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Double Duty: Career Tool for Job Seekers, Labor Supply Tool for Economic Developers

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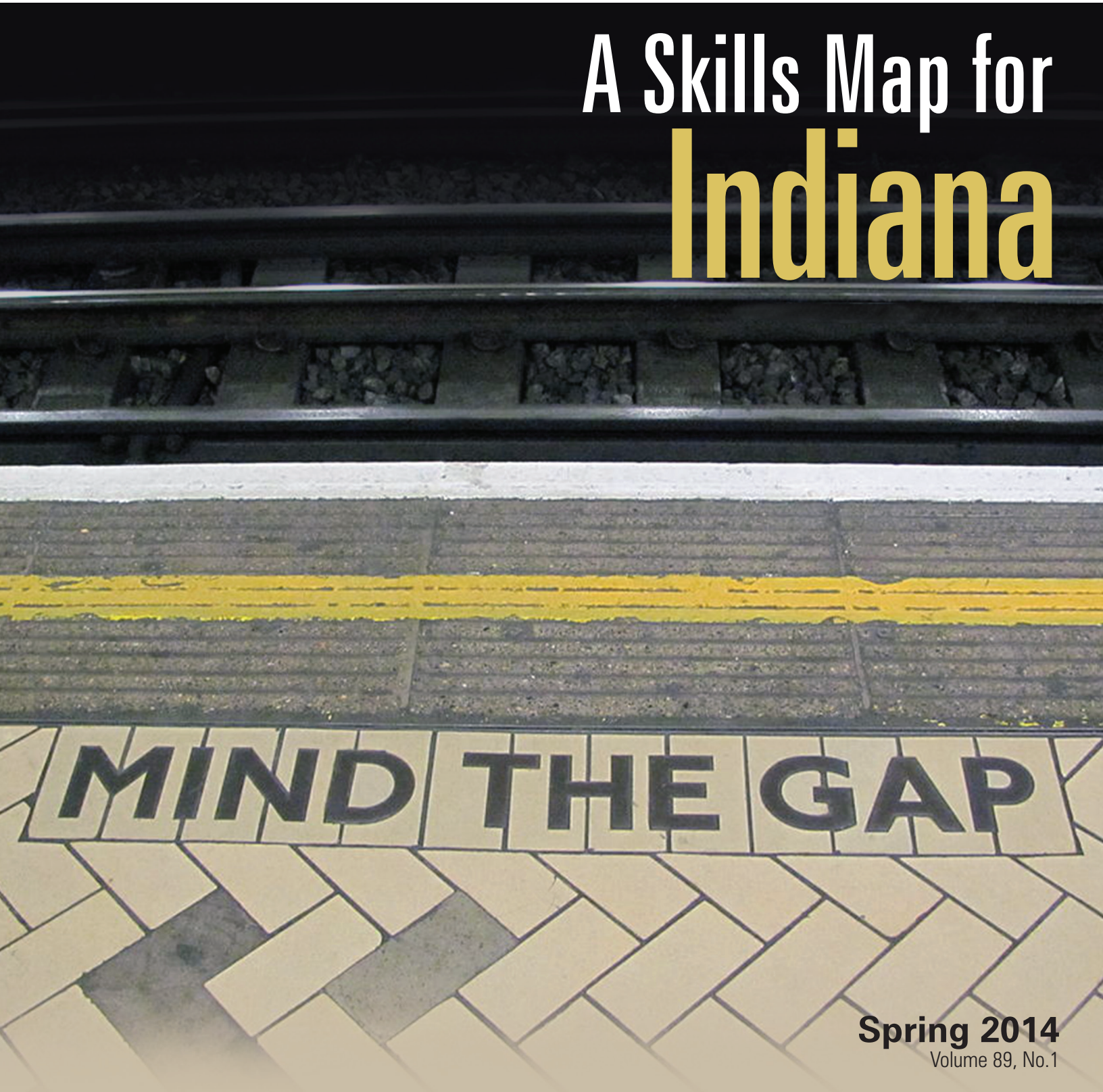
INDIANA BUSINESS REVIEW

A Skills Map for Indiana



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From the Editor

What do employers want? Renaissance workers: folks who are skilled at many things and master of them all. They want Leonardo's and Michelangelo's—and no, not the teenage mutant versions, but the ones who, during the European Renaissance, were architect, painter, sculptor, poet and engineer all in one body. The 15th and 16th centuries were a time of rapid change, of new technologies—think paper and printing presses with exchangeable type invented by another Renaissance worker, Gutenberg. They were living in a time where the rapid dissemination of knowledge increased and great shifts occurred in the locations of money and power.

Fast forward to the 21st century and marvel at the technological advances, across all sectors of our economic lives, that have transformed how we work and what we do. Today's employers want workers with ready-to-use skill sets who can also adapt to rapid change. Indiana is seeking to transform its education and career policies and systems to meet the challenge of creating a new breed of Renaissance workers. This issue of the *Indiana Business Review* contributes to the grand discussions throughout our state regarding how we can create the modern-day worker.

A Skills Map for Indiana

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Since the end of the Great Recession, firms have increasingly cited the presence of a skills gap as a key factor in the sluggish hiring levels. A 2013 survey found that 39 percent of U.S. businesses cited difficulties in finding qualified talent.[1] This mismatch forces job seekers to search longer to find work and leaves vacant positions open longer because it is harder for employers to find qualified applicants.[2]

The problem seems especially acute in manufacturing, where advanced techniques are dramatically increasing the demand for postsecondary skills in addition to experience.[3] The Georgetown Center for Education and Workforce estimates that of the 55 million projected new U.S. jobs between 2010 and 2020, two-thirds will likely require at least some postsecondary education—with more than half of these (middle-skill jobs) requiring workers with an associate degree or postsecondary vocational certificate.[4]

In Indiana, of the nearly 1.1 million job vacancies projected for the current decade, 60 percent will require some postsecondary education, with 38 percent requiring an associate degree or more.[5] The Alliance for Science and Technology Research in America (ASTRA) reported that Indiana will have demand for 123,000 STEM-related jobs by 2018, and the National Skills Coalition projects Indiana to have a total of 550,000 middle-skill job openings by 2020 (half of all openings).

Complaints about Indiana's skills mismatch tend to come from the state's prominent industry clusters, especially advanced manufacturing and health care. These are key drivers of the Indiana economy, along with life sciences, defense and aerospace, logistics, and energy. In these high value-added clusters, the occupational skill requirements are notably different than in many other sectors, and they change more rapidly.

