Executive Summary:
Understanding the IT Skills Gap in Northeast Ohio

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Stark State College

Cuyahoga Community College
Understanding IT Skills Gap in Northeast Ohio

LABOR MARKET DATA ANALYTICS + EMPLOYERS FEEDBACK = STRATEGIC INTELLIGENCE FOR WORKFORCE DEVELOPMENT LEADERS

I. RESEARCH GOALS

The challenge of providing actionable strategic information to quantify the skills gap has always been two-fold:

- Need for a deeper understanding of skills in short supply for occupations in great demand; and,
- A clear path to dissect and quantify sources of job seekers for open positions.

This report takes these challenges head-on.

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Introduction:
Quantifying NE Ohio’s IT Skills Gap

*Labor Market Data Analytics + Employers Feedback = Strategic Intelligence for Workforce Development Leaders*

This project is a collaborative effort of community colleges and industry intermediaries acting as co-funders of this research. The primary purpose of this investigation is to identify opportunities for greater alignment of IT postsecondary education and training as well as determining the need for more responsive delivery models like boot camps. Demand by employers is rapidly changing. IT workers now need the knowledge, skills, and work experiences that employers reveal in online job postings. This report documents the region’s skills gap for IT new hires and includes insights into the need for upskilling of industries current, experienced IT workers.

Shanahan Resources, Inc., was commissioned to document the nature and nuance of current gaps between demand and supply of IT workers in the regional labor market. From similar investigations in regions in other states, consistent findings reveal that while the gap is large:

- Not all IT occupations have a gap, and some have a more intense gap than others. Gap analysis is shown at two levels of education credentials: Bachelors and above, and Associates or other postsecondary credential.

- Not all IT programs (CIPs) are equally effective at preparing students for each IT occupation and career path.

- Using the methodologies developed by Burning Glass Technologies it is possible to determine which occupations are experiencing the most intense gaps and what education and training programs have the best potential to impact the gap.

Funding partners are:

Community Colleges: Cuyahoga Community College; Lorain County Community College; and Stark State College

Industry Intermediaries: ConxusNEO; Magnet; and RITE

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Executive Summary: Understanding the IT Skills Gap in NE Ohio

Based on research findings and early discussions with employers and educators, it is now possible to visualize the IT Skills Gap, how to think about it, measure it, and more clearly consider the power of industry-led initiatives like RITE, ConxusNEO, and others. We now have actionable data needed to improve the alignment of demand and supply in NE Ohio.

Now is the time to strengthen efforts in NE Ohio to deeply engage with employers and the eco-system of talent development interests that are determined to better align workforce development, education, philanthropy, etc. with employer needs for workers.

I. Research Goals

This investigation is the first to comprehensively investigate the role of IT in supporting the northeast Ohio (NE Ohio) economy, past and future. It provides some wide-ranging, yet in-depth, insights based on an equally deep-dive into supply and demand of IT talent in the NE Ohio labor market. It also documents the region’s skills gap for IT new hires, including insight into the need for the upskilling of current, experienced IT workers.

The primary purpose of this investigation is to identify opportunities for greater alignment of IT postsecondary education and training as well as the need for more responsive delivery models like boot camps. Demand by employers is rapidly changing: IT workers now need the knowledge, skills, and work experiences that employers reveal in online job postings.

The challenge of providing actionable strategic information to quantify the skills gap has always been two-fold:

- Need for a deeper understanding of skills in short supply for occupations in great demand; and,
- A clear path to dissect and quantify sources of job seekers for open positions.

Up until now, less attention has been devoted to quantifying supply than demand. Even less attention has been given to acknowledging that skill gaps vary across IT occupations and that a large number of variants in IT education and training programs suggests that not all IT programs are equally effective in preparing students for jobs employers cannot easily fill. The ‘Gap’ has been assumed synonymous with large demand and anecdotal information from employers expressing difficulty in finding enough qualified applicants.

