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It's About the Match:

Labor Market Demand and the Supply of Talent in Indiana

November 28, 2018

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INTRODUCTION

In March 2018, Indiana reported a remarkably low statewide unemployment rate of 3.2 percent, the lowest unemployment rate since 1976. Although the rate contains considerable geographic and demographic variations, it suggests overall that economic growth is strong, job openings are plentiful, and the labor force has significant opportunities to move into rewarding careers. Yet, how closely does the supply of talent in the labor force, including incumbent workers and those upcoming from Indiana’s educational institutions, align with employer talent needs?

This report describes current labor market demand in Indiana and the current supply of talent entering the labor market from Indiana’s postsecondary institutions. The demand for talent is projected to grow substantially over the next decade, while the composition of that demand is changing. Jobs and occupations that require postsecondary credentials are increasing more rapidly than those that do not. Here, the key characteristics of the supply of talent from 80 Indiana colleges and universities, public and private, are described. This analysis of demand and supply is considered within the context of current and future labor force demographics.

The relationship between growing demand for talent and the adequacy of the supply of talent has gotten a lot of attention in Indiana as the needs for skilled employees increases. Much of the discussion of alignment between talent demand and supply focuses on the scale of job opportunities and quantity of graduates, from relevant fields of study, to fill them. Greater alignment means that the right number of graduates in the right fields are available to meet anticipated employment demand and job growth. The analysis presented here suggests that, while quantitative alignment is desirable, it will be a challenge to achieve.

Throughout this analysis, we construct a different view of the relationship between talent demand and supply. The demand for talent and the supply are shaped by other factors in addition to quantities of jobs and numbers of graduates. Specifically, demand is also informed by the skills requirements of job functions; supply is also informed by the skills and attributes, in addition to credentials, that are necessary to function successfully in jobs. Increasingly, employers seek to match a set of skills and attributes that define job requirements to the skills and abilities of candidates. A critical aspect of our view of alignment is the need to incorporate skills and qualifications (which we call competencies) that inform characteristics of demand and characteristics of supply. Instead of a quantitative approach to alignment, we identify a need for better and more accurate matching between the skills and characteristics that compose demand for talent with the skills and characteristics that candidates possess. Our views on this are largely shaped by observing what employers are doing to more precisely identify the skills and competencies they need.

Employers in Indiana are increasingly attempting to maximize their success in hiring the right talent through an in-depth analysis of skills and qualities required for the jobs. Through job and organizational profiling, as well as more advanced assessment technologies, employers have greater ability to identify the combinations of technical and other skills needed to successfully function in specific jobs. In other words, employers are fine-tuning their ability to reliably identify the competencies and skills they are looking for. Recent advances in technology-based tools—data analytics—are enabling them to do this with greater confidence. Some of the analytical tools now used in talent acquisition correlate the identification of skills and qualities in the workforce to business outcomes.

There continues to be misalignment between employer job requirements and the ways educational institutions document qualifications of their graduates. Employers report that, while generally satisfied with the technical skills taught in Indiana’s post-secondary institutions, it is often difficult to assess what competencies students have obtained that will help them function in work environments.¹ Students’ perceptions of the skills they gain in college are often different than the perceptions of employers.²





Degrees and credentials are, therefore, limited proxies for a more comprehensive picture of talent.

As such, matching talent supply with demand is more complex than simply matching the numbers of graduates to jobs. Achieving labor market alignment will become more feasible with an emphasis on mapping skills and talents directly to job and career requirements. Developing greater accuracy in matching characteristics of demand to supply will clarify strategies—both programs and public policy—that will maximize outcomes in the labor market for Indiana employers and graduates.

A more comprehensive understanding of the demand for talent, shared between employers and educators, will help shape programs and better inform employers about the development of skills and competencies they want to bring into their organizations. This approach to matching supply with demand can create a more efficient entry into the labor market for Indiana graduates and give Indiana employers opportunities for greater access to Indiana college and university graduates. Indiana can better match talent supply to demand through strategies aimed at enhancing connectivity between Indiana employers and graduates.

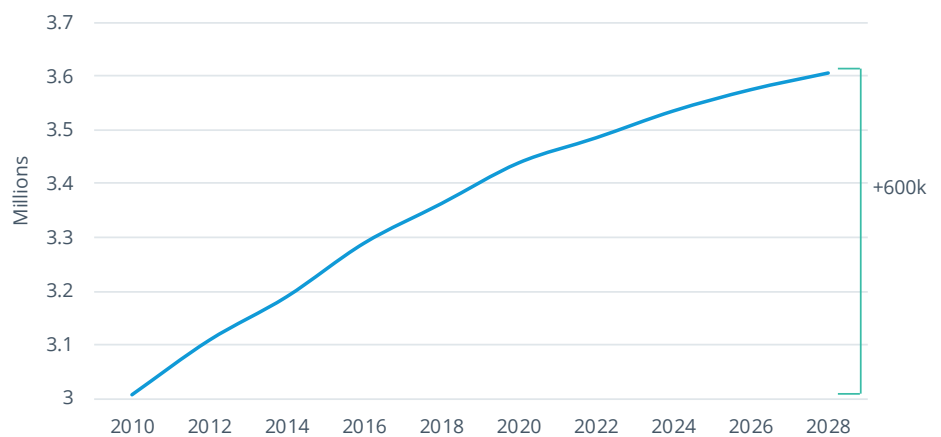
TALENT DEMAND IN INDIANA'S LABOR MARKET

Since recovering from the last recession, Indiana's employment is expected to grow by 20 percent through 2028 to include over 3.6 million total jobs, including 600 thousand new jobs (Chart 1). Robust growth has led to a low unemployment rate in the state and sustained demand for additional talent in the labor force.

Between 2017 and 2028, this increased demand for talent is projected to continue, adding nearly 300 thousand net new jobs in Indiana (Chart 1A). The strong growth curve of the recovery years will continue through the next decade, suggesting that the increased demand for talent will also persist. Yet, while these charts show the whole economy in a state of growth and adding substantial numbers of jobs, there is considerable change occurring among occupations and the requirements for entry into those new jobs. An especially important change is the increasing importance of postsecondary education credentials.

CHART 1: INDIANA AGGREGATE JOB GROWTH, ALL OCCUPATIONS, ACTUAL AND PROJECTED

2010-2028



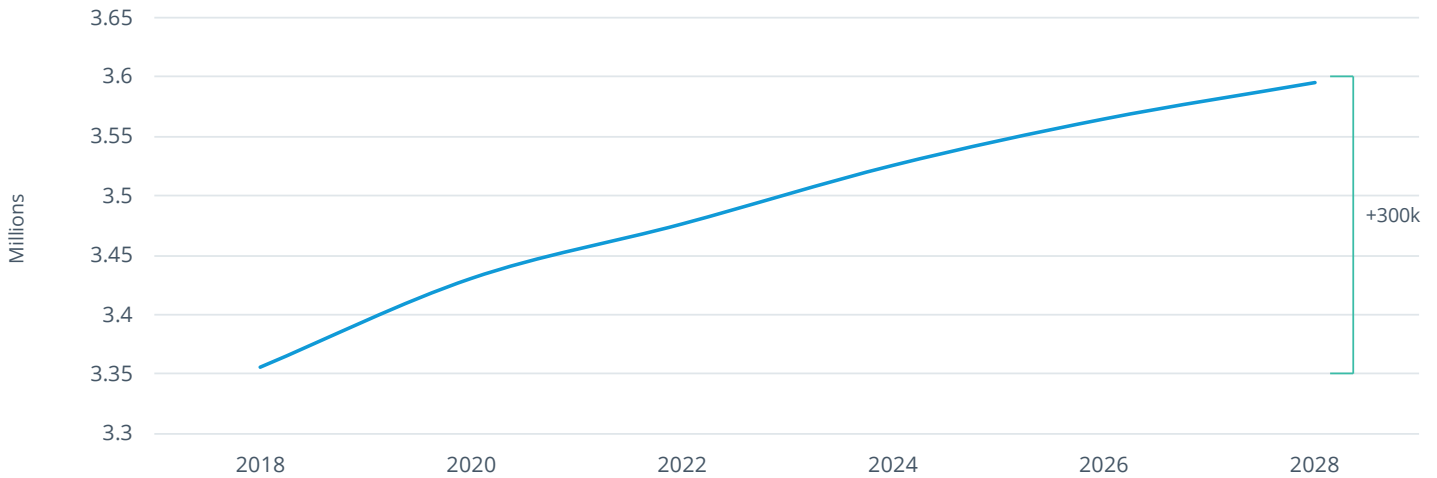
Source: EMSI, BLS, Indiana DWD.