Manufacturers recruiting STEM workers have noted a significant shortage of technicians and skilled workers to implement the new technologies that are necessary to stay competitive in their fields. For example, with increased automation and innovation, skilled workers such as maintenance engineers are needed to operate and fix the machines.[6] A 2005 American Association of Manufacturers survey found that 35 percent of manufacturers expected a shortage of scientists and engineers, but twice as many anticipated a shortage of skilled production workers—primarily middle-skill workers.[7]

Similarly, hospital administrators report increasing reliance on technical specialties. The pressure to operate more efficiently in an environment of declining reimbursements forces hospitals and other health care facilities to focus more on technology-based procedures, in both patient care and administration, to improve financial performance.[8]

These technical skills, termed "hard" skills, are just one piece of the puzzle, however; employers are also looking for "soft" skills—abilities in areas such as communication, problem solving, professionalism, interpersonal interaction, work flexibility and adaptability, as well as overall work ethic, attitude and reliability. In fact, among manufacturing firms, the most serious skills deficiencies were ranked as inadequate problem-solving skills, followed by a lack of basic technical/vocational training, with inadequate basic employability skills in third place.[9]

> *The ideal employee would be a "renaissance technician" with well-developed critical thinking and problem-solving skills.*

The ideal employee would be a "renaissance technician" with well-developed critical thinking and problem-solving skills, strong familiarity with several technical disciplines (developed in an applications framework) and the decision-making skills to optimize production in a complex industrial environment.[10]

Slightly more than half of the employers responding to a 2013 workforce skills survey indicated that additional job training or continuing education would benefit most of their workers.[11] Another 18 percent said it would benefit half of their workers. However, many businesses lack intensive in-house training programs and would like to have academic institutions fill the knowledge gap.

For example, life science firms would like academic institutions to develop post-baccalaureate curricula geared toward industry-specific topics. High priority topics include FDA regulations (including good manufacturing practices, good laboratory practices and quality

assurance), project management, an overview of the pharmaceutical and medical device industries, and the U.S. health care delivery system.

Job Training: From On-the-Job to In-the-Classroom

On-the-job training has gradually been replaced by formal education programs over the past 30 years.[12] To stay afloat during challenging economic times, many firms have focused on productivity and adopted lean business practices—which eliminated many on-the-job training programs. Businesses now prefer to hire a new employee who's able to hit the ground running, possessing a usable skill set and needing only light on-the-job training to get up to speed. They are no longer willing or able to mold non-skilled workers into skilled workers (especially in mass numbers), which translates into more demand for workers with higher levels of educational attainment.[13]

Interestingly, the perceived presence and severity of a skills gap depends on a firm's willingness and ability to train its prospective workforce. An example from a report by the Boston Consulting Group on the U.S. manufacturing sector aptly illustrates the point:

> *"Say that two companies are having difficulty recruiting a pipe welder. Company A is a large industrial conglomerate, has training infrastructure, and works with a community college to develop curricula. Company A says it does not perceive a skills shortage because it can "build" a pipe welder by training a high school graduate or by hiring through its partnership with the community college. Company B, by contrast, is a small automotive supplier that lacks the resources for training programs. It says that there is a skills shortage because its available options may be more limited. If it does not have a relationship with the community college or an established apprenticeship program, the most likely way for Company B to hire a pipe welder is to compete for one by offering high pay."*[14]

Thus, much of the burden of closing the skills gap has shifted to the (mostly public) educational system.

Recommendations

To address the skills gap challenge, studies point toward multi-pronged approaches. Some focus on students in the K-12 education system, while others seek to increase retention and completion rates for postsecondary education. Other approaches focus on adults with no postsecondary credential: those with some post-high-school education who never completed a degree, as well as helping adults with no postsecondary education to earn at least a high-quality certificate.[15] And finally and inevitably, affordability of post secondary education is a critical need.

1. Developing a More Holistic K-12 Approach

A more holistic approach to K-12 education is needed to equip young adults with the broad range of skills required to succeed in the 21st century economy. Numerous studies have observed that today's young adults are weak in oral and written communications, critical thinking, problem-solving and creativity, and professionalism skills.

A focus on college readiness alone does not equip young people with all of the skills and abilities they will need in the workplace or to successfully transition into adulthood. Therefore, the current education reform movement should broaden significantly, adopting a "post-high-school credential for all" goal while reincorporating career-focused learning, historically known as vocational programs. This goal should not be limited to only a bachelor's or higher degree. Rather, it should embrace the completion of certificates and associate degrees—the bare minimum a student should obtain before entering the workforce.

> *"The bottom line is that many high school and college students do not see a clear link between their coursework and a career path they can build a future on."*

The bottom line is that many high school and college students do not see a clear link between their coursework and a career path they can build a future on. Indiana needs more early emphasis on career options and defining explicit pathways that can equip young people to reach their goals.

The college readiness pathway would be the current curriculum with the inclusion of Core 40 classes in a career and technical education (CTE) format. The career readiness pathway could be the CTE program, allowing students to pick a career cluster of interest and including applications or work-based learning experiences. Courses in the CTE pathway should also allow students to fulfill the Common Core standards and Core 40 coursework. Students and their parents would be given the option of which pathway will be their primary pursuit at the end of the 10th grade, following two years of career

guidance and participation in CTE courses within the career cluster of interest.

An example from the FutureWorks report may help illustrate how this career readiness pathway could work. At the end of the 10th grade, students could be given the option to enroll into a CTE program in their field of interest. This could be a three-year program. In the first two years, students complete their high school requirements and earn a diploma; in the third year they complete a high-quality, industry-recognized credential from a community college that can flow directly into an associate degree program or a career-oriented job with advancement opportunities.

During the CTE program, students should receive career counseling, job shadowing and opportunities to work on projects or problems designed by industry partners. Likewise, each CTE program should be designed in collaboration with industry leaders and have opportunities for more intensive work-based learning, such as internships. As the student moves into the postsecondary portion of the CTE program, the college should continue to expand on the previously learned skills and knowledge, with input from industry leaders and trade associations. They should also provide structured part-time employment opportunities linked to the student's program of study.

A prototype of this type of program is the engineering cooperative education program at Purdue University; however, it would be scaled appropriately for certificate-level students. Upon earning a certificate, the knowledge and skills earned should allow a graduate to enter the workforce or have enough postsecondary credits to easily transition into an associate degree program if desired.

Another variation of a three-year CTE program could entail a partnership with a polytechnical institute at a four-year institution. The institute would be based in an appropriate school or college at the institution (e.g., School of Business, College of Agriculture) and have a rigorous, multi-disciplinary, three-year curriculum that would lead to a polytechnical degree. Here a student would apply for admission at the end of their sophomore or junior year of high school. The sending school could finance the first year of study and award the high school diploma at the completion of year one.