This report takes these challenges head-on.
II. Methodology: An Innovative Approach Using Big Data Analytics

Three major sources of data are used to measure demand and supply: Burning Glass’ Labor/Insights\(^1\) for labor analytics on demand; IPEDs\(^2\) for the most comprehensive source of data on recent completers of post-secondary and vocational education and training; and proprietary data purchased from Burning Glass on postsecondary programs designed to prepare students for career employment in IT matched with detailed data on IT demand by occupation and data-based estimates of the numeric gap between annual job postings and annual completers from college and vocational programs. This calculation is done for each occupation: An AI models is used to compare the learning outcomes of each IT program against several sources of data on skills and knowledge required to perform the occupation well. If there is a strong degree of overlap between student learning outcomes and the occupations skill set then the program identified as one that generally prepares students well to do IT jobs assigned to the occupational title. Each of nearly 40 programs are assessed for each of nearly 40 IT occupations. The result is a much more cross-matching of programs to occupations, and vice versa. Further, this analysis is performed for the two levels of educational attainment—Bachelors or more and Associates or shorter postsecondary program.

Using data purchased from Burning Glass provided a definitive matching of IT programs by Classification of Instructional Program (CIP) where students learn the core skills now required by employers when hiring for each occupation. This level of nuance has not been available before in discussions about poor alignment of supply with what employers need. The result: skills that a developer needs are not the same as for a Network Systems Administrator, for example.

Also, purchased from Burning Glass are the estimates of demand versus supply of workers for each IT occupation. This is based on the number of job openings posted and the supply of recent completers from programs. Combined, these two data analytics document the numeric gaps for NE Ohio.

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\(^{1}\) A direct investigation of jobs employers post online provides a more complete picture of jobs in demand as they emerge and change. Burning Glass identifies employers with high demand for workers and occupations with the most openings and reveals details about employers’ demand for skills and credentials. Burning Glass has compiled a database of over 150 million job listings, updated daily from roughly 40,000 websites nation-wide. The database includes listings from major job boards, newspapers, government agencies, and a broad array of small, medium, and large employers—so long as they are placed online. The sites captured include a strong representation of the small businesses driving economic recovery; 51 percent of sites mined produce 20 or fewer jobs. Most sites are employer sites. Also, Burning Glass leverages patented text mining to code 70-plus data elements to render detailed skills-level intelligence on who is hiring and where, what jobs are in demand, and what skills and credentials employers now require for those jobs.

\(^{2}\) Integrated Postsecondary Education Data System is the primary source for information on U.S. colleges, universities, and technical and vocational institutions. The completion of all IPEDS surveys, in a timely and accurate manner, is mandatory for all institutions that participate in or are applicants for participation in any Federal financial assistance program authorized by Title IV of the Higher Education Act (HEA) of 1965. IPEDS responds to certain of the requirements pursuant to Section 421(a)(1) of the Carl D. Perkins Vocational Education Act. The data related to vocational programs and program completions are collected from postsecondary institutions known to provide occupationally specific vocational education.
These findings and implications formed a single source of hard data that provides a wellspring of information that employers, educators, workforce boards, and regional intermediaries can explore together and create agreement on actions to improve the alignment of demand and supply in the next three to five years.

**Aligning Demand with Potential Sources of Talent Supply**

Quantifying shortages of IT supply to fill open positions is best understood, not by IT occupation alone, but by segmenting job openings by entry-level and mid-level demand. This is more important than the job alone. To break down supply to align with demand, experience of applicants is more important than education.

This starts with understanding more about demand measured by real-time online job postings.

**BREAKING DOWN IT JOB ADS—AT THE POINT OF SOLICITING APPLICANTS, EMPLOYERS USE EDUCATION AND PRIOR WORK EXPERIENCE AS THE TWO BEST INDICATIONS OF APPLICANT QUALIFICATIONS.**

I. In terms of education, employers often include preferences for majors and level of education credentials in job ads.

II. In terms of work experience, most IT job ads seek experienced workers with at least 3 to 5 years of relevant job experience. Over half of all ads are seeking to fill these mid-level jobs—Fifty-nine percent of all Software Developer ads but 51% for all other IT Occupations.

