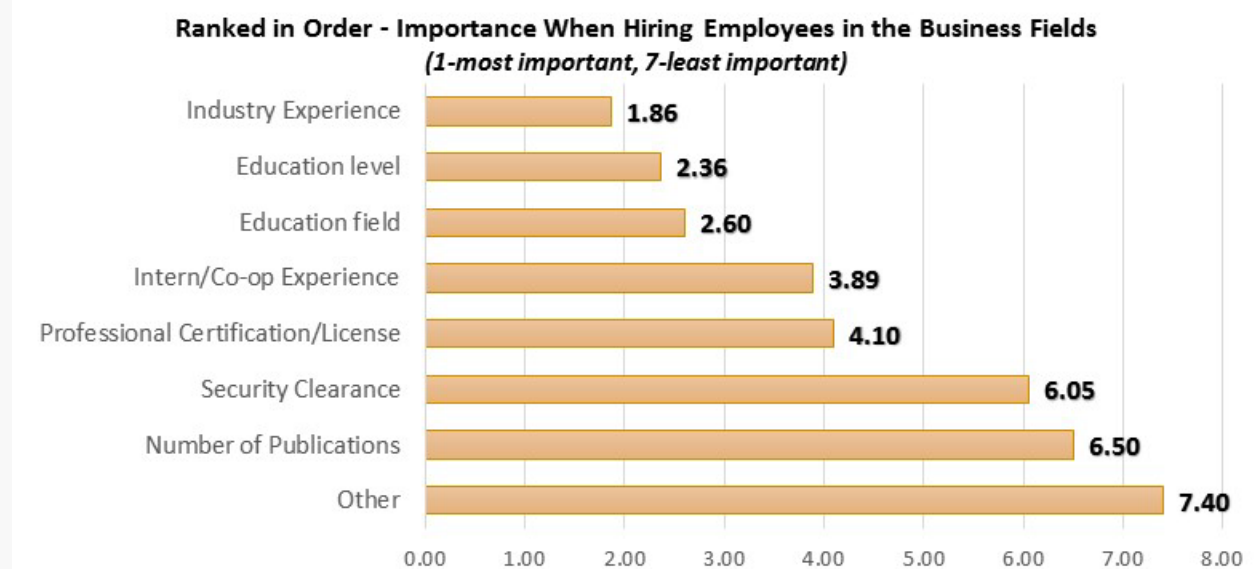
For Engineering fields, please rank order what is most important in your hiring (1-most important, 7-least important)



For Technical fields, please rank order what is most important in your hiring (1-most important, 7-least important)



For Business fields, please rank order what is most important in your hiring (1-most important, 7-least important)

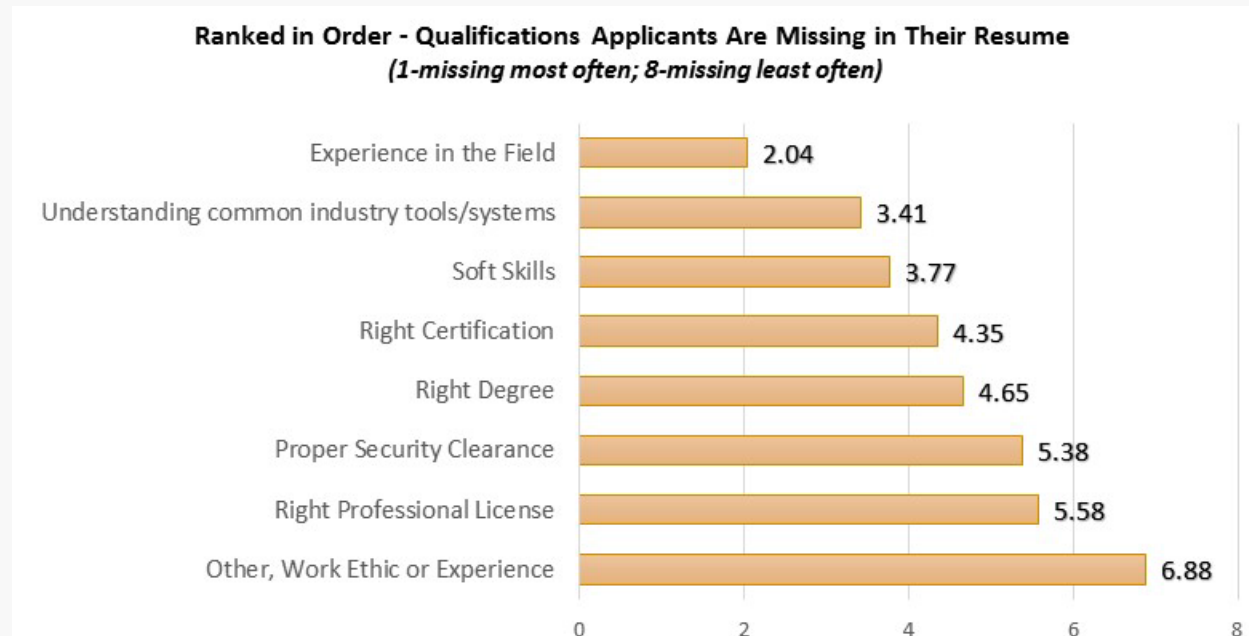


For Skilled Labor fields, please rank order what is most important in your hiring (1-most important, 7-least important)