1 See for example the discussion of Indiana employer hiring practices and relationships with educational institutions in Ascend Indiana, Hiring the Right Talent: Understanding Where Employability Skills Fit, Indianapolis, January 2018

2 Hart Research Associates. Falling Short? College Learning and Career Success. Association of American Colleges and Universities. January 2015.

3 For simplicity's sake we do not describe the job openings generated by the growth of jobs shown in these charts. However, job openings have a significant impact on the overall demand for talent at any given time. The term job openings is used throughout to identify both new jobs (due to net new growth in the economy) and replacement jobs that are created when workers retire or leave an occupation. We follow the BLS's methodology, recently adopted, to estimate job openings. A large proportion of job openings are replacement jobs. Job openings describe an approximation of the total numbers of jobs available to be filled by new employees moving into those positions.

CHART 1A: INDIANA AGGREGATE JOB GROWTH, ALL OCCUPATION, PROJECTED
2018-2028

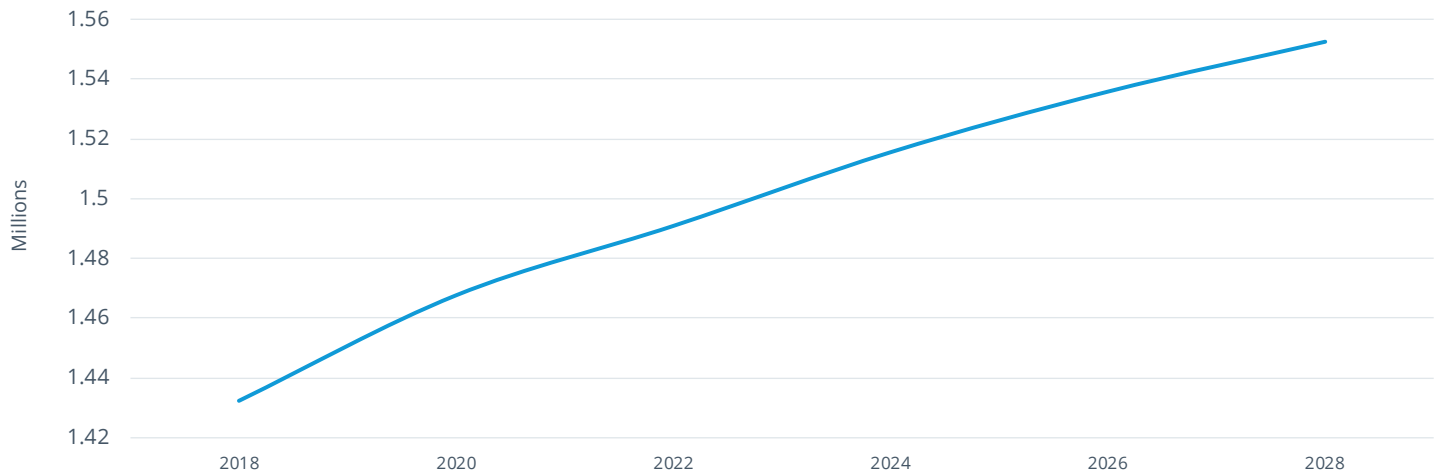


Source: EMSI, BLS QCEW, 2017 – 2018 Occupations

Job Growth and Projected Job Openings Requiring Postsecondary Education

The projected 300 thousand net new jobs vary widely in their education requirements for entry-level positions. However, as Chart 2 shows, half of these new jobs will require a postsecondary credential as an entry-level requirement. Although the projected increase in jobs requiring postsecondary education is not as high as other estimates, most studies are consistent in showing a rising level of education requirements in Indiana.⁴

CHART 2: INDIANA PROJECTED AGGREGATE GROWTH IN JOBS REQUIRING POST SECONDARY EDUCATION
2018-2028

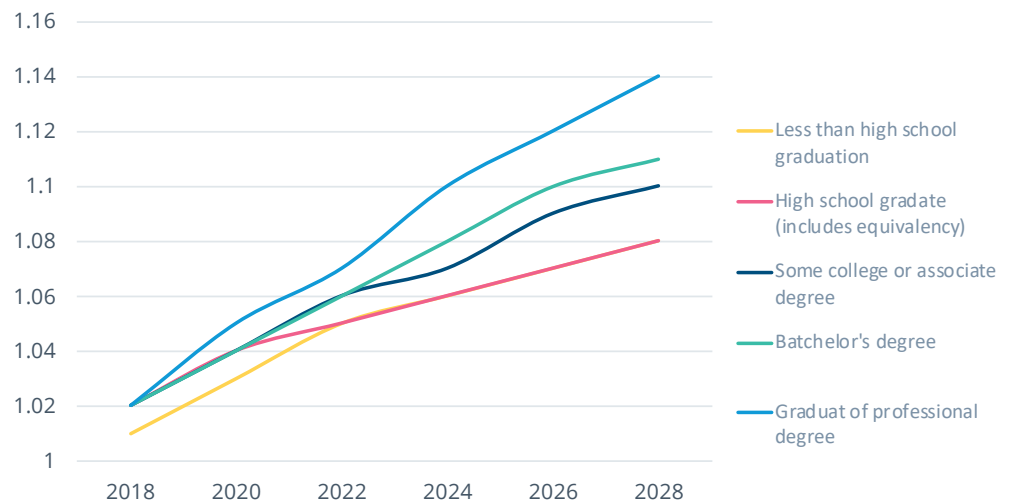


Source: EMSI, BLS, Indiana DWD

⁴ See for example: Georgetown Center on Education and the Workforce, *Recovery: Job Growth and Education Requirements through 2020*. Georgetown Public Policy Institute. Washington, DC, June 2013.

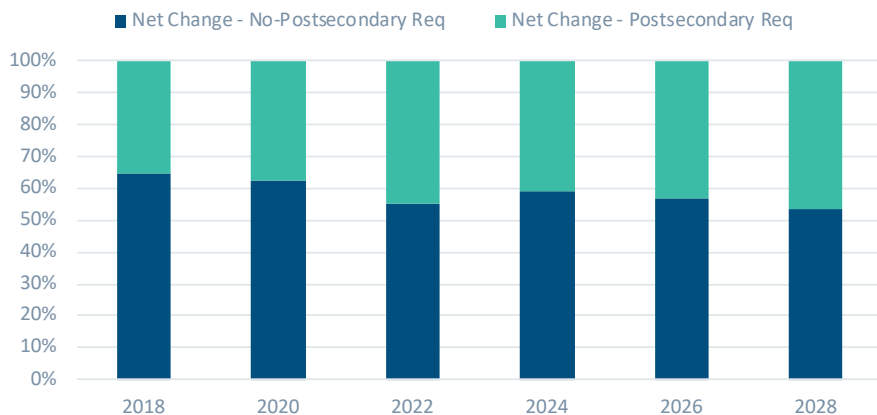
The rate and scale of growth within occupations also varies. Jobs and job growth in occupations that require postsecondary education are increasing at faster rates than those that do not require a postsecondary degree or certificate. This trend toward increasing postsecondary education requirements becomes more pronounced when job growth is viewed in terms of more detailed education credential requirements. Chart 3, indexed to 2017, shows a widening distance between the increases in jobs that do not require postsecondary education as an entry-level requirement and jobs that do require postsecondary credentials or some college, such as certificates. The slope of growth for bachelor's and Master's Degrees are especially steep compared to increases in jobs requiring a high school degree or less. In general, the higher the educational requirements, the steeper the rate of growth.