III. Ads to hire workers with 6 or more years of IT experience are senior-level.

IV. Even in IT, 25% of all ads invite applicants with no more than 2 years of relevant work experience. This percentage varies dramatically among IT occupations. From 65% for Computer Support Specialists to 9% of Database Architects.

Four in ten IT ads requiring no more than two years of prior work experience are for either Computer Support Specialists or Software Developer/Engineer. Over 600 entry-level ads are for this developer position alone.
System Analysts ranks third with 262 ads for entry-level, inexperienced applicants.

Likewise, ads vary in terms of education requirements: Bachelors or more versus less than a Bachelors but more than a high school credential. From a low of 9% for Software Developers to a high of 65% for Computer Support Specialist in which employers specify that less than a Bachelor’s degree is the minimum level of educational credential expected from applicants. For IT ads overall, 18% will accept less than a Bachelors.

To quantify the skills gap for IT talent, we must create a research design that dissects IT demand for each IT occupation by level of education credential and prior years of work experience.

“Individuals emerging from IT education and training programs” is the best way to define a pool of potential job seekers with skills acquired through formal education rather than from work experience.

### Supply of IT workers for entry-level jobs

*Entry-level jobs are the best prospects for recent college grads, most of whom will not come with significant prior work experience.*

## III. IT Demand and Supply Equals Measure of Skills Gap by Occupation

We researched the ability of NE Ohio higher education to produce IT grads in the same year as job ads are active (2015).

- A gap exists when breaking down demand and supply by Bachelors or more versus less than Bachelors.
- Separate gap analysis was provided by Burning Glass for IT postings that want a Bachelors or more and those accepting less than a Bachelors.
- A numeric gap in numbers of IT grads to job ads for entry level IT was extremely large. There are 3 to 10 ads for every grad from IT programs, depending on the occupation. A gap exists for occupations if there are at least twice as many job postings as completers emerging from NE OHIO sources of IT education and training during 2015.
At the Bachelors Level:

- Given the number of grads from majors with learning outcomes that generally prepare them for the top ten IT occupations with unmet demand, there is only one grad for every 5.8 postings for entry-level jobs.
- The shortage is even more dramatic for the four occupations: Computer Support Specialists, Software Developer/Engineer, Web Developer, and Database Administrator.
- There were 30 job ads for Software Developer/Engineer positions during 2015 for every grad from an IT Bachelors program with the aim of emphasizing development of software where the primary job duty is design and implementation of software applications. This gap is on the extreme end of the continuum of supply shortage emerging from NE OHIO education and training systems.
- Systems Analyst job postings outnumber completers from matching IT programs by 4 to 1. The severity of the gap is less but important to resolve.
- IT programs differ in nature and prior learning outcomes. The nearly 40 distinct IT programs with varied learning objectives are not equally effective at developing skills employers now need. It depends on the specific needs and how they vary across IT occupations. For example, knowledge and abilities of programming languages and methods and applications are more important for the range of developer occupations than for jobs in networks and computer systems. There are other specific IT programs that emphasize learning how to work in this area.
- The numeric gaps are too large to breach in a few years even if large new investments into postsecondary capacity to enroll and graduate additional supply were made. IT grad numbers have been flat over last five years for NE Ohio.

At the Less Than Bachelors Level:

- The annual grads at Certificate and Associate levels also fall short of demand for entry-level openings. Several IT occupations produced four times as many job ads for applicants as potential job seekers who completed Certificates or Associate degrees from IT programs with learning outcomes aligned with current employer skill needs.
- Computer Support Specialist tops the list yet typically does not require a Bachelor’s degree. Specific programs designed to prepare workers to fill these positions with Certificates or
Associate degrees are not a major emphasis for institutions in the region. Employers like Charter/Spectrum based in Canton cite difficulty recruiting workers to meet their needs.