The student could then be eligible for an Early Graduation Scholarship or for other special financial support for the student's next two years at the polytechnical institute. Students would be in cohorts of 20-25 individuals and move through a very structured program with a block schedule and fixed course sequences (like their high school experience). At the time of admission, students would know their three-year schedule and competency expectations. Completion of the program would then yield a unique degree—e.g., Associate of Polytechnical Sciences—which would allow the graduate to either enter the workforce or continue education toward a bachelor's degree in polytechnical sciences or another technical degree program.

The use of CTE programs to equip students for the workforce is gaining traction among states. Unfortunately, CTE programs around the nation do not have a universal approach. Recently, Indiana revised its CTE programs to create pathways to career clusters with several ending with the option to obtain certificates.

Indiana's K-12 CTE program has much untapped potential and could be a great tool to bridge the skills gap; however, identifying successful approaches to enrolling and retaining students in the program is needed. In fact, the Indiana Works Councils recently announced the availability of $4.3 million in grant funding for Innovative Career and Technical Education Curriculum—to foster and scale the most innovative and effective CTE curriculum models in the state. There is also a CTE Awareness grant initiative underway to help the regional Works Councils fund CTE awareness. Both of these grants will be helpful in propelling CTE as an attractive educational program within Indiana.

> *"Overall, the U.S. now has the highest college-dropout rate in the industrialized world."*

2. Retaining Postsecondary Students

Addressing the needs of current postsecondary enrollees and the adult workforce likely requires less radical change than the K-12 educational system. Approximately 70 percent of American high school graduates now go to college within two years of graduating; yet, by their mid-twenties, only four out of 10 adults have obtained either an associate or bachelor's degree, while roughly 10 percent have earned a certificate.

Overall, the U.S. now has the highest college-dropout rate in the industrialized world. Students drop out of college for many reasons, including under-preparation for the required coursework, financial pressures, and the competing demands of family or jobs. A major reason, however, is that too many do not see a clear, transparent connection between their program of study and tangible opportunities in the labor market.[16] In addition, a

growing number of these students no longer attend college in traditional ways; thus, innovative approaches are needed to retain students and help them to complete degrees.

Lumina Foundation strongly advocates a student-centered higher education system with multiple approaches. It recommends taking advantage of the proliferation of competency-based models[17] and open courseware to create new pathways to degrees, expanding the availability of prior learning assessments and other innovative approaches to accelerate progress toward degrees. These approaches could help colleges serve many more students and also appeal to adult learners who return to complete their degrees.

3. Adult Learners: Helping Them Succeed

When developing programs aimed at adult learners, colleges should expect returning students to require a strong dose of remediation. Tying in remediation with coursework—rather than as separate courses—may be one promising approach to this issue. Indiana's Ivy Tech Community College has created a College for Working Adults that utilizes these innovative recommendations; however, the program could be expanded to more areas of study and more locations for adult learners to participate.

Through a Shifting Gears grant from the Joyce Foundation, Ivy Tech developed five pilots that contextualized basic-skills instruction within occupational programs to help students gain the academic foundation needed to move from initial technical certificates to more advanced ones and then into degree programs.[18] This was an innovative approach to reaching adult learners and Ivy Tech did experience higher completion and persistence rates. However, it required one-on-one interaction between staff and at-risk students, and the contextualization of basic skills required significant time, effort and collaboration between developmental educators, career and technical faculty, and workforce partners. Ivy Tech has indicated that increased funding would be needed to continue this effort.[19]

Another recommendation in this vein: improve Associate of Applied Sciences (AAS) programs that allow graduates to easily matriculate into bachelor's degree programs with a similar applied learning format, retaining credits obtained en route to the higher degree. The program would focus on technical program areas, addressing skills and knowledge needed in the workplace rather than liberal arts. Thus, the distinguishing characteristic would be learning in an applications context—not the traditional academic framework. It is envisioned that this program would be designed for seamless transfer from the AAS degree that was once considered "terminal" and non-transferrable. If designed correctly, such programs could be natural extensions of the CTE programs mentioned earlier—maintaining the applied learning format while enhancing knowledge and skill levels.

4. Improving Affordability

Reviewed studies presented several policy recommendations to make higher education more affordable, as well as make technical education more enticing to students. One option would be to expand eligibility for financial aid for sub-baccalaureate degrees and part-time students, and expand upon federal on-the-job training assistance program opportunities.

Another option would be to establish and support statewide Lifelong Learning Account programs.[20] These programs would allow workers to set aside funds via payroll withholding for continuing education—matched by their employer—to be redeemed at a college or university to offset the expenditures associated with higher education.[21] Incentives designed to increase the appeal of technical education could be designed in a way to link public and private sectors in support of technical education and attainment, engage postsecondary institutions, and reflect regional needs by being state-led but locally administered.

"Since employers desire workers with the right technical skills who can be productive without a steep learning curve, the education system shoulders an immense burden in tackling the skills gap."

Conclusion

Indiana is not alone in its transformation into a knowledge economy, one that is less reliant on low-skill workers.[22] Since employers desire workers with the right technical skills who can be productive without a steep learning curve, the education system shoulders an immense burden in tackling the skills gap.

The K-12 system needs to strengthen vocational education by creating a system of career-focused pathways spanning the last two years of high school and at least one

year of postsecondary education or training that leads to an industry-recognized credential. These career pathways need to be firmly linked to community colleges and four-year, career-oriented majors. Many other countries place far more emphasis on vocational training than the United States; likewise, they have superior postsecondary attainment rates due to more diverse, robust pathways to careers and practical-minded postsecondary options than the U.S.[23]

However, in order to truly make these approaches effective, employers will need to become full partners in the effort to prepare young adults and displaced workers for success. Expected roles for businesses would include assistance in program development and implementation, such as setting standards, designing the programs of study, advising young people and providing expanded opportunities for work-based learning.[24]

Employer involvement could be expanded more robustly to the college level, where business leaders could serve as adjunct professors or even become close collaborators in developing courses to train students on skills needed in the workforce. Even if employers may not have the funds to provide intensive on-the-job training, they could help shape the future workforce by collaborating closely with the education community. The Indiana Career Council and the Indiana Works Councils, which began their work in 2013, include in their missions greater involvement by the business community. More on those efforts can be found at www.in.gov/icc/ and www.in.gov/irwc/.

Notes

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Double Duty: Career Tool for Job Seekers, Labor Supply Tool for Economic Developers

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A new career pathway tool is available on the Hoosiers by the Numbers labor market information website (www.hoosierdata.in.gov). Called the Virtual Career Counselor (VCC), it is an interactive tool that allows users—a job-seeker or a workforce career counselor, for example—to estimate the needed preparation time to transition from one occupation to another.