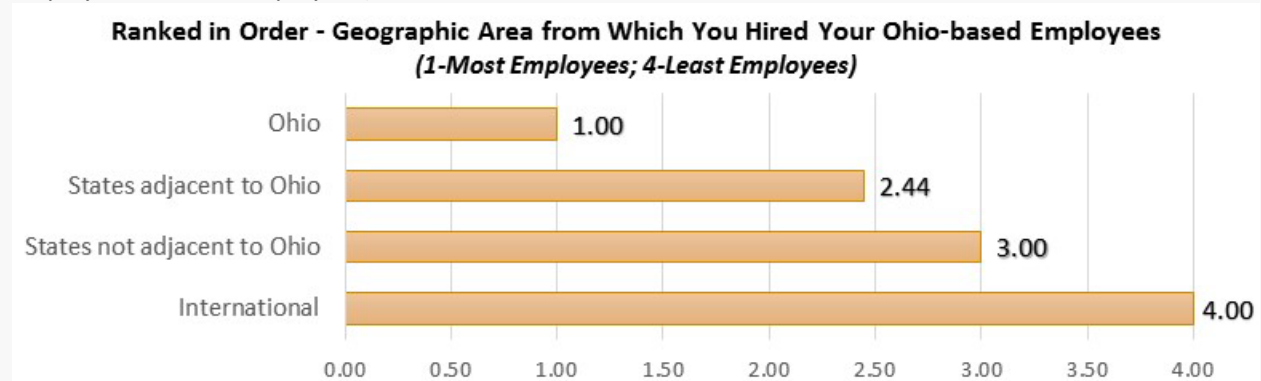
Most startling, even though Industry Experience is considered the highest priority in all fields, it is the number one factor deemed lacking in applicant resumes.

Please rank order the qualifications your applicants are missing in their resume (1-missing most often; 8-missing least often).



Yet, despite this lack of industry experience, respondents reported that most of their employees are hired from within Ohio.

Please rank order the geographic area from which you hired your Ohio based employees. (1-most employees, 4-least employees)



This seemingly conflicting information suggests that these companies would prefer industry experience, but are willing to hire employees that have the appropriate education level if employee relocation time/cost could be avoided.

To better understand where the pain point may be in hiring challenges, a gap analysis was conducted. Annual openings in particular occupations are a function of two different elements. The first element is the projected gross change in the number of jobs that require that occupation. Table 3 and 3a provided an explanation of what lies behind that projection. That projected job growth for each of the 14 IT Occupations is shown again in Table 4 for the 2015 to 2025 time frame. The second element is linked to the projected job leavings within each particular occupation in a region. That is partially a function of transitions into other occupations but primarily a function of the age distribution of people in that occupation currently and how many people are expected to age out of the profession annually. In the West Ohio Region, that second element is of some importance, (see Table 11), and helps explain why annual openings for each occupation is substantially greater than what would be expected given projected job growth over the 10 year period.

Regional completions in CIP codes, (Classification of Instructional Programs), linked to IT occupations, (see Table 6), are one measure of whether the region will face labor shortages for particular occupations. Looking at the IT occupations as a group, the estimated 811 completions in relevant CIP areas in the West Ohio region is more than sufficient to cover the 483 Annual Openings. In no single one of the 14 IT occupations is there a suggestion of a potential shortage based on regional completions with the possible exceptions of *Computer System Analysts* and *Software Developers, Applications* where openings exceed a third of completions. This apparent lack of shortage however is due to double counting individual CIP code completions across the individual 6 digit IT SOC's. As will be apparent in Table 6, (second page following), there are double counts in program completions across occupations and so at the individual occupation level that might hide a shortage for that particular occupation.

Table 5: IT Occupation Gap Analysis, 2015-2025, West Ohio JobsOhio Region, CIP Code Completions double counted at 6 digit IT SOC level

Standard Occupation Classification	2015 Jobs	2025 Jobs	2015 - 2025 Change	2015 - 2025 % Change	Annual Openings	Regional Completions (2014) *
15-1111 Computer and Information Research Scientists	105	119	14	13%	3	131
15-1121 Computer Systems Analysts	2,544	2,936	392	15%	83	224
15-1122 Information Security Analysts	150	207	57	38%	9	596
15-1131 Computer Programmers	845	971	126	15%	39	320
15-1132 Software Developers, Applications	2,736	3,328	592	22%	99	221
15-1133 Software Developers, Systems Software	583	788	205	35%	30	222
15-1134 Web Developers	955	1,124	169	18%	34	596
15-1141 Database Administrators	452	517	65	14%	16	160
15-1142 Network and Computer Systems Administrators	1,563	1,644	81	5%	38	160
15-1143 Computer Network Architects	370	415	45	12%	12	596
15-1151 Computer User Support Specialists	2,378	2,731	353	15%	77	374
15-1152 Computer Network Support Specialists	802	824	22	3%	17	421
15-1199 Computer Occupations, All Other	1,089	1,072	(17)	(2%)	21	157
17-2061 Computer Hardware Engineers	223	224	1	0%	6	73
Total	14,795	16,901	2,106	14.2%	483	811

* Due to substantial overlaps in CIP programs providing Completers across IT SOC's, the total regional completions is not the sum of completions applicable to each IT SOC (see Table 6)

Table 5a, (next page), crudely corrects for this double count phenomenon by assuming that completers from each CIP code will be distributed across 6 digit IT occupations that recruit from that CIP code based on that IT occupation's share of annual openings. The potential shortage in particular IT occupations abruptly emerges.

There are eight occupations where completions in the West Ohio Region are potentially insufficient to cover openings because the ratio of completions to openings is 1 or less. The ratio of completions to openings for two occupations, *Computer and Information Research Scientists* and *Computer Hardware Engineers* should be met with some suspicion because the numbers involved are very small. Focusing on the other 6 occupations with ratios of completions to openings 1 or less, the shortages for *Database Administrators* and *Network and Computer System Administrators* are particularly severe with ratios of 0.83 and 0.77. Tightness is also apparent for the two *Software Developer* occupations, *Applications* and *Systems Software* with ratios of completions to openings of 0.90 and 0.92 respectively.