- While a high school credential is minimally acceptable for many of these job ads, at least a relevant certificate is needed. This could be learned in a high school career academy or subsequently at a postsecondary institution or short-term training program.
- Typically, the other occupations require a Bachelors. Ads for these positions (Software Developer/Engineer, Computer Programmer, and Database Administrator) are small and best addressed at the Bachelors level.
- Equally surprising is that a few IT occupations where employers do accept applicants with less than a Bachelors are being oversupplied with completers from NE Ohio postsecondary system:

There were in total 214 completers from programs that match knowledge and skill requirements of these IT occupations with only an annual number of 50 job ads.

- These programs and completers could potentially be better served by transferring into one of the IT programs where a gap exists. Networking and Computer Systems appears to be an area of IT expertise that is producing more completers than NE Ohio needs based on annual job postings.
V. Deeper understanding of NE Ohio postsecondary completers of IT programs

The distinct mix of education and training providers in NE Ohio is a mix that offers IT programs at every level of completion.

- Public and Private/ non-profit institutions provide the most graduates with Bachelor’s degrees—193 and 156, respectively, in 2015.
- For-profits generally do not offer Bachelors-level programs on any scale.
- It appears that NE Ohio Adult Career and Technical Education providers are not reporting IT program data at the federal level since no data of completions are recorded in any year studied. Fifteen institutions appear in the data reported.

These institutions produced a total of 374 Bachelors grads in 2015.

- Number of completers has been relatively flat over the last few years despite the heightened level of engagement between the higher education system and industry around the need for more IT grads.
- The region’s three public universities produced 193 grads in 2015, followed closely by the array of private institutions, which includes Case-Western that graduated 156. For-profit education in NE Ohio does not focus on four-year programs.

### IT Programs in NE Ohio with the Most Completers

Including all levels of award, NE Ohio produced 1,115 completers in 2015 from IT programs.
By award level, there were 136 Certificates; 473 Associate and 506 Bachelors’ degrees. Obviously, the relative mix of IT Associate vs Bachelors awarded seems disproportionately tilted toward community colleges; universities are under-producing given industry needs for IT professionals with four-year degrees.

The equally large numbers from Computer Science and Systems Analysis may reflect sensitivity to employer preferences. Moreover, the collective outcome for total awards by IT program content is heavily weighted to five program areas. The largest number of completers is for Computer and Information Sciences programs which is the most general preparation of all programs.

However, the dearth of completers from programs focused on Computer Engineering or Security of IT systems helps to explain why Software Developer/Engineer and Network/Information Security Analysts are prominent among the IT occupations with the most intense skills gap.

These data provide insights into opportunities for better alignment of actual IT curriculum with emerging directions of skill and occupational needs of IT employers in the region and creates possible avenues for engaging employers and educators around where and how to achieve a better and improved supply of completers. This discussion is further pursued in the Conclusions and Recommendations section.

### VI. Speculating on NE Ohio’s IT skills gap for mid-level positions

As daunting as the gap is for even entry-level jobs for everything from developers to computer support specialists, there is an equally challenging short-fall cited by employers when trying to fill the mid-level jobs where experience matters. While not an objective of this investigation, we now better understand the nature of demand for these IT workers and the need to assess the potential for the region’s workforce development eco-system to assist industry in addressing skill gaps of those already working in IT.
If soliciting recent grads with the right education is not the best way to find these applicants, where do employers turn to fill jobs for experienced workers?

- The supply of experienced workers with the appropriate educational credentials and evidence of needed skill sets is largely met by those already employed—employers primarily seek to hire from pool of IT workers already employed although for someone else.

- Supply is augmented by the ability of employers to search for workers outside of the region, or outsource to companies out of the region to meet their needs. As one employer put it:

  “If we can't find or grow talent here then we will permanently move jobs out of the region through outsourcing to another company or by setting up captive centers elsewhere, usually offshore”.

Why can’t employers find enough workers within the region’s incumbent IT workforce?

1. If the region’s demand for mid-level IT workers is growing, by definition, employers in total cannot satisfy their hiring needs by simply trading current IT workers. Numerically, the total number of IT employed is fixed.