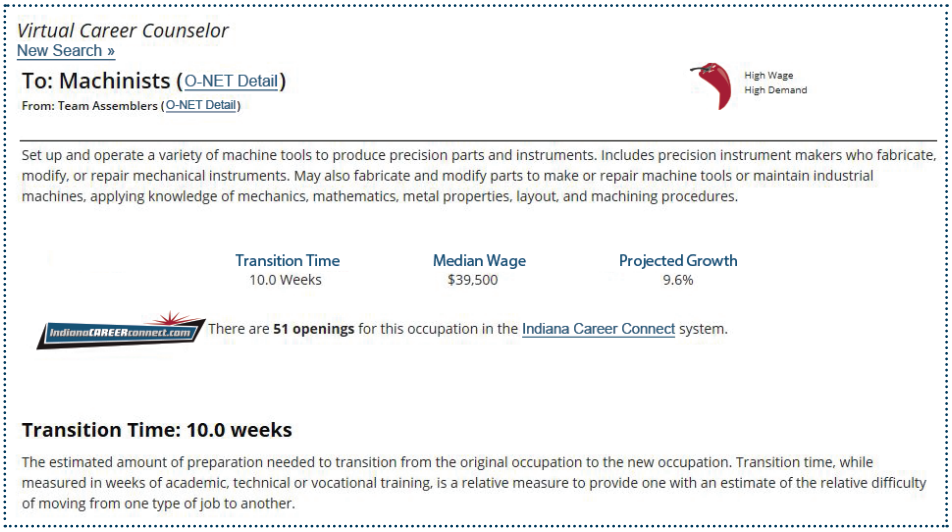
The preparation time—measured in weeks of academic, technical or vocational training—is a relative measure estimating the ease or difficulty of moving from one type of job to another.

This article goes beyond the job seeker's perspective, however, to show how these data can be used in the economic development community to determine how difficult it would be to close a region's skills gap for an occupation or a category of occupations relative to a benchmark region.

The database underlying the VCC reports the knowledge, skills and training required for each of the approximately 800 standardized occupations classified by the federal government. The calculations compare the similarity of education, skills and training between occupations and estimate the additional amount of education or training one would need to move from one occupation to another.

In other words, the VCC addresses the questions of how long and how difficult the transition will be from an "originating" occupation to a "destination" occupation (see **Figure 1**). The algorithm estimates the gap or distance based on the knowledge, skills and training requirements for each occupation (the "from" and the "to").[1]

Figure 1: From Team Assembler to Machinist using the Virtual Career Counselor



Source: Hoosiers by the Numbers

The goal of the Indiana Business Research Center (IBRC) and Department of Workforce Development (DWD) team was to boil down the complex components of an occupation's knowledge and skill requirements. To move from one occupation to another, a worker in transition would likely need additional training, education or even an apprenticeship. Those take time. So, the team compared the knowledge, skills and training (KST) for an originating occupation and a destination occupation. The differences in the two KSTs were distilled down to one dimension: time. This time dimension can inform a worker's decision about which destination occupation would fit with his or her time and financial resources.

Put another way, time is the dimension on which to measure a skills gap, the length of the journey to move from occupation A to occupation B. There are many other considerations, of course. A path that means paying large sums for tuition would not be feasible for many. Many would rule out a path requiring in-residence course work far away from home. But transition time can represent the difference between working in one occupation and migrating to another.

The team followed other models that also use time as the primary gap-closing measure. O*NET, for example, surveys incumbent workers to determine, among many things, the level of proficiency necessary for a wide range of worker and job characteristics and the educational and training time it would take for an individual to become proficient at a particular job. O*NET rates each

proficiency level; the research team estimated the extent to which each proficiency level requires more time in terms of education and training.

The researchers found that as one moved through the O*NET proficiency levels, the estimated time required to complete each increased substantially with each step. The difference in training to move from Level 1 to Level 2, for example, was less than a week—notably less than the gap between a Level 5 and a Level 6, which was an average of 7 weeks. The O*NET scale, therefore, was not linear.

The research team sought to simplify the methodology, and making the measurements simple came at the cost of some precision. For example, the estimated time required for education and training were made consistent across different mechanisms for knowledge or skills development—academic, vocational or apprenticeships. An hour in a college classroom is different from an hour in a vocational training laboratory, but both represent a time investment by the worker and are expressed in the transition-time calculation.

It is important to stress that the time measure indicates the relative ease or difficulty of moving from one occupation to another, and one might consider the time measure to be "on average." After all, the time to complete a class or training may be dependent on when a course starts or if the training is conducted on a compressed time schedule. There is no accounting for "intensive training."

The team also adjusted the O*NET time dimension based on the fact that gaining skills and training in one knowledge area enhances one's skills in another knowledge area. One might call this "overlap" in educational pursuit. Students often gain knowledge and skills in tandem; not all knowledge is gained sequentially. For example, as one pursues education in physics, he also develops knowledge in the highly correlated knowledge area of mathematics as well. As one learns to operate specialized machines, she is also gaining experience in instruments and monitoring production processes. In other words, the body of coursework or training is not necessarily sequential or additive. Analysts added only the non-overlapping portions of additional training time to derive the transition time.

In order to cross-check the transition-time estimates, the team also compared the transition-time results with the O*NET job zone framework. O*NET groups occupations into job zones based on their required levels of formal education, experience and on-the-job training. In all, there are five zones, with Zone 1 occupations requiring little or no preparation and Zone 5 occupations needing extensive preparation. Generally speaking, moving up a job zone will require more time than stepping down to a lower job zone.

Examples from the Virtual Career Counselor

The Virtual Career Counselor on the Hoosiers by the Numbers website is applicable to all occupations and puts the transition-time research into practice.

A displaced worker would likely entertain several options before committing to an educational or re-training program. Some workers may prefer transitions with the shortest transition time in order to adopt new career opportunities as quickly as possible.

For example, the most common job among automotive workers is team assembler. If a team assembler was interested in a higher-wage/higher-demand job, he or she could transition to a hazardous materials removal worker with approximately eight weeks of training time. He or she could transition to an insulation worker with only five weeks of training time.

Production helper is another auto-sector occupation in decline. On average, these workers can make relatively fast transitions to construction laborers.

Transition Time and Labor Shed Analysis

The transition-time method is groundbreaking because it compresses all of the differences between occupations into a common numéraire, namely the preparation or re-training time it would take to change jobs. It is alleged that the American labor force is suffering from a "skills gap," or a mismatch between the knowledge, skills and training (KST) of the labor supply and the KST demanded by firms. In the main, the skills gap is a knowledge or human capital gap and, as described above, the transition time measures that gap. In other words, the transition-time framework embodies all of the occupational dimensions of a job ranging from knowledge content to problem solving to the ability to work as a team member.