Table 5a: IT Occupation Gap Analysis, 2015-2025, West Ohio JobsOhio Region, Based on Share of Openings								
Standard Occupation Classification		2015 Jobs	2025 Jobs	2015 - 2025 Change	2015 - 2025 % Change	Annual Openings	Share of Regional Completions (2014) *	Ratio of Completions to Openings
15-1111	Computer and Information Research Scientists	105	119	14	13%	3	2	0.58
15-1121	Computer Systems Analysts	2,544	2,936	392	15%	83	83	1.00
15-1122	Information Security Analysts	150	207	57	38%	9	28	3.28
15-1131	Computer Programmers	845	971	126	15%	39	193	4.94
15-1132	Software Developers, Applications	2,736	3,328	592	22%	99	89	0.90
15-1133	Software Developers, Systems Software	583	788	205	35%	30	27	0.92
15-1134	Web Developers	955	1,124	169	18%	34	110	3.28
15-1141	Database Administrators	452	517	65	14%	16	13	0.83
15-1142	Network and Computer Systems Administrators	1,563	1,644	81	5%	38	29	0.77
15-1143	Computer Network Architects	370	415	45	12%	12	38	3.28
15-1151	Computer User Support Specialists	2,378	2,731	353	15%	77	141	1.84
15-1152	Computer Network Support Specialists	802	824	22	3%	17	34	2.02
15-1199	Computer Occupations, All Other	1,089	1,072	(17)	(2%)	21	20	0.98
17-2061	Computer Hardware Engineers	223	224	1	0%	6	2	0.39
Total		14,795	16,901	2,106	14.2%	483	811	1.68
* Completers from each CIP spread across IT SOC's based on Share of Total IT Annual Openings, Table 6a								
Occupations with Potential Shortages								

To help understand the limitations of the gap analysis done, Table 6 traces the cross-walk between program completions by CIP code and 6 digit IT Occupation SOCs. A 1 is placed in a cell when a particular CIP has graduates able to compete for jobs in the particular IT occupation shown in the columns. For example graduates from a program coded as *CIP 11.0201 Computer Programming, General* are able to compete for jobs in 15-1122, 15-1131 thru 15-1134, 15-1143, 15-1151 and 15-1152. As a result it is not the case that all 95 *CIP 11.0201 Computer Programming, General* completers from 2014 in the region are available for 15-1132 *Software Developers, Applications* although Table 5 regards them as 95 of the 221 completers who could fill those jobs.

Table 6: West Ohio Region Completions in IT Occupation Relevant Programs, 2014																
CIP Code and Program		Regional Completions (2014)	IT Occupations using graduates of particular CIPs													
			15-1111	15-1121	15-1122	15-1131	15-1132	15-1133	15-1134	15-1141	15-1142	15-1143	15-1151	15-1152	15-1199	17-2061
11.0101	Computer and Information Sciences, General	82	1	1	1				1	1	1	1			1	
11.0103	Information Technology	1	1	1	1		1	1	1			1				
11.0199	Computer and Information Sciences, Other	0	1													
11.0201	Computer Programming/Programmer, General	95			1	1	1	1	1			1	1	1		
11.0202	Computer Programming, Specific Applications	5				1	1	1								
11.0203	Computer Programming, Vendor/Product Certification	15				1										
11.0301	Data Processing and Data Processing Technology/Technician	1													1	
11.0401	Information Science/Studies	1	1					1							1	
11.0501	Computer Systems Analysis/Analyst	0		1	1				1			1	1	1		
11.0701	Computer Science	47	1		1	1	1	1	1			1		1	1	
11.0801	Web Page, Digital/Multimedia and Information Resources Design	27			1				1			1				
11.0802	Data Modeling/Warehousing and Database Administration	1								1						
11.0901	Computer Systems Networking and Telecommunications	141		1	1				1			1	1	1		
11.1001	Network and System Administration/Administrator	1			1				1		1	1	1	1		
11.1002	System, Networking, and LAN/WAN Management/Manager	26			1				1			1	1	1		
11.1003	Computer and Information Systems Security/Information Assurance	77			1				1	1	1	1	1	1		
11.1004	Web/Multimedia Management and Webmaster	0			1				1			1				
11.1006	Computer Support Specialist	34											1	1		
14.0901	Computer Engineering, General	73			1		1	1	1			1				1
30.1601	Accounting and Computer Science	0													1	
43.0116	Cyber/Computer Forensics and Counterterrorism	26			1				1			1			1	
51.0709	Medical Office Computer Specialist/Assistant	0				1							1	1		
52.0205	Operations Management and Supervision	43				1										
52.1201	Management Information Systems, General	101				1										
52.1299	Management Information Systems and Services, Other	14				1										
Completions 2012		811	131	224	596	320	221	222	596	160	160	596	374	421	157	73

One method to avoid double counting is to spread regional completions across 6 digit IT SOC occupations based on each occupations share of annual openings for which completers of that CIP code get recruited. The results of that effort are shown in Table 6a. The resulting attribution of completions by 6 digit IT SOC is shown in the bottom row of the table. Note that now the completions sum to the total of completions across the IT CIP Code programs