2. A more likely explanation is the rapid pace of change in information technology that is impacting job duties and skills sets employers now need. Current workers likely will lack some of what now is required and need to be up-skilled before entering the new job with a new or same employer.

3. In response, employers attempt to attract workers with business, engineering, and other occupations to fill IT openings.

On balance, employer opinion is that other methods are necessary if they are to fill critical vacancies.

The second and third explanations are most likely why many employers launch programs to promote from within. At the same time employers that can afford to do so heavily pitch their openings to experienced IT workers elsewhere in Ohio and beyond.

Producing hard data on IT job seekers already in the workforce was well-beyond the scope of this investigation, but employers indicate that these positions are more difficult to fill than entry-level. There is no source of inclusive data on workers already employed and how likely they will apply for positions with other employers posted jobs.

By and large these individuals are not currently enrolled in IT education and training programs to prepare for a career in IT, or even to address IT skills they need to acquire or improve to stay current and advance in their career.
The best we have is information about those employed by occupation or industry. For example, NE Ohio residents now employed as IT professionals present limitations. When considered as the potential pool for filling mid-level IT roles with the skills mix employers want, too few have a Bachelor’s degree. Too few females currently are employed in IT jobs. Most jobs are held by white males relative to persons of color.

Lack of females and persons of color, relative to their overall presence in the workforce likely suggest barriers to entry into IT careers that need breaching if the region’s industry is to make full use of NE Ohio’s current working age population.

Many companies have tired of competing with one another for NE Ohio experienced workers and have increased efforts to promote from within by identifying high performing workers who started in entry level jobs and have created ways to get them additional skills required to succeed in mid-level openings.

VII. Conclusions and Recommendations

The region’s primary infrastructure for improving an existing and emergent workforce are the very entities that make up our education and workforce systems: postsecondary education (colleges and universities, and vocation and technical training); the public workforce system (funded by federal and state resources); economic development organizations; and other major efforts to support talent development that addresses the region’s skill gaps.

Greater alignment and partnership among these regional workforce development partners is vital to hastening the pace to improve workforce quality for the employer.

- Employers look to the region’s higher education system for job seekers emerging from IT programs as graduates. Yet few are confident of their ability to greater impact enrollment growth or program changes. The result is the findings of this research suggest that we may be falling farther behind when it comes to changes in demand for IT professionals to fill entry-level positions.
- Years ago, employers annually made visits to college campuses to search for pending graduates in business, engineering and other programs. For decades, this was an effective way for national and local employers and graduates to connect around hiring opportunities for entry-level
positions. Today, needs to fill mid-level positions, which has already been stressed, are not typically found among those emerging from postsecondary education and training systems.

**Recommendation at Entry-level: Better Alignment of IT Programs and Employer Demand for Entry-level Job Openings**

Again, the numeric gaps overall are daunting. It is as much a matter of lack of capacity to greatly expand numbers of completers by two-, or three-fold, as it is in attracting youth; young adults and transitioning workers into programs that prepare them for IT careers. This is not to imply that addressing the gap is hopeless.

**The real opportunities to improve is to lock in on the IT occupations with the greatest gaps, and work with employers to improve the number of students entering, or adding learning outcomes to, IT majors that best prepare students with the skills and proficiencies now needed.**

There are nearly forty programs with differing orientations to prepare students for IT career employment. Concentrations or specializations vary widely with the broad disciplinary thrusts of Information Science or Management, Computer Science, and Computer Engineering. Based on content, emphasis and purpose, none prepare students for entry-level jobs no matter what the occupation title or area of expertise.

Are all these majors equally effective at developing grads capable of handling the responsibilities of the job—at the entry level?

Example, what major do employers most prefer when hiring entry-level developers? For Systems Analyst? Or, if computer science is still the preferred major, can curriculum and experiential learning be improved to boost learning of systems design and modeling or OOAD theory, or by working closely with engineers and business professionals?