CHART 3: GROWTH IN JOBS BY LEVEL OF EDUCATION REQUIRED
2018-2028



Source: EMSI, BLS QCEW, 2017-2028 Occupations.

CHART 4: INDIANA PROJECTED JOB GROWTH BY ENTRY LEVEL EDUCATION REQUIREMENT, NET CHANGE
2018-2028



Source: EMSI, BLS QCEW, 2018-2028 Occupations (2022 appears to be an anomaly)

Finally, Chart 4 summarizes the cumulative impact of these projected trends within Indiana's economy. This chart shows the proportions of projected job increases, over the entire economy, that require postsecondary education between 2018 and 2028, compared to those that do not. Jobs that do not require postsecondary education are a significant component of the economy and will remain important. However, the chart also shows that as new jobs are created in Indiana, a steadily increasing proportion will be jobs that require a postsecondary credential as an entry level requirement.

Contours of the Demand for Talent: Job Growth Across Occupations, Industries and Early Careers

Additional detail below examines the characteristics of projected job growth and demand in the labor market to provide a more nuanced understanding of the aggregate demand described above. Through this lens, segmentation and, in some cases, fragmentation of aggregate demand can be seen across occupations and industries. These characteristics have a significant impact on the ability to operationalize alignment between talent supply and demand.

Occupations and Growth: Table 1 provides an overview of the projected change between 2017 and 2028 for jobs in occupational groups that require postsecondary education credentials as an entry-level requirement. The table displays occupational groups with substantial increases in openings requiring postsecondary education. While these occupations comprise the aggregate data shown in Chart 2, they also considerable variation in total growth, the rate of growth, and annual openings.⁵ Not surprisingly, healthcare-related occupations have one of the highest projected increases between 2018-2028, expecting 44,500 new jobs for Healthcare Practitioners and Healthcare Support occupations. The smaller occupational group of Computer and Mathematical occupations is also expected to experience more than 20% job growth in this time period.

Over 300 different occupations (based on SOC codes) are represented in the occupational groups shown in Table 1, ranging from registered nurses to accountants to mechanical engineers to programmers. Each group (and each specific occupation) has a different projected growth rate and projected total change in job growth. This illustration of variation in occupation growth offers a reminder that the demand curve for talent can be very specific. That specificity in rates of growth and total growth make conclusions about the relationship between talent demand and the flow of qualified candidates subject to qualification and makes alignment across groups challenging to achieve.

TABLE 1: SELECTED OCCUPATIONAL GROUPS. GROWTH IN JOBS WITH POSTSECONDARY EDUCATION REQUIREMENTS, AND ANNUAL OPENINGS
2017-2018

Occupations	2017 Jobs	2028 Jobs	2017-2028 % Change	2017-2028 Openings	Annual Openings
Office and Administrative Support	149,928	159,349	6.3%	200,172	16,681
Management	157,496	170,657	8.4%	153,718	12,810
Healthcare Practitioners and Technical	190,749	221,758	16.3%	152,135	12,678
Business and Financial Operations	122,560	137,071	11.8%	142,563	11,880
Production	101,866	106,601	4.6%	128,562	10,713
Healthcare Support	64,771	78,294	20.9%	101,501	8,458
Sales and Related	76,081	84,752	11.4%	101,318	8,443
Computer and Mathematical	61,606	74,297	20.6%	62,172	5,181
Installation, Maintenance, and Repair	41,223	44,131	7.1%	48,368	4,031
Architecture and Engineering	48,474	52,463	8.2%	43,955	3,663

Distributions of Occupations Among Industries: While the occupational groups above tell one story, people within the same occupational groups will often work in different industries and in different jobs. Thus, there are often unique skill requirements within occupational groups, such as the specific technical requirements for programmers in advanced manufacturing compared to programmers in an information

⁵ See footnote 3 for a discussion of the differences between net job growth and job openings.

technology firm. We can impute variation in skill requirements by examining distributions of occupations across different industries. To simplify the task of describing the relationships between occupations and industries, we focus on three large occupational groups in healthcare, information technology, and business and finance associated with Indiana industry sectors. The industry sectors associated with these occupations are also representative of the group of important sectors identified by the Indiana Sector Partnership Initiative⁶ led by the Indiana Department of Workforce Development. The occupations within the three groups were selected as high-demand occupations typical of those in the sectors and which require postsecondary credentials as an entry-level requirement.

The three charts to the right offer comparisons between occupational groups and their distributions across industries. The healthcare occupational group of Registered Nurses, Nurse Practitioners, and Physician Assistants (a group of nearly 75,000 in 2018) is highly concentrated in healthcare facilities (Chart 5). The other two groups shown in Charts 6 and 7 are distributed much more widely across different industries. For example, although about 40 percent of IT professionals (Bachelor’s degree and above) work in the scientific and technical industry sector, including technology and IT companies, the remaining 60 percent are spread across several other industries. Therefore, more IT professionals work in hospitals, manufacturing firms, or other sectors than in IT-focused firms. Those in business and finance occupations are also spread across industries, with an especially strong concentration in manufacturing. Thus, within the same occupational group, the technical skill requirements—and thus labor market demand—will have considerable variation. These kinds of distributions of occupations have a significant impact on demand for talent.

Early Career Occupations and Growth: Many analyses of talent demand and supply treat the labor market as monolithic, assuming jobs in an occupation or field have a uniform skill set and require similar credentials and degrees. However, in practice, the labor market is segmented along several dimensions. One additional dimension is experience level: not all jobs are equally accessible to recent graduates from Indiana’s colleges and universities. Some jobs within the same occupation will require years of experience, while others do not, creating two relatively distinct labor market segments.

CHART 5: REGISTERED NURSES, NURSE PRACTITIONERS AND PHYSICIANS ASSISTANTS OCCUPATION GROUP JOBS IN INDUSTRIES
INDIANA 2018

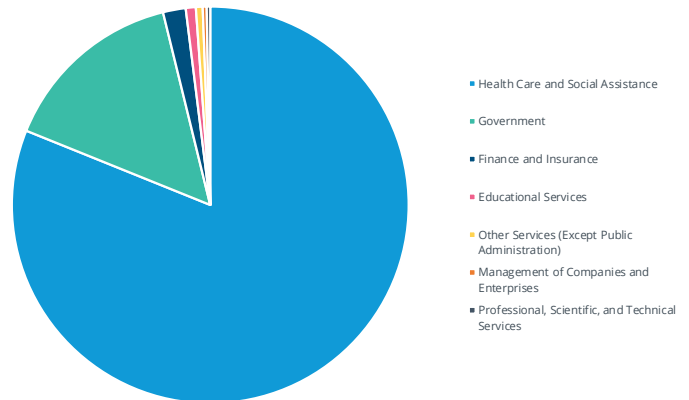


CHART 6: IT PROFESSIONALS OCCUPATION GROUP JOBS IN TOP INDUSTRIES
INDIANA 2018

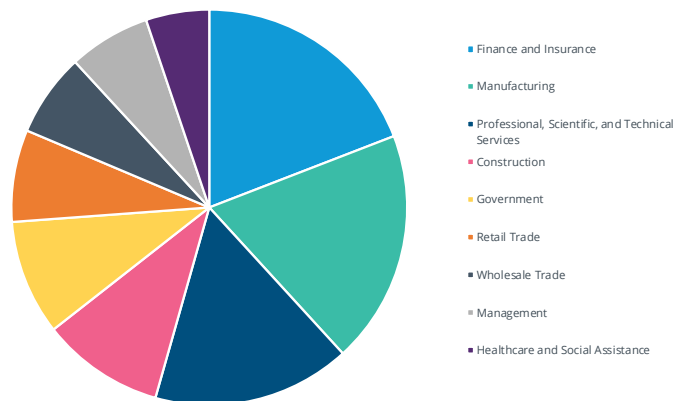
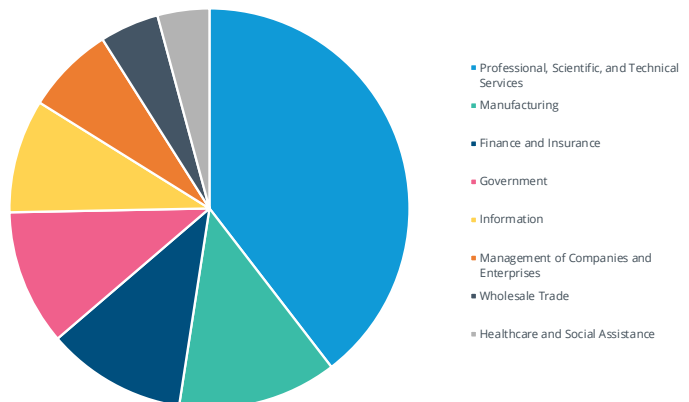


CHART 7: IT PROFESSIONALS OCCUPATION GROUP JOBS IN TOP INDUSTRIES
INDIANA 2018



6 The sectors are: Advanced manufacturing, Agriculture, Health Sciences, Information Technology, and Transportation, Distribution and Logistics

Early career jobs are an important component of the labor market because employers identify them as places to bring in new talent; graduates seek those jobs in order to enter a career field. Generally, these jobs require either a postsecondary credential, certificate or some college, but they do not require any or significant experience in a related field. Moreover, they are neither at the top nor the bottom of the wage distribution.