Table 6a: West Ohio Region Completions in IT Occupation Relevant Programs spread across IT Occupation Annual Openings																
			Number of Completions Assigned to IT Occupation based on Share of Openings													
CIP Code and Program		Regional Completions (2014)	15-1111	15-1121	15-1122	15-1131	15-1132	15-1133	15-1134	15-1141	15-1142	15-1143	15-1151	15-1152	15-1199	17-2061
11.0101	Computer and Information Sciences, General	82	1.22	31.84	3.29	0.00	0.00	0.00	12.84	6.04	14.37	4.40	0.00	0.00	7.99	0.00
11.0103	Information Technology	1	0.01	0.31	0.03	0.00	0.37	0.11	0.12	0.00	0.00	0.04	0.00	0.00	0.00	0.00
11.0199	Computer and Information Sciences, Other	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0201	Computer Programming/Programmer, General	95	0.00	0.00	2.59	11.72	29.88	8.99	10.10	0.00	0.00	3.46	23.15	5.11	0.00	0.00
11.0202	Computer Programming, Specific Applications	5	0.00	0.00	0.00	1.16	2.95	0.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0203	Computer Programming, Vendor/Product Certification	15	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0301	Data Processing and Data Processing Technology/Technician	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
11.0401	Information Science/Studies	1	0.06	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00
11.0501	Computer Systems Analysis/Analyst	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0701	Computer Science	47	0.57	0.00	1.54	6.97	17.76	5.34	6.00	0.00	0.00	2.05	0.00	3.04	3.73	0.00
11.0801	Web Page, Digital/Multimedia and Information Resources Design	27	0.00	0.00	4.32	0.00	0.00	0.00	16.89	0.00	0.00	5.78	0.00	0.00	0.00	0.00
11.0802	Data Modeling/Warehousing and Database Administration	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0901	Computer Systems Networking and Telecommunications	141	0.00	50.85	5.25	0.00	0.00	0.00	20.51	0.00	0.00	7.02	47.00	10.38	0.00	0.00
11.1001	Network and System Administration/Administrator	1	0.00	0.00	0.05	0.00	0.00	0.00	0.18	0.00	0.20	0.06	0.42	0.09	0.00	0.00
11.1002	System, Networking, and LAN/WAN Management/Manager	26	0.00	0.00	1.51	0.00	0.00	0.00	5.91	0.00	0.00	2.02	13.55	2.99	0.00	0.00
11.1003	Computer and Information Systems Security/Information Assurance	77	0.00	0.00	3.29	0.00	0.00	0.00	12.87	6.05	14.40	4.40	29.48	6.51	0.00	0.00
11.1004	Web/Multimedia Management and Webmaster	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.1006	Computer Support Specialist	34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.85	6.15	0.00	0.00
14.0901	Computer Engineering, General	73	0.00	0.00	3.32	0.00	38.37	11.54	12.97	0.00	0.00	4.44	0.00	0.00	0.00	2.35
30.1601	Accounting and Computer Science	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43.0116	Cyber/Computer Forensics and Counterterrorism	26	0.00	0.00	3.00	0.00	0.00	0.00	11.71	0.00	0.00	4.01	0.00	0.00	7.28	0.00
51.0709	Medical Office Computer Specialist/Assistant	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52.0205	Operations Management and Supervision	43	0.00	0.00	0.00	43.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52.1201	Management Information Systems, General	101	0.00	0.00	0.00	101.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52.1299	Management Information Systems and Services, Other	14	0.00	0.00	0.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Completions 2014	811	2	83	28	193	89	27	110	13	29	38	141	34	20	2

There are limitations to this method. For example, while 14.0901 computer engineering completers do go into other IT Occupations, one would expect them to favor computer hardware engineering jobs differentially. That is not accounted for in this methodology.

Demand

One way of gauging changing demand for particular IT Occupations is to note changes in the unique job postings for those occupations¹. The process of monitoring this should still be used as a barometer to changes in the current and future demand, not real jobs going unfilled. Some companies will leave job postings on specific sites to collect a pool of candidates and aren't necessarily hiring.

In addition, IT experiences significant talent poaching that results in a shuffling of the workforce. Some of this shuffling occurs as employees obtain specific certifications qualifying them for new positions. Regardless of the reason, employee retention is a significant problem, especially in regions where the supply is not adequate to fill the demand. Working with business partners to analyze what positions have the highest churn may provide insight into where the real shortfalls are on the supply side.

Unique Postings in the West Ohio Region in January, 2011 are compared to those for July 2015. Across 11 of the 14 IT occupations, there has been a dramatic increase in postings. The exceptions are Database administrators, (-8%), Computer Network Support Specialists, (0%) and Web Developers, (9%). The greatest increases, (ignoring those with small sample sizes), have occurred for *Software Developers, Systems Software*, (656%) and *Software Developers, Applications*, (221%). Note that these are both areas where the ratio of completions to openings is less than 1.

SOC	Occupation	West Ohio Region			National % Change	Ratio of Completions to Openings
		Jan 2011 Postings	Jul 2015 Postings	% Change		
15-1111	Computer and Information Research Scientists	8	26	225%	420%	0.58
15-1121	Computer Systems Analysts	128	207	62%	141%	1.00
15-1122	Information Security Analysts	74	112	51%	259%	3.28
15-1131	Computer Programmers	32	85	166%	68%	4.94
15-1132	Software Developers, Applications	135	434	221%	200%	0.90
15-1133	Software Developers, Systems Software	25	189	656%	369%	0.92
15-1134	Web Developers	82	89	9%	76%	3.28
15-1141	Database Administrators	63	58	(8%)	67%	0.83
15-1142	Network and Computer Systems Administrators	74	188	154%	151%	0.77
15-1143	Computer Network Architects	4	25	525%	191%	3.28
15-1151	Computer User Support Specialists	75	216	188%	221%	1.84
15-1152	Computer Network Support Specialists	3	3	0%	327%	2.02
15-1199	Computer Occupations, All Other	135	355	163%	194%	0.98
17-2061	Computer Hardware Engineers	7	16	129%	147%	0.39

One way of measuring the relative tightness of the local market is to compare the regional ratio of average monthly postings to hires to the national ratio of average monthly postings to hire. When the regional ratio is greater than 100% of the national ratio, one could assume local employers are having greater difficulties than those nationally for that particular occupation. Note that *for Software Developers, Systems Software*, this approach does suggest greater difficulty locally than nationally, (492%) while the differential is not as great for *Software Developers, Applications*, (123%) or Database Administrators, (132%). For *Network Administrators*, the percent is actually less than 100% at 87%.

¹ Note that job postings data is based on a unique compilation by EMSI.