Ongoing discussions with a group of IT leaders from industry can potentially answer questions such as: How do we balance employer preference for training in Computer Science with emerging needs to hire individuals with a more blended skill base?

Pursuit of this approach will require deliberate efforts by employers and educators to work together if they are to define where improvements should be focused and what actions can be taken with maximum benefit to the region.

**Suggestions for a More Targeted Approach:**

We now know that the following IT occupations have large numeric gaps between supply and demand, and that in many cases it is not clear which IT programs best prepare students for these job assignments:

- **Systems Analysts**: In NE Ohio this position ranks third in terms of numeric gap. Specific programs exist in NE Ohio with the primary focus on systems analysis as a core program at every level of completion. Completers at all levels of attainment emerged by the end of 2015: 78 with an
Associates and 55 with a Bachelors. But, there were nearly 300 job postings for Analysts with a Bachelors. Baldwin Wallace and the main campus of Kent State University offer this degree. In 2015, Kent State’s programs produced most of the grads.

Could employers agree on whether a concentration on systems analysis is preferred when hiring new analysts?

Could they work with either institution to quicken the pace of completers from these programs with modifications employers greatly value? Possibly this could be providing opportunities to their students in their other IT majors to acquire more systems analysis in their education, rather than simply rely on efforts to expand enrollment or transfers into the Systems major.

Undoubtedly, this could work best if interested employers are highly engaged with advising the institutions on how best to modify IT programs to improve student knowledge and skills important to hiring of System Analysts and preferably interact with students while in high school, etc.

- **Cyber/Information Security Analysts/Managers**: This occupation ranks fourth in terms of numeric skills gap. Only 35 of the 564 grads with a Bachelors from IT programs were a strong match with the knowledge and abilities employers seek from job seekers. This relatively new occupation accounts for almost all jobs posted where the position has primary responsibility over the security of information and systems for an organization or business. While most postings for this position in NE Ohio are mid-level, requiring 3 to 5 years of prior work experience, there was 197 postings at the entry-level.

Again, how can IT program resources be shifted around to make special areas of expertise (data and system security in this case) in an efficient, yet effective way and raise the number of grads measurably above 35?

There were only 19 grads from a Bachelors program in security in 2015 and those were from ITT and the University of Phoenix. Not a single grad came from any of the public or private universities in NE Ohio.

This finding provides a case for convening a conversation among the universities and potentially employers with the greatest demand for this occupation in an attempt to determine the need and develop ideas on improving this situation. What can be addressed in one to three years?

- **Software Developer/Engineers**: This occupation may present the mostly difficult case to resolve. In 2015. It had by far the largest numeric gap (976 at the entry-level) and the least number of grads (32) from IT programs. Not all IT majors equally prepare students for developer roles; yielding the result that there was one grad for every 30+ postings during the year.

It is not clear which of the nearly 40 IT programs of study are specifically aimed at placing grads into developer positions. The two majors most linked with software developers or engineers are Computer Programming and Software Engineering. Most of the completers of Computer
Programming degrees are at the Associate level, not the Bachelors. Only employers can confirm the preparedness of these grads. Are they likely to be hired if a Bachelors is preferred? Baldwin Wallace has the only Software Engineering program but only three grads from the Bachelors program in 2015. No others exist in the region.

Beyond the rise of new programs specializing in software applications for the web or mobile devices, few new education and training programs are specifically aimed to address this gap facing employers.

Most posts for developers or software engineers are not from firms producing software products and services as their main purpose. Rather these workers are playing a role as a developer where software is a critical element of a larger problem.

The severity of the gap makes a case for convening a group of employers to discuss what might be doable to address this problem.

- **Computer Support Specialist:** Finally, at the Associate level this is the occupation with the single largest gap. Combined, the region’s education and training systems simply are producing too few completers of either Certificates or Associate degrees—Only 90 total in 2015 from majors judged to be strongly prepared for this role. Completers from Computer Support Services programs are provided by the private for-profit technical training organizations, not the community colleges. There are no programs in Computer and Information Sciences and Support Services with grads with Associates degree in 2015.