Table 2, below, presents our identification of early career jobs and their projected growth. These are presented as broad occupational groups but are composed of specific occupations that require some postsecondary credential or some college, do not require prior experience as an entry level requirement, and are in the middle two quartiles of the total average wage distribution for all occupations.⁷ The early career jobs included here represent about 20 percent of Indiana's total jobs (out of 3 million) in 2017. This proportion stays approximately the same through 2028 for projected growth. Contained here are over 150 occupations that new entrants to the labor market, with the appropriate credentials, can seek.

With regard to the demand and supply relationships, early career jobs are a large cluster of occupations that may have a demand curve that is different from their counterparts that require more experience or are at a more senior level and higher wage rate. Early career jobs create another distinct segment within the overall labor market.

TABLE 2: INDIANA'S EARLY CAREER SELECTED OCCUPATIONS PROJECTED GROWTH AND ANNUAL OPENINGS
2017-2028

Occupational Groups	2017	2019	2021	2023	2025	2027	2028	Annual Openings
Business and Financial Operations	99,833	103,314	105,895	107,720	109,580	111,093	111,738	10,566
Computer and Mathematical Sciences	56,153	59,547	62,050	63,806	65,575	67,009	67,620	5,141
Architecture and Engineering	47,876	49,219	50,119	50,685	51,263	51,668	51,816	3,944
Life, Physical, and Social Sciences	14,187	14,599	14,871	15,039	15,213	15,342	15,391	1,545
Community and Social Services	21,637	22,328	22,847	23,272	23,682	24,038	24,199	2,702
Legal	5,473	5,505	5,539	5,575	5,611	5,644	5,660	559
Arts, Entertainment, Sports, Media	25,889	26,489	26,912	27,233	27,553	27,812	27,922	3,008
Healthcare Practitioners and Technical	128,298	133,659	137,788	140,964	144,164	146,958	148,226	9,615
Healthcare Support	60,027	63,074	65,537	67,519	69,511	71,297	72,125	8,368
Protective Services	7,709	7,834	7,940	8,028	8,116	8,196	8,234	570
Sales and Related	1,107	1,163	1,204	1,233	1,262	1,286	1,296	139
Office and Administrative Support	38,222	38,232	38,020	37,655	37,381	37,081	36,925	4,239
Installation, Maintenance, and Repair	35,286	35,802	36,197	36,485	36,802	37,070	37,189	3,702
Production	6,080	6,091	6,067	6,016	5,974	5,919	5,889	617
Transportation and Material Moving	57,744	59,183	60,189	60,837	61,515	62,032	62,238	6,876
Totals	605,522	626,042	641,174	652,070	663,202	672,447	676,467	61,592

* Early career occupations are those which require postsecondary education as an entry requirement, but no required experience to start, and are in the middle two quartiles of the distribution of average hourly wages.

7 By selecting jobs that are in the middle two quartiles of the average hourly wage distribution we are not including low-wage jobs or, at the other end, higher wages associated with senior or advanced technical positions.

We've described the overall demand for talent in Indiana as very robust. Job growth is steepest among jobs that require a postsecondary credential. We expect that what employers and policymakers describe as a tight labor market with many job openings will continue for awhile, unless the state or national economy takes a sharp downturn.

At the same time, this growth is not monolithic or evenly distributed across occupations or across industries. The variation in growth rates of occupations and occupational groups means that the total demand for talent in Indiana has many components shaping it. Moreover, the distribution of demand across industries also suggests considerable variation in the demand for skills. Given this, effective strategies to better align talent demand with supply must take this variation into account.

To evaluate the overall alignment of talent supply to demand in Indiana, we now turn to the supply-side of the equation.



THE SUPPLY OF TALENT IN THE LABOR MARKET

In this section, we address the composition of the supply of talent in Indiana. That composition depends on many conditions, but here, as in the above discussion of demand, we will only focus on a few. First, given that supply is ultimately shaped by the number of people in or entering the labor force, we briefly examine population demographics. Second, we analyze the supply of talent coming from Indiana's institutions of postsecondary education. While there are other ways to obtain talent in the state and to gain the skills employers are seeking, Indiana's postsecondary education is the largest source of skilled and talented entrants to the labor market in the state. Finally, as we did with demand, we examine additional factors that are important in shaping talent supply — in this case, the retention of graduates from Indiana colleges and universities.

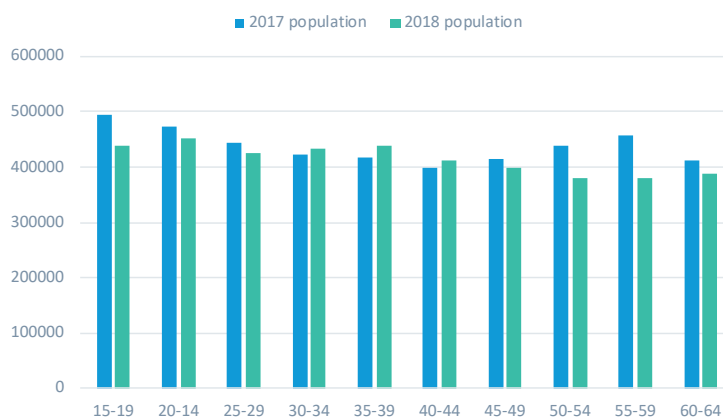
Based on the analysis described below, we conclude that it is unlikely the supply of talent in Indiana will achieve what policymakers and the state's educational leaders have described as an alignment between supply and demand. Significant factors—such as demographics and trends in postsecondary education—combine to limit the rates of growth in the supply of talent. In response to this, we examine other strategies to achieve alignment, which may be more attainable for employers, students, and educators.

Demographic Trends

A significant influence on the available talent flow into the labor market is population demographics. Chart 8 compares current population cohorts (2017) to growth projected through 2028. The table shows an overall decline of 187 thousand in Indiana's working aged population as many older workers exit the labor force and fewer younger workers enter. For example, over the ten year period, the cohort aged 15-19 is projected to hold 20 thousand fewer entrants to the labor market in 2028 as in 2017. There are not enough incoming younger workers to replace the older workers and supply the new jobs anticipated in key occupations and sectors.