The IBRC analysts applied the KST information for each occupation (used by the transition-time framework) to measure the relative concentration of KSTs in a region in much the same way that a location quotient (LQ) measures the relative concentration of industry or occupations in a region. One might say that this analysis presents LQs in terms of how difficult it would be to close a region's KST gap for an occupation or a category of occupations, at least relative to a benchmark region or the nation as a whole.

Data Sources and Method

The occupation data for the regional Indiana analysis were pulled from the Hoosier by the Numbers

"Regional Labor Mix" (RLM) tool. The RLM presents county-level data on industry employment by detailed NAICS industry as well as occupation counts by detailed occupation titles for the state (with the proviso that the total employment for all counties presented must exceed 25,000). The transition-time estimates for moving from one occupation to another are also available on the Hoosier by the Numbers website. The KST data used to estimate transition time were taken from the national database of occupation characteristics compiled by O*NET.

An occupation's KST level is the average of all the transition times for all occupations moving to a target destination occupation. For example, the KST level for a dishwasher is very low while the KST for a neurosurgeon is quite high. The KST value for any occupation is constant; it does not vary according to whether a region is in Indiana or elsewhere in the nation. The occupation skills gap, or KST gap, was calculated by multiplying the percent of the region's workforce associated with an occupation by the occupation's KST level. The KST gap is, therefore, a concentration measure of the deficit or surplus of a region's KST for an occupation or category of occupations. The KST gap for a region can be compared to another peer region, the state or the nation as a whole.

Applying the KST Gap to North Central and Central Indiana

The KST gap provides a measure of the level of difficulty to build a region's KST for an industry that uses certain critical occupations. In the following example, the KST gaps were calculated for the North Central Indiana region of Cass, Clinton, Fulton, Howard, Miami and Tipton counties and the Indianapolis-Carmel Metropolitan Statistical Area (MSA). Because occupations are "counted" in the county where the firm operates—that is, occupation by industry—the actual number of any particular occupation within the boundaries of a region depends on the extent of commuting from areas outside the region under study. For example, the North Central region registers a fairly high concentration of engineers, but they may live in Lafayette or in Carmel.

The KST analysis has both strengths and weaknesses. The method and data can provide a quick assessment of which occupations, and their associated KST sets, will be more difficult for a region to develop or "sell" to a prospective firm interested in establishing a new business location. The measure cannot identify specific skills—for example, complex problem solving or C++ programming capabilities—that may be strengths or weaknesses in a region. The measure also does not take into consideration the persistence of the KST concentration. A region may have a super-endowment of CNC machinists, but they may be close to retirement. Average worker age is not (at least not yet) taken into account.

The inconsistency of SOC codes used to classify occupations has caused some issues because of time-lags in application of revisions to actual data publication. These inconsistencies play out in another caveat: one can only compare occupations, and occupation codes, for which data are collected. If data are collected and reported using different classification vintages, it makes it a challenge to ensure that 100 percent of a category of occupations—for example, health care practitioners—in the study region consist of the same occupations in a peer region.

The good news for Indiana Regional Labor Mix customers is that the IBRC has a consistent set of occupations for any one year and IBRC occupation estimates are more comprehensive, occupational-mix-speaking, than many of the Bureau of Labor Statistics (BLS) data products for smaller regions. The IBRC occupation estimates are a hybrid of national staffing patterns—which means there is a more diverse and comprehensive array of occupations for any geographical boundary—and BLS/DWD regional Occupational Employment Statistics (OES) estimates that provide regional characteristics of the local industry staffing patterns. The end result is a set of industry staffing patterns that were sketched-out using national estimates and refined by regional characteristics.

Finally, many O*NET occupation characteristics, as in the skills needed for an occupation, cannot be changed by legislative fiat. Necessary skills like "life skills" may or may not be amendable to changes in public school curriculum or community

Occupational Clusters: A Brief Excursus

In 2009, the IBRC and the Purdue Center for Regional Development (PCRD) published papers on innovation, occupation and industry clusters and created a website to provide data on how these data and concepts are important for economic development practitioners. The PCRD defined "knowledge-based clusters" based on the relative level and importance of knowledge for an occupation–knowledge being a critical element for innovation-based economic growth. In 2014, the IBRC updated the knowledge-based clusters (to conform to new O*NET vintages of occupation definitions) and extended this analysis to include what is here called "skill-based clusters" of occupations. The new IBRC occupation clusters cover the waterfront, with all occupations included. The 34 new clusters are used in this analysis and available in the appendix at www.ibrc.indiana.edu/ibr/2014/spring/appendix.html.

college programs of study. This raises the question: What is a skill? Is a skill a subject in school? Are skills inculcated by a family? Are skills developed by social interactions during club soccer? Can reasonable people agree on a definition?

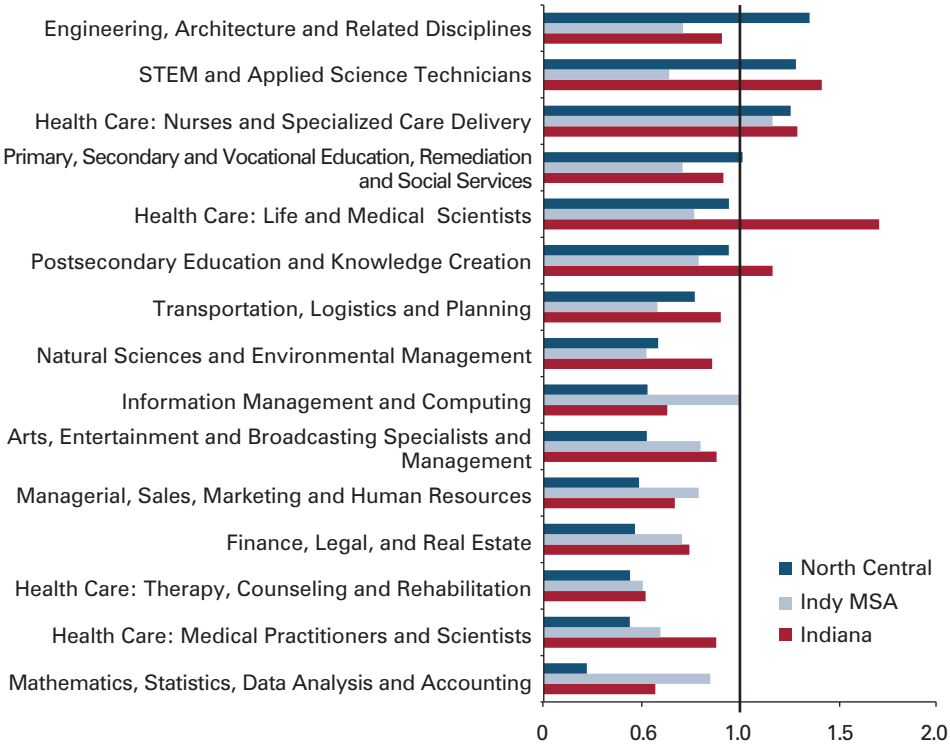
All this to say, many workforce "skill" measurements are lacking. In several studies about the so-called skills gap,[2] managers pointed to life skills as the most important determinant in hiring. This would jibe with the authors' conversations with businesses and employers around the state about the most critical skills employers need: workers that show up on time and can pass a drug test.