Table 9: Postings vs. Hires, West Ohio Region, Comparison to National Ratio

SOC	Occupation	West Ohio Region			National Ratio of Postings to Hires	Regional to National Ratio	Ratio of Completions to Openings
		Avg Monthly Postings (Jan 2011 - Jul 2015)	Avg Monthly Hires (Jan 2011 - Jul 2015)	Ratio of Postings to Hires			
15-1111	Computer and Information Research Scientists	17	3	5.7	2.8	207%	0.58
15-1121	Computer Systems Analysts	162	80	2.0	2.1	97%	1.00
15-1122	Information Security Analysts	58	5	12.3	4.8	259%	3.28
15-1131	Computer Programmers	45	25	1.8	1.1	160%	4.94
15-1132	Software Developers, Applications	231	80	2.9	2.3	123%	0.90
15-1133	Software Developers, Systems Software	74	17	4.4	0.9	492%	0.92
15-1134	Web Developers	93	22	4.3	6.0	73%	3.28
15-1141	Database Administrators	49	15	3.3	2.5	132%	0.83
15-1142	Network and Computer Systems Administrators	134	60	2.2	2.6	87%	0.77
15-1143	Computer Network Architects	9	12	0.8	0.8	93%	3.28
15-1151	Computer User Support Specialists	143	90	1.6	1.3	119%	1.84
15-1152	Computer Network Support Specialists	4	27	0.1	0.1	104%	2.02
15-1199	Computer Occupations, All Other	189	35	5.4	7.2	74%	0.98
17-2061	Computer Hardware Engineers	7	6	1.3	1.2	107%	0.39
	Total	1,215	474	2.6	2.2	116%	1.68

Table 10 provides information on both the total and unique job postings for the 14 IT Occupations in the West Ohio Region

Table 10: Top Companies Postings for IT Occupations in West Ohio Region

Company	Total (Jul 2015)	Unique (Jul 2015)
Oracle Corporation	2,249	117
Booz Allen Hamilton Inc.	150	65
Reed Elsevier PLC	203	47
Crown Equipment Corporation	80	45
Lexis Nexis	68	43
Lexis-Nexis SA	171	43
TEKsystems, Inc.	141	41
Ball Corporation	85	38
The Reynolds and Reynolds Company	1,066	33
Wyle Laboratories, Inc.	799	33
Caresource Management Services Co.	82	30
Kettering Health Network	67	29
Robert Half International Inc.	46	27
General Electric Company	61	26
General Dynamics Corporation	39	24
Macaulay-Brown, Incorporated	126	24
Global Minerals Ltd.	47	22
Leid's Incorporated	31	21
Radiance Technologies Inc	35	20
Fourth Technologies, Inc.	19	19
McR, LLC	28	18
R & L Carriers	30	17
The PNC Financial Services Group, Inc.	43	16
Northrop Grumman Corporation	38	15
Tyler Technologies, Inc.	33	14

Alion Science and Technology Corporation	23	14
Sogeti USA LLC	14	13
AT&T Inc.	20	13
The Keyw Corporation	15	13
BAE Systems Technology Solutions & Services Inc.	46	13
University of Dayton	15	13
Integrity Applications Incorporated	12	12
Whitney, Bradley & Brown, Inc.	43	12
Tecnosoft Corporation	12	12
Reynolds American Inc.	28	12
Kforce Inc.	45	11
Premier Health Partners, LLC	14	11
The MITRE Corporation	15	11
Veredus Corporation	20	11
ManTech International Corporation	55	11
Cognizant Technology Solutions Corporation	41	10
Xylem Inc	12	10
Wright State University	20	10
The Children's Medical Center Dayton Ohio	18	10
Teradata Corporation	26	10
Tech Force, Inc	29	9
W B B Inc	11	9
Cyber Code E	9	9
Assured Information Security	30	9
Trimble Navigation Limited	16	9