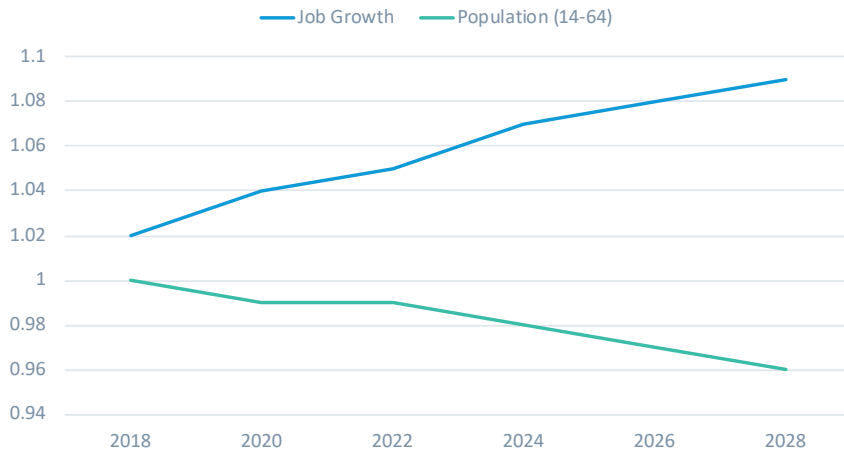
Chart 9 (next page) hints at the dilemma caused by economic growth alongside a declining working-age population: where will new workers come from to fill job openings and to replace workers who exit the labor force? This

CHART 8: PROJECTED WORKING-AGE POPULATION CHANGE
INDIANA, AGE 15-64, 2017-2028



Source: EMSI, US Census, HUD Mortality and Population Estimates.

**CHART 9: PROJECTED JOB GROWTH AND POPULATION CHANGE
2018-2028**



Source: EMSI, BLS, Indiana DWD, US Census, HUD Mortality and Population Estimates.

trend is further exacerbated by other demographic factors, such as declining labor force participation among workers over 50 and variation in participation by ethnicity/race.

Chart 9 depicts a widening distance between job growth and population decline in the working-age populations. We hesitate to conclude that these numbers can be added together to identify a specific labor shortage. However, it does suggest that, based on demographics alone, Indiana faces a shortage in the supply of new talent. This tightening of the labor market supply will likely continue, as the age groups that project sharpest declines in population are ages 15 through 29.⁸

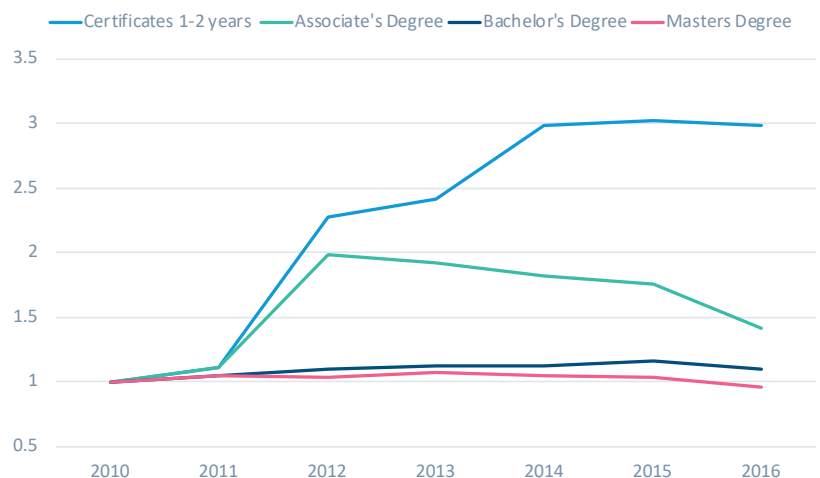
Talent Supply from Indiana’s Colleges and Universities

Indiana is truly fortunate to host a wealth of world class public and private postsecondary education institutions. Each year, these institutions award about 90,000 credentials to graduates, many of whom begin careers with Indiana employers. This is the major source of new talent for Indiana employers and the most significant arena for responding to increasing demand for postsecondary educated talent. Therefore, it is no surprise that policy discussions about the alignment of demand and supply hinge on the capacity of these institutions.

The quantitative production of graduates with credentials has been relatively flat over time and is not keeping pace with increased demand in the labor market. Between 2010 and 2016, most of the growth in total credentials in Indiana comes from certificates in sub-associate degree programs. Extrapolating current degree completion rates over the next decade, Indiana postsecondary institutions will produce only about two-thirds of the graduates needed to fill the anticipated 128,000 annual job openings requiring postsecondary credentials.

Chart 10 shows credential production among 80 Indiana public and private colleges that enroll more than 200 students in Indiana (online enrollments are not included).⁹ Shown are the last

**CHART 10: CREDENTIAL AWARDS, INDIANA PUBLIC AND PRIVATE POSTSECONDARY INSTITUTIONS
2010-2016**



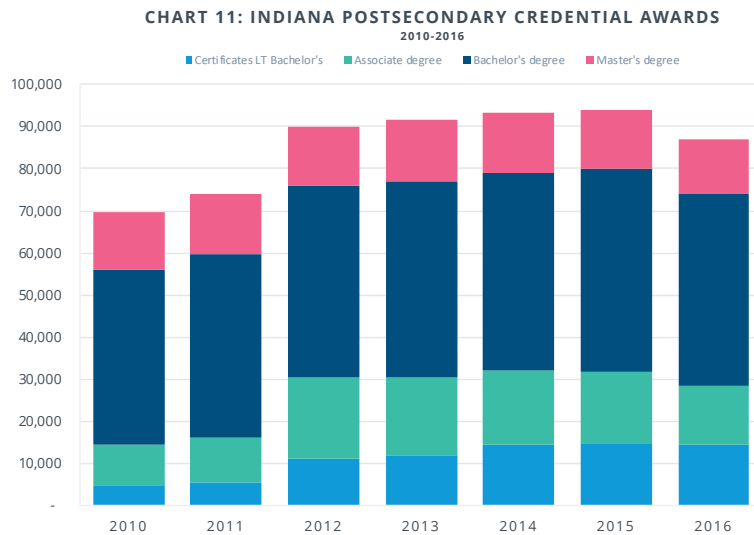
Source: NCES, IPEDS, Completions, 2010-2016.

⁸ EMSI Demographic Analysis, Indiana Population 2017-2028.

⁹ Postsecondary data from the National Center for Educational Statistics, IPEDS Data Center. The latest year of completions available is 2016; excluded from the analysis are smaller or single purpose schools such as bible institutes or cosmetology schools. Though closed in 2016, ITT Institute is included through 2015. See Appendix E for the list of institutions used in this analysis.

several years of completions from all programs offered by the institutions (through the most recent year available). The data is indexed to a 2010 baseline. After a substantial climb in associate degrees and sub-baccalaureate certificates, increases level off and show slight declines over the last couple years. Production of bachelor's and master's degrees increased very little over the entire time period. In the last two years, the number of master's and bachelor's degrees awarded have declined slightly. These data are consistent with the confluence of effects from a much lower unemployment rate, which draws people away from education into employment, and the decline in the student-aged populations (aged 18 to 24 and younger).

Chart 11 summarizes the quantities of credential and degree production in Indiana for the period 2010 to 2016 and shows the types and numbers of credentials awarded. A total of nearly 600,000 credentials were awarded during this period, of which over half were bachelor's degrees across all fields of study. Although not enough years are presented here for a valid longitudinal assessment, it appears that increases in degree production peaked for all credentials in 2014 and 2015, then began declining in 2016.



As suggested in Chart 10's trendlines, Chart 11 shows how only associate degree and certificates showed substantial positive growth during the period, while bachelor's and master's degrees were flat to negative. Overall, credential production in Indiana colleges and universities increased about 4 percent per year; yet, over half of that increase (56 percent) was in sub-baccalaureate certificates. Of the total increase in credentials awarded between 2010 and 2016, 80 percent was comprised of associate degrees and sub-baccalaureate certificates.

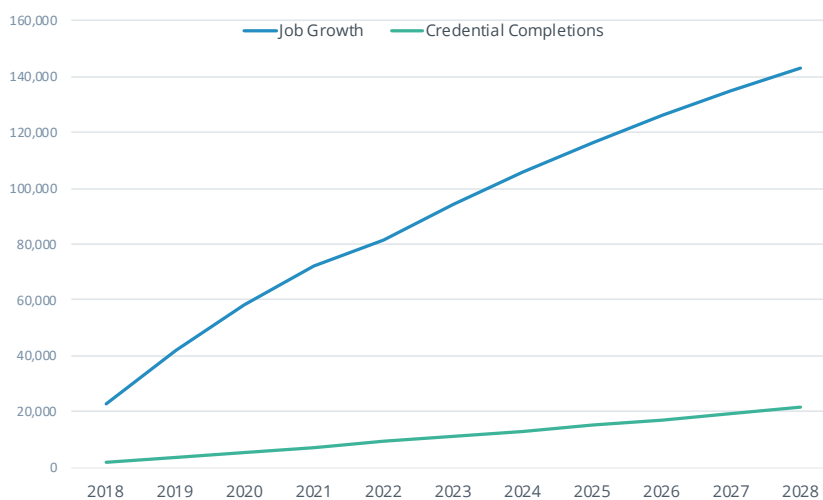
Recently, Indiana education has increased the availability of certificate award programs to make credential-bearing education more widely accessible in occupational and professional fields. And, Indiana policymakers have rightly focused attention on increasing completion rates and degree attainment in the state's associate degree-granting institutions. However, based on the data shown here, increased production of certificates and associate degrees overshadows the lower growth of baccalaureate and graduate degrees.