**Recommendation at Mid-level: New Initiatives Focused on Attacking the Skills Gap for Mid-level IT Workers**

Imagine what is possible if we had a regional approach where employers partner with each other and with higher education to agree on ways to tweak curriculum and the use of fast-track programs to provide workers added skills needed to advance in their careers. This could be through either additional education or work experiences built around shared employer needs.

The future is ripe with opportunities to change behaviors and address employer pain point through collaborative efforts and concrete action.

**PROMOTING FROM WITHIN—DEVELOPING A REGIONAL MODEL**

Just as internships are used to develop a pool of potential applicants for entry-level positions, once hired, these employees can become a potential pool of talent for future mid-level openings within a company. Some employers site efforts to identify workers during their first few years at the company and program talent development opportunities to further prepare them for future openings.

Sometimes the path ahead is within one of the four career orientations—Business Intelligence; Networks and Computer Systems; Development; and Internet Technology and Interactive Media. For example, recent grads are hired into entry-level developer positions and some eventually will be promoted into
more responsible, mid-level developer jobs as they gain skills and experience needed in advanced positions. However, depending on the organization’s need, filling from within for some positions will target individuals originally hired in one of the other three IT areas of career/skill orientation, or even workers from another area of the company. Developers may be developed into Systems Analysts; Financial Analysts are developed into BI Analysts or Managers, or Forensics experts, etc.

Companies also rely on other companies, vendors, or community programs to help provide training and development needed to move these employees along. A recent convening of HR personnel responsible for filling employer needs for IT talent by RITE asked them to discuss with each other how they were meeting needs to fill mid-level positions generally and for software developers specifically.

This is occurring in different ways, using different approaches across the region, especially within larger companies. However, overall success is constrained by the size of company, budgets, and the pool of internal workers that meet the criteria for internal promotion.

While this is routinely occurring in NE Ohio within individual companies, imagine what a program at the regional level might do to further develop entry-level workers for mid-level jobs.

For example, if employers generally experience problems filling mid-level developer job openings, what could be done to address this problem other than what individual employers are doing on their own?

What can industry-led intermediaries do to organize an initiative to build the regional capacity to ‘promote from within’? What efforts that augment and coordinate with what the larger employers already are doing?

By understanding the career paths commonly taken by the region’s IT workers as they move from job to job, employer to employer, or change positions with the same employer, we can gain insights into keeping employers and workers in synch with supply and demand.

Many of the recent initiatives to provide alternative education and training resources and to create more experiential learning opportunities are an effort to respond quickly and specifically to perceived employer needs at the mid-level as well as entry-level shortfall of IT workers in the region.

As important as these are, they are expensive alternatives to the public higher education system which often is faulted as neither responsive or specific in terms of the IT majors and students attracted into their programs.

Not all institutions are interested or positioned to play such a new role, but should not be left out of conversations that shape early efforts to determine what is possible in solving the mid-level skills gap in IT.

After all, there are many accelerated degree programs for mid-level professional and technical workers in other disciplines.
The largest number of postings in the region is for mid-level Software Developers. These positions mask the diverse range of roles and assignments employers have for these workers. They vary by industry and over time as the problems posed to developers become more specialized and complex.

**Attracting Experienced IT Professionals Back to NE Ohio**

Another regional strategy being discussed in NE Ohio is a program directed at IT workers living elsewhere in the nation who were raised in the region. Targeting of IT professionals living outside Ohio but which are early to mid-career and who would be receptive to returning to NE Ohio and family. Connecting employers with these individuals as they recruit outside the region might expand the pool of applicants for mid-level jobs to some extent. The upside potential to lessen the gap is hard to estimate.

**Recommendation for Further Research**

Proper validation and further perspectives and labor market insights can best be achieved by conducting a survey across the region of a representative cross-section of IT employers. The survey content should be structured around the findings, implications and recommendations addressed in this summary and technical report.
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Understanding the IT Skills Gap in Northeast Ohio

SHANAHAN RESOURCES, INC.