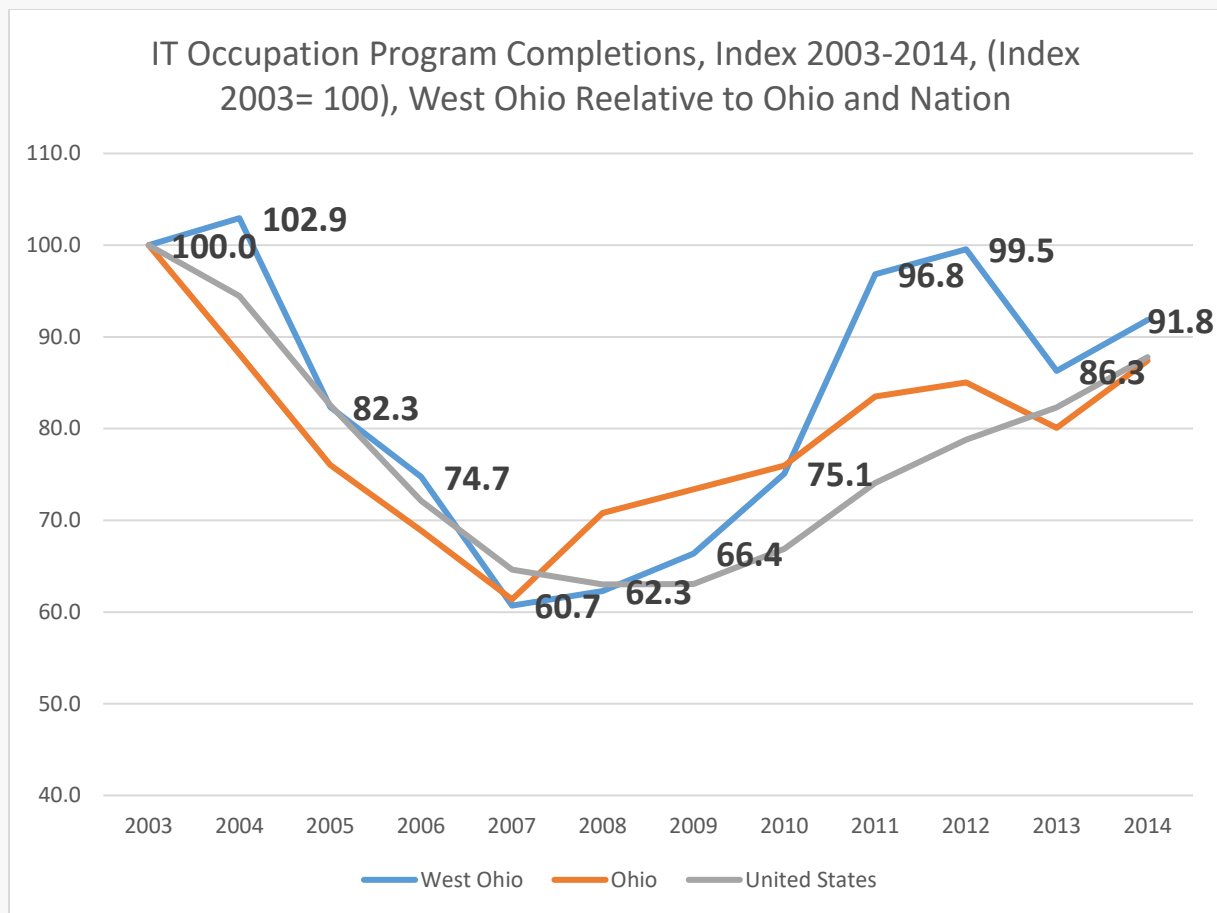
Supply

IT Occupation Regional Completions are shown for the period from 2003 to 2014. Those completions declined dramatically in the period from 2006 to 2009 and then started to recover over the period from 2010 to 2012. However, completions in the last 2 years, (762 and 811) have fallen below their 2012 high of 879.

The regional pattern mirrors closely the completion pattern for Ohio and the Nation as a whole, (see chart). As in the West Ohio region, completions in Ohio and the Nation fell dramatically in the 2006 to 2008 period only to grow again over the next 4 years.

	West Ohio		Ohio	United States
	Number	Index (2003 value = 100)		
2003	883	100.0	100.0	100.0
2004	909	102.9	88.1	94.5
2005	727	82.3	76.0	82.6
2006	660	74.7	68.9	72.1
2007	536	60.7	61.4	64.6
2008	550	62.3	70.8	63.0
2009	586	66.4	73.4	63.1
2010	663	75.1	76.0	66.9
2011	855	96.8	83.5	74.1
2012	879	99.5	85.0	78.8
2013	762	86.3	80.1	82.3
2014	811	91.8	87.4	87.8

* based on 25 CIP codes, see below



The IT Occupation completions by CIP Code Program are shown in Table 15 for the period from 2008 to 2014. Some trends are most apparent. First, there has been a dramatic decrease in the last two years in the general *CIP 11.0101* from 239 to 83 and 82 and a decrease in 2013 and 2014 in the *11.0901 Computer Systems Networking and Communications* area, (from 232 to 212 and then 141). There has been an abrupt increase in 2014 in the CIP area, *11.0201 Computer Programmer*.

Table 15: IT Occupation Related Completions by CIP Program Type

CIP	Program Description	Completions						
		2008	2009	2010	2011	2012	2013	2014
11.0101	Computer and Information Sciences, General	156	182	186	214	239	83	82
11.0103	Information Technology	11	13	7	19	5	2	1
11.0199	Computer and Information Sciences, Other	0	0	0	0	0	0	0
11.0201	Computer Programming/Programmer, General	3	6	3	1	2	26	95
11.0202	Computer Programming, Specific Applications	0	1	2	3	2	4	5
11.0203	Computer Programming, Vendor/Product Certification	0	0	0	0	0	0	15
11.0301	Data Processing and Data Processing Technology/Technician	0	0	0	5	1	1	1
11.0401	Information Science/Studies	9	19	4	14	13	7	1
11.0501	Computer Systems Analysis/Analyst	0	0	0	0	0	0	0
11.0701	Computer Science	64	59	41	50	34	37	47
11.0801	Web Page, Digital/Multimedia and Information Resources Design	37	25	13	13	3	21	27
11.0802	Data Modeling/Warehousing and Database Administration	0	0	0	0	0	2	1
11.0901	Computer Systems Networking and Telecommunications	55	66	116	184	232	212	141
11.1001	Network and System Administration/Administrator	0	0	2	12	10	9	1
11.1002	System, Networking, and LAN/WAN Management/Manager	0	0	0	0	0	7	26
11.1003	Computer and Information Systems Security/Information Assurance	27	40	82	82	96	72	77
11.1004	Web/Multimedia Management and Webmaster	0	0	0	11	8	5	0
11.1006	Computer Support Specialist	0	0	0	24	0	26	34
14.0901	Computer Engineering, General	68	66	62	71	63	70	73
30.1601	Accounting and Computer Science	0	0	0	0	0	0	0
43.0116	Cyber/Computer Forensics and Counterterrorism	0	0	0	0	0	24	26
51.0709	Medical Office Computer Specialist/Assistant	0	0	0	0	0	0	0
52.0205	Operations Management and Supervision	6	15	24	23	47	32	43
52.1201	Management Information Systems, General	106	84	105	111	117	115	101
52.1299	Management Information Systems and Services, Other	8	10	16	18	7	7	14
		550	586	663	855	879	762	811

Table 16 (next page) provides a breakdown of IT Occupation Completions in 2014 by institution and degree type for all institutions in the West Ohio area. Five institutions dominate the completions. Wright State and University of Dayton dominate bachelor and above completions while Sinclair, Edison State and Clark State dominate 2 year and less degree completions.