Comparing degree production to labor market demand, shown in Chart 12 (next page), projects a misalignment of considerable scale between the output of academic programs and the scale of demand for talent across the economy. In 2016, Indiana colleges and universities produced a total of 88,700 credentials. An average growth rate of 2 percent (excluding the certificate production rate)¹⁰ yields a projection of 110,000 credential awards in 2028, a total increase of 21,500 for the period. However, the projected increase in jobs over the same period totals about 143 thousand — and those are all jobs that require postsecondary education. While the production of degrees is complicated to approximate, a simple straight-line estimate using average annual growth from recent years suggests that educational output will not achieve quantitative balance with labor market demand.¹¹



CHART 12: PROJECTED ANNUAL INCREASES IN JOB GROWTH AND IN CREDENTIAL COMPLETIONS

2018-2028



Sources: Jobs, EMSI, Job Growth Occupations that Require Post Secondary Education; Completions, IPEDS Completions 2010-2016 projected from an estimated growth rate of 2 percent per year (see notes).

Student Out-Migration and the Labor Market

The charts above of aggregate postsecondary trends and credential output may lead to the impression that all graduates of Indiana colleges and universities are available as candidates for Indiana employers. We know this is not the case, although determining the number that are available is hard to determine. We can use a relatively new data source — the LinkedIn Alumni Tool ¹² — to approximate the proportion of students who graduated from an Indiana college in 2016 that are employed and living in Indiana today (2018).

Based on a subsample of larger Indiana colleges and universities (80 public and private institutions), we arrived at an estimate that just under 60 percent of the graduates of those institutions (who reported their locations to LinkedIn) are employed in the state almost two years after graduation.

These data are shown in Table 3 (next page) and vary by campus. 85 percent of Indiana University-Purdue University Indianapolis graduates in 2016 are self-reported as living and working in Indiana in 2018. As shown in Table 3, the retention of graduates from Indiana colleges varies considerably by type of institutions. About 50 percent of graduates at non-profit private four-year colleges, 65 percent at public four-year colleges and universities, and 66 percent at public two-year colleges report working and living in Indiana two years after graduation. And, within those groups of colleges, there is a wide variation between the institutions. The latter suggests differences among student populations and the different student markets targeted by different colleges.

Generalizing from the LinkedIn data, the total aggregate credentials awarded, shown above in Chart 11, overstate the pool of potential job candidates for Indiana employers. So, unless numbers of graduates substantially increase and/or greater proportions of the graduates stay and enter employment in Indiana, it is very likely that Indiana colleges will produce significantly fewer graduates than projected demand for new employees in the state.

¹⁰ Using the total average annual increases for all awards from the institutions in our sample yields a slightly negative average annual growth rate. We have arbitrarily assigned a growth rate of 2 percent to use for projected total growth in credentials.

¹¹ Because we use an estimated rate of growth for educational credentials and because the increase in jobs is also projected, we cannot say with any confidence that there is a specific “gap” between jobs and credentials. However, the trends in job growth and in degree production are clear. There is a significant divergence in the total production of credentials and the need for credentials in the economy.

¹² LinkedIn provides data drawn from those who registered with LinkedIn and entered biographical and professional information. This includes schools attended and years attended or graduated. No attempt was made in this report to determine what proportion of total completions and degree awards (e.g. reported to NCES/IPEDS) are reflected in the LinkedIn data. It is used here for approximation only.

TABLE 3: ALUMNI FOR GRADUATION YEAR 2016 REPORTED RESIDING IN INDIANA

Institution	2016 Alumni	Living in Indiana	Percent Living in Indiana
Private Not for Profit Four Year			
Postsecondary Indiana Wesleyan	3,906	1,681	43.0%
University of Notre Dame	4,407	1,015	23.0%
Indiana Institute of Technology	1,840	858	46.6%
University of Indianapolis	1,692	1,306	77.2%
Butler University	1,847	1,115	60.4%
Public Four Year			
Indiana University–Bloomington	15,458	8,319	53.8%
Purdue University	17,553	8,973	51.1%
Indiana University – Purdue Indianapolis	7,718	6,575	85.2%
Ball State University	6,026	4,110	68.2%
Indiana State University	3,497	2,417	69.1%
Public Two Year			
Ivy Tech Community College	9,576	7,144	74.6%
Vincennes University	1,243	712	57.3%

THE SKILLS CONNECTION: IT'S ABOUT THE MATCH

We've argued above that the quantity of demand is outpacing the quantity of supply; and, for several reasons we've outlined, the quantitative gap is unlikely to close in the coming years. While it is an important effort to increase access to postsecondary education and to increase educational attainment in the population, efforts to close the gap between labor market demand and talent supply that focus mainly on a quantitative gap in numbers of jobs and numbers of graduates to fill them are unlikely to be successful.

However, recent advances in techniques for identifying the skills and characteristics that employers are seeking to recruit and hire offers a new perspective on talent alignment. This new perspective revolves around the ability — in some cases, through data-intensive analytic modeling — to identify skills and competencies required in the work environment (creating a job profile) and to match that profile with characteristics of candidates. In other words, employers are increasingly focused on matching what they know about the requirements of a job and expected job performance with the skills, capabilities, and competencies of candidates for a position. Instead of comparing quantities of jobs to quantities of candidates, much more attention is being paid to matching the position to a person.

Employers and human resource leaders are incorporating these new practices for several reasons. First, as talent development becomes deeply integrated into the strategic plans of organizations, it becomes more important to identify and hire job candidates who possess the skills that are needed for positions in the organization. Second, organizations understand the importance of helping new hires perform successfully in their jobs. Successful job performance and contributing to the broad success of the organization is linked to business outcomes and performance metrics. Both entail a valid understanding of the skills and competencies that contribute to successful performance and reliably knowing whether a candidate has or is likely to develop those skills.

This new approach relies on accurately matching skill sets to the requirements of the organization. While this capacity has long been part of the intuitive skill set of human resource professionals, data-intensive methodologies are increasing the accuracy of these matches. New data applications have been focused on skill and competency identification and assessment, laying the foundation for the creation of new assessment tools.

In addition to this shift in talent alignment, a second significant change in talent acquisition is the way employers define job characteristics and skill requirements. Employers now frequently define clusters of competencies, which include technical skills, common skills, and attributes. Technical skills are occupational or job-specific technical skills. Common skills are skills needed to carry out tasks and function well at work. Attributes are characteristics that enable people in a work environment to be successful in their jobs; they may be behavioral, like energetic or perseverant, or qualities, like honesty and integrity.¹³

Including common skills and attributes as integral requirements for a job also broadens the definition of talent supply. Now, in addition to technical skills, often represented by a degree award, the listed requirements for a job might also include specification of common skills and attributes.

Given this, employers would like to understand whether a candidate, through their educational program, has cultivated not only the technical skills but also the common skills and attributes required for a position. Advances in assessment technology are producing more valid methods of identifying and measuring whether candidates demonstrate those characteristics.

Among employers, this focus on clusters of competencies is producing a common language and terminology. For example, Table 4, lists common skills and their frequency of appearing in job postings in Indiana across occupations that required postsecondary education over 2016 and 2017. These common skills were culled from over 850,000 postings; it suggests that a relatively small number of common skills may cover a large number of different occupations and job requirements.