After all those provisos and caveats, it may be a wonder that the reader has not "changed the channel." But consider the power of one simple measure to assess the level of difficulty to build a region's knowledge, skills and training for any particular application. The method and data can provide a quick assessment of which occupations, and their associated KST sets, will be more difficult for a region to develop or "sell" to a prospective firm interested in establishing a new business location.

The example below, using the six-county region of North Central Indiana, shows the difference between a region's labor concentration using standard LQs and that of the KST concentration using the new IBRC occupation cluster definitions. **Figure 2** presents standard LQs with knowledge-based occupations. **Figure 3** presents standard LQs with skill-based occupations.

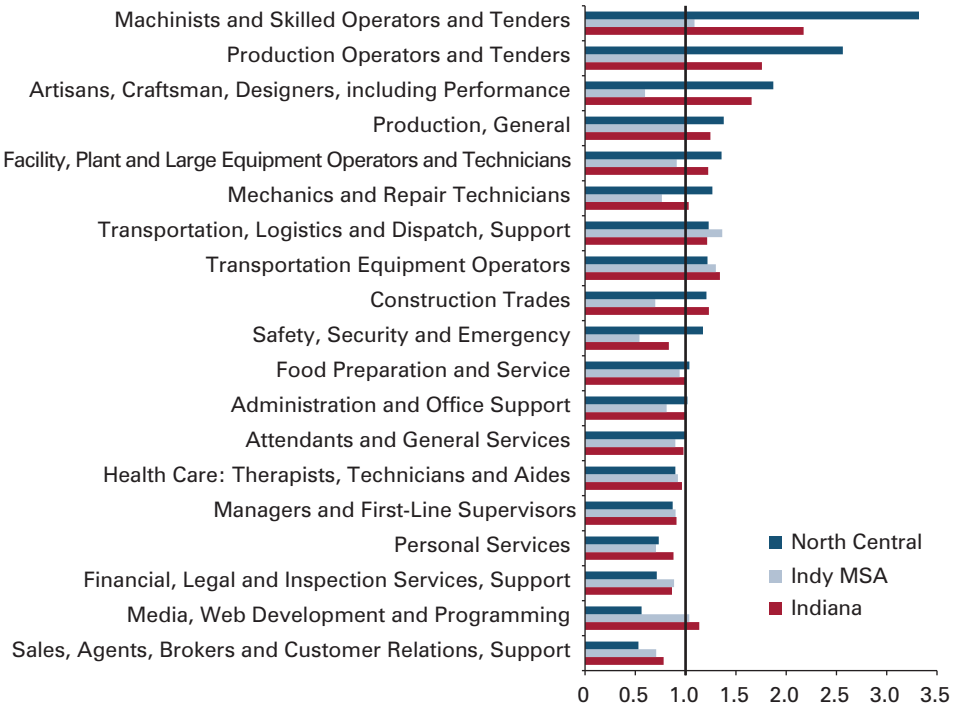
Figures 2 and **3** show that the region has particular strengths in engineering as well as STEM and applied technology on the knowledge-based side of the ledger, complementing the machinists and other production occupations that are also in abundance in the region.

FIGURE 2: North Central Indiana Location Quotients for Knowledge-Based Occupations, 2012



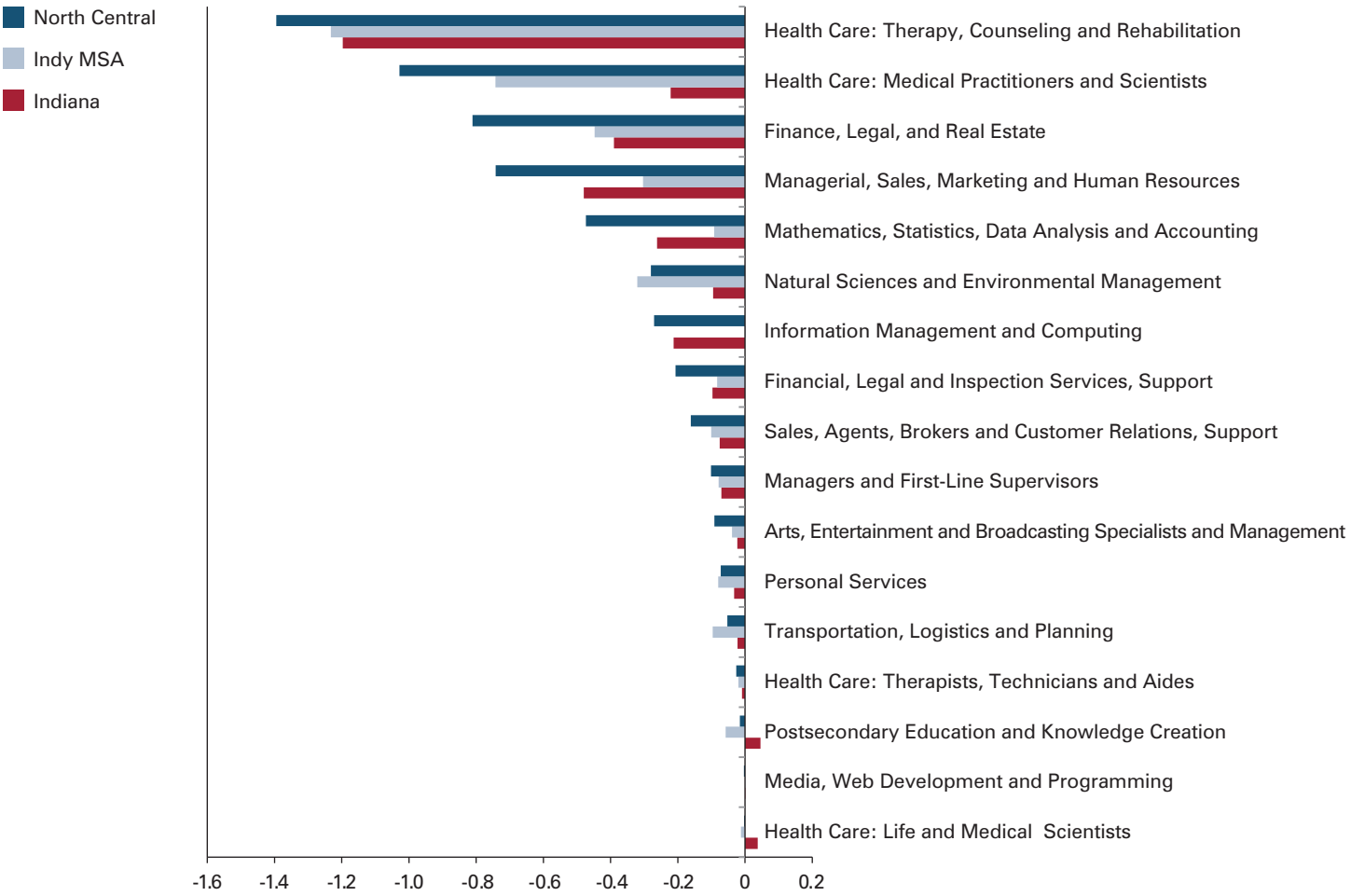
Note: An LQ of 1 shows an employment concentration equal to the nation. Clusters are sorted based on the North Central LQ.
Source: IBRC estimates using Quarterly Survey of Employment and Wages and Occupation Employment Survey data from the BLS