Table 16: Institutional Completions for IT Occupations by Degree Level, West Ohio Region, 2014
(25 CIP)

Institution	Award < 1 academic year	Award < 2 academic years	Associates	Bachelors	Post baccalaureate certificate	Masters	Doctors	All Certificates	All Degrees	All Completions
Sinclair Community College	122	8	123	0	0	0	0	130	123	253
Wright State University-Main Campus	0	0	0	133	0	30	6	0	169	169
University of Dayton	0	0	0	94	0	17	0	0	111	111
Edison State Community College	2	29	34	0	0	0	0	31	34	65
Clark State Community College	12	0	44	0	0	0	0	12	44	56
ITT Technical Institute-Dayton	0	0	31	6	0	0	0	0	37	37
Air Force Institute of Technology- Graduate School of Engineering & Management	0	0	0	0	5	26	1	5	27	32
Fortis College-Centerville	0	0	30	0	0	0	0	0	30	30
Cedarville University	0	0	0	25	0	0	0	0	25	25
Wright State University-Lake Campus	0	0	18	0	0	0	0	0	18	18
Wittenberg University	0	0	0	5	0	0	0	0	5	5
Central State University	0	0	0	4	0	0	0	0	4	4
Wilberforce University	0	0	0	3	0	0	0	0	3	3
National College-Columbus	0	1	1	0	0	0	0	1	1	2
Urbana University	0	0	0	1	0	0	0	0	1	1
All Institutions	136	38	281	271	5	73	7	179	632	811

The Age Distribution of the 14 IT Occupations in the West Ohio Region are documented in Table 12. Relative to the age distribution of those IT occupations nation-wide, those 55 and over are over-represented in the West Ohio region. On average, across the 14 occupations, those 55 and over constitute 17% of the workforce in West Ohio while in the nation as a whole for those occupations they constitute 14%. The over-representation of those 55 and over is particularly acute for several of the IT occupations where other data suggests regional completions will fall short of what is required for annual openings. For example, 16% of *Software Developers, System Software* in West Ohio are 55 and over while nationally only 12% are.

Table 11: Age Distribution of IT Occupations, West Ohio Region Compared to Nation

SOC	Description	2015 Jobs	West Ohio Region			Nation			Ratio of 55 and Up, West Ohio relative to Nation	Ratio of < 35, West Ohio relative to nation
			< 35	35-54	55 and up	< 35	35-54	55 and up		
17-2061	Computer Hardware Engineers	223	24%	55%	21%	27%	58%	15%	1.35	0.92
15-1133	Software Developers, Systems Software	583	28%	56%	16%	32%	56%	12%	1.33	0.89
15-1143	Computer Network Architects	370	30%	56%	14%	33%	57%	10%	1.32	0.92
15-1132	Software Developers, Applications	2,736	29%	56%	14%	34%	55%	11%	1.26	0.87
15-1111	Computer and Information Research Scientists	105	27%	51%	22%	31%	51%	18%	1.25	0.88
15-1151	Computer User Support Specialists	2,378	34%	49%	16%	37%	49%	14%	1.20	0.92
15-1131	Computer Programmers	845	25%	55%	20%	29%	55%	16%	1.19	0.88
15-1142	Network and Computer Systems Administrators	1,563	31%	55%	14%	34%	55%	11%	1.19	0.92
15-1152	Computer Network Support Specialists	802	34%	49%	16%	37%	50%	14%	1.18	0.94
15-1121	Computer Systems Analysts	2,544	26%	54%	21%	28%	54%	18%	1.17	0.92
15-1141	Database Administrators	452	22%	59%	19%	24%	60%	17%	1.16	0.91
15-1199	Computer Occupations, All Other	1,089	29%	52%	19%	31%	52%	17%	1.16	0.93
15-1122	Information Security Analysts	150	25%	53%	22%	26%	54%	20%	1.10	0.94
15-1134	Web Developers	955	37%	53%	10%	40%	50%	10%	1.04	0.92
	All Computer Occupations	14,795	30%	53%	17%	33%	54%	14%	1.20	0.92

The Gender distribution of IT Occupations has historically skewed male. For the nation, 75% of those in IT Occupations are male. The Gender distribution of those occupations in West Ohio mirrors that for the nation with 74% of those in IT occupations male. Note that in every single IT occupation the gender distribution in the region mirrors that for the county as a whole.

Table 12: Gender Distribution of IT Occupations, West Ohio Region

SOC	Description	2015 Jobs	West Ohio Region				National		Male Ratio, Region to National
			Number		Percent of Occupation		Percent of Occupation		
			Males	Females	Males	Females	Males	Females	
15-1111	Computer and Information Research Scientists	105	72	33	69%	31%	69%	31%	0.99
15-1121	Computer Systems Analysts	2,544	1,732	812	68%	32%	69%	31%	0.98
15-1122	Information Security Analysts	150	112	38	75%	25%	75%	25%	0.99
15-1131	Computer Programmers	845	666	179	79%	21%	78%	22%	1.01
15-1132	Software Developers, Applications	2,736	2,171	565	79%	21%	79%	21%	1.00
15-1133	Software Developers, Systems Software	583	469	114	80%	20%	80%	20%	1.01
15-1134	Web Developers	955	687	268	72%	28%	70%	30%	1.02
15-1141	Database Administrators	452	278	174	62%	38%	63%	37%	0.98
15-1142	Network and Computer Systems Administrators	1,563	1,242	320	79%	20%	80%	20%	1.00
15-1143	Computer Network Architects	370	291	79	79%	21%	79%	21%	1.00
15-1151	Computer User Support Specialists	2,378	1,712	666	72%	28%	71%	29%	1.01
15-1152	Computer Network Support Specialists	802	572	230	71%	29%	71%	29%	1.00
15-1199	Computer Occupations, All Other	1,089	746	343	69%	31%	71%	29%	0.96
17-2061	Computer Hardware Engineers	223	188	35	84%	16%	85%	15%	0.99
	Total	14,795	10,940	3,856	74%	26%	75%	25%	0.99

The Ethnic Identity Distribution of IT Occupations in the West Ohio Region is documented in Table 13. Here what is most important is the IT Occupation distribution relative to the ethnic identity distribution of the regional population. Two central points are immediately clear. First, both Hispanics and African Americans are substantially under-represented in IT Occupations relative to their proportion of the regional population. For Hispanics, their share of IT jobs is just 54% of what you would expect given their regional populations and for African-Americans, the share is just 60% of what would be expected. Second, Asians are substantially over-represented in IT occupations relative to their share in the regional population. Their share is 373% of what would be expected. The share of whites is in close approximation, 103%, of what would be expected given their share of regional population.