TABLE 4: COMMON SKILLS IN JOB POSTINGS, JOBS REQUIRING POSTSECONDARY EDUCATION

INDIANA 2016-2017

Skill Label	Frequency	Skill Label	Frequency
Management	20%	Writing	2%
Communications	12%	Verbal Communication	2%
Sales	9%	Listening	2%
Operations	9%	Time Management	2%
Leadership	8%	Decision Making	2%
Innovation	7%	Problem Solving	2%
Customer Service	7%	Infrastructure	2%
Problem Solving	5%	Project Management	2%
Research	4%	Data Analysis	1%
Written Communication	4%	Integration	1%
Presentations	3%	Prioritization	1%
Coordinating	3%	Training and Development	1%
Interpersonal Skills	3%	Mathematics	1%
Computer Literacy	3%	Clerical Works	1%
Teaching	3%	Computer Sciences	1%
Mentorship	2%	Creativity	1%
Information Technology	2%	Leadership Ethics	1%
Investigation	2%	Negotiation	1%
Troubleshooting	2%	Quality Assurance	1%

Skill Labels Total N = 103, Total Labels N = 2,284
Source: Ascend Indiana, May 2018.

13 For a discussion of competencies and employer perspectives see Joy Heinrich, "Competency-based education: The employers' perspective of higher education," The Journal of Competency-Based Education, Wiley Publishing, New York, 2016. And see Matthew Kwok, "Towards an Understanding of Employability Skills Development among University Graduates for Workplace Entry". Paper. St. Paul's College, The University of Manitoba, 2003. And, see: "Ascend Indiana, Hiring the Right Talent: Understanding Where Employability Skills Fit", Indianapolis, January 2018. And, see: Mind Tools, "Developing a Competency Framework Linking Company Objectives and Personal Performance. Retrieved from: https://www.mindtools.com/pages/article/newISS_91.htm May 2018.

Table 5, below, lists the attributes and qualities that a sample of Indiana employers, senior management, and human resource executives most commonly look for in the hiring process. While there is some overlap with common skills, these attributes focus more on personal characteristics and qualities. Formal strategies for assessing these characteristics are being developed through techniques such as structured situational interviews. The techniques seek to translate difficult-to-measure qualities into behavioral descriptions and experiential assessments and evaluations.

TABLE 5: EMPLOYABILITY SKILLS CATEGORIES (ATTRIBUTES)

Employability Skill Summary Term	Typical Descriptors
Relational Skills	Generosity, Humility, Low Ego, Personable, Relatable, Builds Relationships, Selflessness, Social Awareness.
Integrity/Honesty	Honesty, Effective, Ethics, Fair, Good Person, Has Integrity, Kind, Respectful, Trustworthy.
Collaboration/Teamwork	Collaborative, Group Skill, Cross-Functional, Team Skills, Work for Team.
Communication	Communicate Effectively, Articulate.
Flexibility	Multi-tasking, Adaptable, Situational Adaptability, Accommodate Others' View
Customer Service	Customer Fanatic, Patients First, Customer Centric.
Innovative	Research new ways of improvement, Innovation, Free to Explore.
Engagement	Enthusiasm and Can do Attitude, Getting Hands Dirty, Motivation, Passion, Savvy.
Organization	Detail orientation, Planning and Aligning, Organized, Time Management.
Resilience	Grit, Perseverance, Overcome difficult obstacles, Resilience, Chopper.
Ability to Learn	Perpetual Learner, Coachability, Continuous Learner, Learning Agility, Can ask for Help.
Initiative	Bias to Action, Shows Initiative, Internally Motivated, Self-guided, Self-Directed.
Problem Solving	Apply logic to complex problems, Solves Problems, Good Thought Process.
Responsibility	Accountability, Dependability, Timeliness, Solid Workstyle.
Presentation	Presentation Skills, Self-Presentation.
Relational Skills	Generosity, Humility, Low Ego, Personable, Relatable, Builds Relationships, Selflessness, Social Awareness.
Integrity/Honesty	Honesty, Effective, Ethics, Fair, Good Person, Has Integrity, Kind, Respectful, Trustworthy.
Collaboration/Teamwork	Collaborative, Group Skill, Cross-Functional, Team Skills, Work for Team.

Together, technical skills, common skills, and attributes comprise the competency clusters that are now often used to define positions within organizations and to identify qualified job applicants. Moreover, the organization itself — its mission, core values, and business strategies — can also shape the job profiles or competency clusters required. There are many possible characteristics required for various jobs within an organization.

Competencies are more than a variation on what workforce experts and educators describe as groups of soft skills. The latter are often treated as generic qualities unattached to technical skills sets. In the talent development and talent acquisition context, however, competencies are characteristics and qualities integrated with technical skills and are related to job performance. Thus, they are measurable in relation to job and organizational outcomes. There are tools, now primarily used by human resource and talent development offices, that are enabling new ways of identifying and assessing talents and competencies. A postscript to this report concludes with a brief discussion of them.

Understanding competencies and being able to identify them is not only critical for employers who are hiring. It is also important for educational institutions to identify the competencies that are being developed by each educational program and express them as outcomes of the program of study. Currently, most postsecondary institutions rely on credential awards as their measure of skills and readiness for employment. However, employers report that they want more information from educators about the competencies of graduates and better demonstrations that they possess or have the potential to develop those skills.

Right now, a substitute for this information comes through the relationships that many employers form with colleges or universities. Through these relationships, employers learn the common skills and attributes that the educational programs develop. These partnerships, however, can be expensive and time-consuming; usually employers must limit themselves to just a few. This has the unintended consequence of restricting the opportunities for employers to access sources of talent and for students to access a variety of employment options.

Ideally, the labor market will seek a balance between broadening the requirements of Indiana employers to look for a combination of skills and competencies, while education institutions will identify the learning and experiential outcomes of their programs of study and more clearly document these student outcomes.

In sum, imbalances between the demand and supply of talent have long been considered a quantitative issue: there have been too few graduates available to enter occupations and industries with growing demand. However, reframing this issue to one of matching talent requirements of employers with talent and skill characteristics of graduates can reduce the magnitude of the problem and create greater efficiency within the labor market.

Chart 13: Analytics Model: Skill Based Supply and Demand Matching



Ultimately, stronger alignment within the labor market could increase the number of Indiana students finding employment in Indiana. Chart 13 shows a potential model for balancing talent supply and demand based on enhanced competency matching. The tools to reach this balance are available and becoming more widely used. It is our hope that employers, education institutions, and policymakers will increasingly adopt these tools, enhancing matches between candidates and available jobs and encouraging greater numbers of Indiana graduates to launch and sustain their careers in Indiana.

POSTSCRIPT: DATA ANALYTICS AND THE SUPPLY OF TALENT

The processes to define competencies that organizations will seek to acquire vary from relatively informal and ad hoc to highly formalized planning that integrates developing competencies within the workforce into the strategic business plans of the organization. In research on employability skills, over half the respondents in interviews with senior HR leaders reported they used a formal process and/or third parties to create job profiles and identify employability skills and competencies, including assessments and outcome metrics.¹⁵

The recent emphasis on data analytics and applications to human resources has opened opportunities to provide measurement and assessment services to organizations. Small and large firms, from Predictive Analytics, an assessment firm that has been in operation from the 1950s but now expanding its psychological assessments into large-scale data analysis and larger firms like Gallup, Deloitte or McKinsey, help clients develop a data-intensive approach to job profiling and job analysis and talent development strategy (See Figure 1). While employee and candidate assessments have been available for a long time, often based on psychometric models of personality types like Myers-Briggs, now firms are mining large amounts of accumulated data on job characteristics, organizational characteristics and employee characteristics to develop more finely tuned descriptions of skills. In some cases, among the larger consulting firms, these are based on millions of records and the claim is for high levels of validity and confidence in results.

Quantitative approaches to aligning labor market demand with talent supply are unlikely to produce results for the reasons outlined here. However, if efforts toward greater alignment are approached through a skills and competencies lens, then it is possible to achieve a more efficient means to achieve a balance based on matching the demand and supply for skills. And, based on the proliferation of data analytic models being applied to talent acquisition and talent management in organizations, it is possible to imagine these also being applied to programs of study and to the graduates of those programs. These applications are not out of the question. We have already seen that common skills do not have that great a range and there is considerable overlap among the common skills associated with different occupations. In other words, applying data analytics to educational programs to identify skills, competencies, and performance is not an impossibly complex task.