FIGURE 3: North Central Indiana Location Quotients for Skill-Based Occupations, 2012



Note: An LQ of 1 shows an employment concentration equal to the nation. Clusters are sorted based on the North Central LQ.
Source: IBRC estimates using Quarterly Survey of Employment and Wages and Occupation Employment Survey data from the BLS

FIGURE 4: Largest Negative KST Concentration Quotients for North Central Indiana, 2012



Source: IBRC estimates using Quarterly Survey of Employment and Wages and Occupation Employment Survey data from the BLS

Figure 4 presents the KST concentration quotient. That is, it adjusts the standard LQ by the level of difficulty associated with transitioning to a cluster of occupations that require greater levels of knowledge and skills. Five occupation clusters are in relatively low concentration in North Central Indiana:

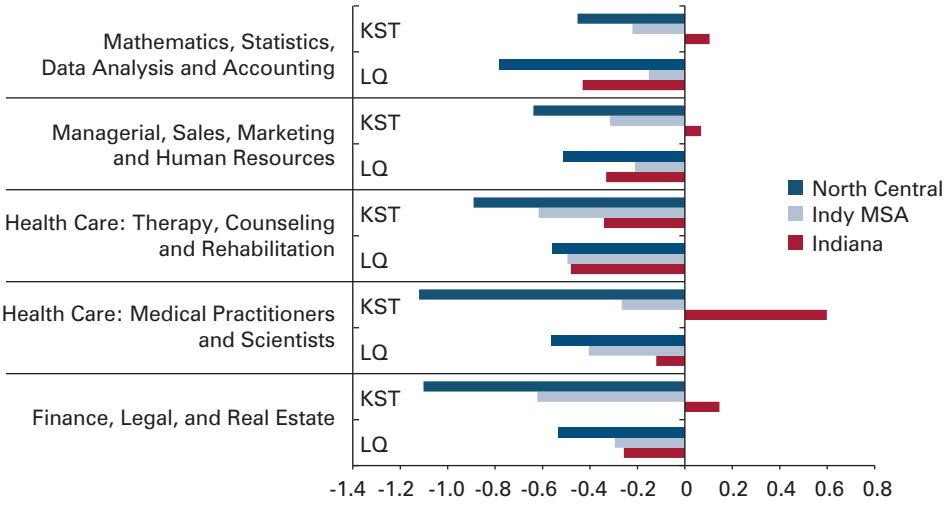
- Health Care—Medical Practitioners and Scientists
- Finance, Legal, and Real Estate
- Health Care—Therapy, Counseling and Rehabilitation
- Managerial, Sales, Marketing and Human Resources
- Mathematics, Statistics, Data Analysis and Accounting

Figure 5 compares the standard vs. KST approaches for this trimmed-down set of occupation clusters more directly. The bar chart shows that with the exception of the mathematics, statistics, data analysis and accounting cluster, the KST concentrations indicate that closing the human capital gap in the North Central region will be more difficult than the standard LQ analysis. (It also shows that it would be difficult for the region "to poach" these occupations from the Indianapolis MSA.)

Aggregating occupations (or industries) is one thing, but as with most analysis, the devil abides in the detailed occupations. The left-hand set of three columns

> *The KST concentrations indicate that closing the human capital gap in the North Central region will be more difficult than the standard LQ analysis.*

FIGURE 5: North Central Indiana Low Concentration Occupation Clusters, Comparing Standard LQ and KST Concentration Results, 2012



Source: IBRC estimates using Quarterly Survey of Employment and Wages and Occupation Employment Survey data from the BLS

in **Table 1** presents the location quotients for the occupations in the region with particularly low concentrations compared to the Indianapolis-Carmel MSA, the state of Indiana and the nation (which equals 1). One might immediately note that chemists and computer systems analysts in the region, compared to the Indy MSA, have a particularly low concentration.

The right-hand set of columns in **Table 1** show the KST concentrations of the three regions.[3] It shows that some occupations are more of a challenge to develop than others. In the region, computer systems analysts are in relatively low concentration, but the human capital gap for them is greater than for word processors or telemarketers. Policy makers in the region would do well to be concerned about the human capital gap as it relates to physicians and surgeons and civil engineers since these occupations may be a constraint to growth.

Figure 6 presents these data graphically. The standard LQs in **Figure 6** show the region to be relatively low in concentration for physicians, computer systems analysts, civil engineers and market research analysts. The KST framework helps to begin the conversations of "how do we close the gaps" by adding a measure of difficulty. Word processers are easy to develop; analysts are not.

Given that occupations of a complementary set, or of a particular nature, can be of importance for an economic developer either interested in wooing a new firm into the neighborhood or looking into the future to determine whether his or her region is ready for economic growth or industrial expansion, understanding the human capital constraints is of paramount importance. The KST framework is a step closer to an easy-to-understand measure for an economic development practitioner to know his or her region.