Of less interest, but worthy of note, the ethnic identity distribution in Ohio favors whites relative to all other ethnic identities. Whites are a disproportionate share of all IT Occupation jobs in Ohio, 1.24, relative to the country as a whole.

Table 13: Ethnic Identity Distribution of IT Occupations, West Ohio Region

SOC	Description	2015 Jobs	Hispanic or Latino	White	Black or African American	Asian	Hispanic	White	Black or African American	Asian	Hispanic	White	Black or African American	Asian
			West Ohio Region IT Occupation %				Relative to Regional Population Proportion				Relative to National IT Occupation Proportion			
15-1111	Computer and Information Research Scientists	105	1.9%	82.1%	10.1%	4.8%	0.81	0.99	0.90	3.05	0.38	1.25	1.01	0.26
15-1121	Computer Systems Analysts	2,544	1.3%	84.4%	7.8%	5.5%	0.55	1.02	0.70	3.49	0.23	1.23	0.85	0.36
15-1122	Information Security Analysts	150	2.7%	88.3%	7.0%	0.7%	1.13	1.07	0.63	0.43	0.46	1.20	0.65	0.09
15-1131	Computer Programmers	845	1.1%	89.5%	3.5%	5.2%	0.45	1.09	0.31	3.33	0.23	1.22	0.77	0.32
15-1132	Software Developers, Applications	2,736	1.0%	82.1%	3.7%	12.3%	0.41	1.00	0.33	7.87	0.26	1.34	0.92	0.42
15-1133	Software Developers, Systems Software	583	0.9%	84.0%	3.6%	10.5%	0.36	1.02	0.33	6.74	0.21	1.40	0.88	0.34
15-1134	Web Developers	955	1.2%	90.9%	4.2%	2.7%	0.49	1.10	0.37	1.73	0.20	1.16	0.83	0.31
15-1141	Database Administrators	452	0.4%	87.0%	6.3%	4.8%	0.19	1.06	0.56	3.09	0.09	1.22	0.77	0.33
15-1142	Network and Computer Systems Administrators	1,563	1.3%	88.9%	6.0%	2.8%	0.57	1.08	0.54	1.82	0.18	1.21	0.75	0.30
15-1143	Computer Network Architects	370	2.2%	86.8%	6.6%	3.8%	0.92	1.05	0.59	2.46	0.31	1.22	0.75	0.34
15-1151	Computer User Support Specialists	2,378	1.6%	85.5%	8.2%	3.7%	0.67	1.04	0.73	2.34	0.21	1.18	0.80	0.45
15-1152	Computer Network Support Specialists	802	1.5%	85.9%	8.5%	3.0%	0.64	1.04	0.76	1.91	0.19	1.21	0.75	0.36
15-1199	Computer Occupations, All Other	1,089	1.5%	79.5%	14.4%	3.5%	0.63	0.96	1.29	2.24	0.25	1.19	1.09	0.29
17-2061	Computer Hardware Engineers	223	0.4%	83.9%	6.4%	7.0%	0.19	1.02	0.58	4.50	0.06	1.47	1.20	0.24
	Total, IT Occupations	14,795	1.3%	85.2%	6.7%	5.8%	0.54	1.03	0.60	3.73	0.22	1.24	0.90	0.35
	Region Population Percent		2.4%	82.5%	11.2%	1.6%								

Recommendations

- 1. Redefine IT in the JobsOhio West Region as a Keystone Industry not a Driver Industry**
- 2. Gather primary data to understand the discrepancies in the need for industry experience but the seemingly low priority for internships among businesses**
- 3. Gather primary data to get a better understanding on how churn impacts job postings in the IT occupations**

Keystone Industry

By looking at IT occupations as a Keystone Industry, it allows workforce development professionals, economic development leaders, and academia to concentrate on meeting the demand across multiple industries. This shift does not make IT a less critical sector, but provides a more holistic view of IT and the potential for future growth with the region.

This action could bring together leader across industry struggling to fill IT jobs to address the shortfalls in experience and credentials. This also widens the field for young talent to get experience in their trade that many high tech companies are seeking, but may not have the time or resources to provide.

Internships Equals Experience

No one would refute that education alone is needed to fill many of these IT jobs, but to retain promising talent in the region, there must be an entry point to gain industry experience. Placing a high priority on internship than, say out of state recruitment, can build an internal pipeline that is needed.

Robust internship programs exist at the Southwestern Ohio Council for Higher Education (SOHCE). Working with SOCHE to gain more internship opportunities and funding to ensure top talent is recruited should be a high priority. Especially in those IT occupations that are hard to fill and require industry experience. Working with area businesses in other industry to identify IT occupations that could provide an intern with relevant work experience would also be beneficial to all.

New Jobs or Talent Shuffle

The churn in the IT occupations has been well documents by many national sources. Talking to human resources experts at companies in the Top Posting table would provide insight on how many of those postings represent real, unfilled jobs. Additionally, collecting this information can assist in identifying skillsets that are most prone to a talent shuffle among businesses within the region.



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