Conclusion

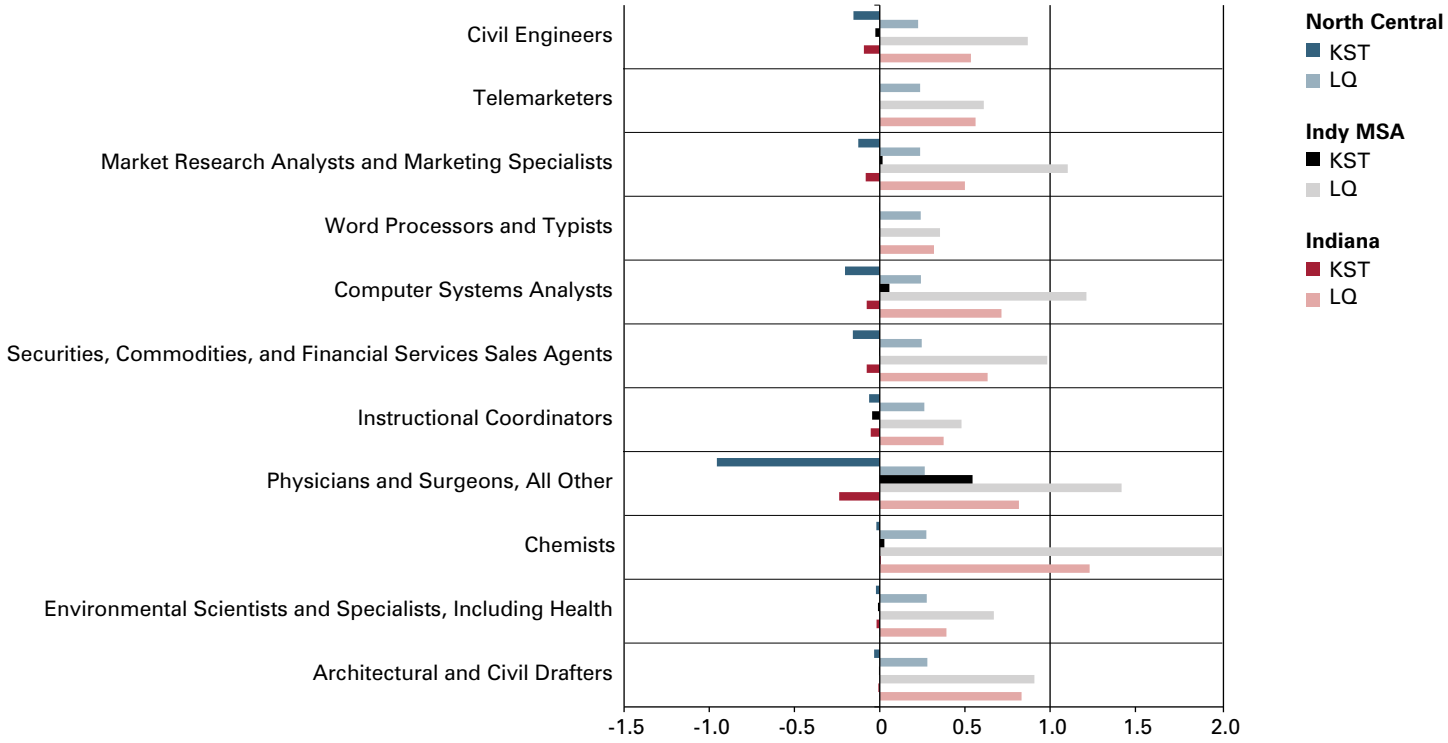
Hoosier economic development practitioners, as well as job seekers looking to transition to new occupations, have a couple of new tools. The Virtual Career Counselor

TABLE 1: Standard LQ vs. KST Concentration for Occupations in the North Central Indiana Region, 2012

Occupation Title	Location Quotient			KST Concentration		
	North Central	Indy MSA	Indiana	North Central	Indy MSA	Indiana
Architectural and Civil Drafters	0.28	0.91	0.83	-0.03	-0.00	-0.01
Environmental Scientists and Specialists, Including Health	0.28	0.67	0.39	-0.02	-0.01	-0.02
Chemists	0.27	2.01	1.23	-0.02	0.03	0.01
Physicians and Surgeons, All Other	0.26	1.42	0.82	-0.95	0.54	-0.24
Instructional Coordinators	0.26	0.48	0.37	-0.06	-0.04	-0.05
Securities, Commodities, and Financial Services Sales Agents	0.25	0.98	0.63	-0.16	-0.00	-0.08
Computer Systems Analysts	0.24	1.21	0.71	-0.20	0.06	-0.08
Word Processors and Typists	0.24	0.35	0.32	-0.00	-0.00	-0.00
Market Research Analysts and Marketing Specialists	0.24	1.10	0.50	-0.13	0.02	-0.08
Telemarketers	0.24	0.61	0.56	-0.00	-0.00	-0.00
Civil Engineers	0.23	0.87	0.53	-0.15	-0.03	-0.09

Note: Highlighted cells indicate the most challenging KST gaps to close.
Source: IBRC estimates using Quarterly Survey of Employment and Wages and Occupation Employment Survey data from the BLS

FIGURE 6: Comparison of Standard LQs and KST Concentrations for Occupations in the North Central Indiana Region, 2012



Source: IBRC estimates using Quarterly Survey of Employment and Wages and Occupation Employment Survey data from the BLS

distills all of the complex elements of an occupation into one measure that can be used to determine the level of relative difficulty one would have moving to another occupation. While other career counseling resources are important, and one should be cautious about planning one's life around just one "transition-time" measure (this is why there are many skills and career tests to more precisely measure aptitude), having one way to easily reduce the set of options has great appeal.

Economic development practitioners can also use these data, at least indirectly. By combining the standard location quotient of occupational concentration with the transition time, one produces a metric that shows the relative difficulty associated with closing the human capital gap. The knowledge, skills and training gap can be, therefore, a useful measure to sell a region's human capital strengths, a signal to warn about possible human capital deficiencies, and a point of departure for conversations about curriculum development and a region's strategic plan. ■

Notes

1. Note that the analysts used "KST" for knowledge, skills and training instead of the often used "KSA" for knowledge, skills and abilities because the analysis did not find that "abilities" differentiated between occupations in a meaningful way.
2. See "Boiling Point? The Skills Gap in U.S. Manufacturing" by Deloitte on behalf of the Manufacturing Institute (2011) at http://ow.ly/uguKG. The top three "serious skill deficiencies" (Figure 9, page 8) were "inadequate problem-solving skills," followed by "lack of basic technical training" and "inadequate basic employability skills (attendance, timeliness, work ethic, etc.)" The latter skill type, often called life skills, out-polled computer and math skills.
3. A note to the reader: this analysis was conducted using the beta version of the Hoosiers by the Numbers website and data. For explanatory purposes, the beta version is fine, but note that by the time this article releases, the data will be improved and finalized.

An appendix is available at www.ibrc.indiana.edu/ibr/2014/spring/appendix.html.