A better balance of demand and supply based on skills and competencies matching will help increase the numbers of 'good' matches between the talents employers seek and the talents that students have developed in their programs of study. This can increase the yield of jobs to students and will contribute toward greater alignment between the demand for talent and its source of supply in Indiana's colleges and universities.

Figure 1: Professional firms providing specialized services for defining competencies



Predictive Index, a data analytics firm in the employee assessment space, originally developed psychometric profiles for different job characteristics. It still does and defines a 7 step process to develop a data-based talent acquisition and hiring strategy. Now, the analysis also rests on accumulated data for validation. The process begins with creating job profiles for positions and consensus that the profile matches that the job really entails. Second, the skills, experience and qualifications, and cognitive skills that make up the technical skill and attribute requirements for the position are identified. Based on a comprehensive position profile, assessments are developed to identify the potential fit or deficient of candidates for the position. Predictive Index claims validity for the processes based on tests of accumulated data across industries and across performance indicators for some 25,000 employees in over 100 different job profiles.

McKinsey&Company

People Analytics

McKinsey and Company, the management consulting firm, offers talent development and hiring strategy and planning relying on data analytics and data from over 5 million employee evaluations.

McKinsey's People Analytics uses organizational analysis and skills assessment to identify those critical roles, determine the qualities required for success, and identify the highest-potential talent in the organization.

GALLUP®

Workforce Analytics

The Gallup organization offers workforce analytics and predictive analysis to define skills and competencies in an organization and then develops assessments to identify job candidates who demonstrate the competencies. Gallup's claims to validity and reliability rest on an accumulated database of 35 million respondents in an employee characteristic database and 2 million employee profiles in some 50,000 organizations. The analysis attempts to link employee characteristics to business performance outcomes.

APPENDIX A: EARLY CAREERS, JOB GROWTH AND THE SUPPLY OF TALENT OF BEGINNING CAREERS

An additional dynamic in the supply and demand for talent is how entry level jobs and early career jobs are considered relative to the credentials and degrees awarded by the colleges and universities that serve a regional labor market. Almost all talent demand and supply analyses treat the labor market as monolithic...all jobs are roughly the same. And, credentials and degrees apply to any of those jobs. However, in practice, we know the labor market is segmented along a number of dimensions. Not all jobs are equally accessible to graduates from Indiana's colleges and universities.

This is especially the case for jobs that are available to those graduates as points of entry into the labor market and into careers. Early career jobs are an important component of the labor market because employers identify them as places to bring in new talent; graduates seek those jobs in order to enter a career field. Generally, these jobs require either a postsecondary credential, certificate or some college, and they do not require any or significant experience in a related field. Moreover, they tend not to be either at the top or the bottom of a wage distribution.

Table A1 (also shown in the text) presents our identification of early career jobs and their projected growth. These are presented as broad occupational groups but are composed of specific occupations that require some postsecondary credential or some college, do not require prior experiences and are in the middle two quartiles of the total average wage distribution for all occupations. The total jobs included here represents about 20 percent of Indiana's total jobs of 3 million in 2017, not a small proportion in that year and is projected to grow to more than 20 percent in 2028. Contained here are over 150 occupations that new entrants to the labor market, with the appropriate credentials, can seek.

Table A1: Indiana's Early Career Selected Occupations Projected Growth and Annual Openings, 2017-2028

Occupational Groups	2017	2019	2021	2023	2025	2027	2028	Annual Openings
Business and Financial Operations	99,833	103,314	105,895	107,720	109,580	111,093	111,738	10,566
Computer and Mathematical Sciences	56,153	59,547	62,050	63,806	65,575	67,009	67,620	5,141
Architecture and Engineering	47,876	49,219	50,119	50,685	51,263	51,668	51,816	3,944
Life, Physical, and Social Sciences	14,187	14,599	14,871	15,039	15,213	15,342	15,391	1,545
Community and Social Services	21,637	22,328	22,847	23,272	23,682	24,038	24,199	2,702
Legal	5,473	5,505	5,539	5,575	5,611	5,644	5,660	559
Arts, Entertainment, Sports, Media	25,889	26,489	26,912	27,233	27,553	27,812	27,922	3,008
Healthcare Practitioners and Technical	128,298	133,659	137,788	140,964	144,164	146,958	148,226	9,615
Healthcare Support	60,027	63,074	65,537	67,519	69,511	71,297	72,125	8,368
Protective Services	7,709	7,834	7,940	8,028	8,116	8,196	8,234	570
Sales and Related	1,107	1,163	1,204	1,233	1,262	1,286	1,296	139
Office and Administrative Support	38,222	38,232	38,020	37,655	37,381	37,081	36,925	4,239
Installation, Maintenance, and Repair	35,286	35,802	36,197	36,485	36,802	37,070	37,189	3,702
Production	6,080	6,091	6,067	6,016	5,974	5,919	5,889	617
Transportation and Material Moving	57,744	59,183	60,189	60,837	61,515	62,032	62,238	6,876
Totals	605,522	626,042	641,174	652,070	663,202	672,447	676,467	61,592

Source: EMSI, BLS Employed and Self-employed, Occupations. See text for selection methodology.

While the proportion of these jobs compared to the total labor market is relatively large, an important question is how well does the supply of newly minted graduates approach the levels of demand for

them? Table A2 offers some indication of the scale of related program completions for a selected group of specific occupations that are included in the occupational groups in Table A1. The general answer is that the numbers of graduates receiving credential awards appropriate for the early career occupational requirements are, for the most part, an approximation of the annual openings for that position. However, the numbers of completions are uneven and in some cases out of line with annual openings.

Table A2: Top Early Career Occupations, Jobs, Annual Openings, and Related Program Completions

Occupations	2017 Jobs	Projected 2028	Annual Openings	Related Program Completions	Entry Level Education
Registered Nurses	65,345	75,588	4,508	3,011	Bachelor's
Computer and Software Systems and Support**	36,661	44,589	3,407	2,821	Bachelor's
Bookkeeping, Accounting, and Auditing Clerks*	34,986	33,638	3,856	822	Some college
Nursing Assistants*	31,752	37,507	4,387	36***	Certificate
Accountants and Auditors	21,842	24,218	2,262	540	Bachelor's
Licensed Practical and Vocational Nurses*	16,559	19,176	1,498	1,925	Certificate
Automotive Service Technicians and Mechanics*	15,912	17,026	1,647	2,271	Certificate
Business Operations Specialists	14,250	15,909	1,503	53***	Bachelor's
Medical Assistants*	12,900	15,711	1,767	3,550	Certificate
Human Resources Specialists	11,680	12,502	1,234	226	Bachelor's
Market Research Analysts and Marketing Specialists	8,964	11,222	1,172	657	Bachelor's
Industrial Engineers	8,873	9,617	674	269	Bachelor's
Mechanical Engineers	8,195	9,048	620	1,030	Bachelor's
Heating, Air Conditioning, Refrigeration Mechanics *	6,697	7,477	761	1,032	Certificate
Child, Family, and School Social Workers	6,435	7,095	744	666	Bachelor's
Purchasing Agents	6,410	6,896	617	571	Bachelor's
Dental Assistants*	5,695	6,759	773	1,122	Certificate

*Includes Associate Degrees incompletions

Includes SOCs 15-1121, 15-1132, 15-1142 and 15-1151 and includes associate degrees in total completions. * No educational program code match for occupation. Sources: EMSI Occupation Projections; IPEDS Completions 2017.

This table also illustrates the limitation of direct comparison of openings, or demand, and the number of graduates. It does not, in light of trends in talent development, tell us whether or not the graduates have the skills that employers are seeking.

APPENDIX B: SELECTED OCCUPATIONAL CHARTS TABLES

Occupations and the Distribution of Demand

To understand more closely what these statistics mean in the demand for talent, we need to turn to a more detailed analysis of occupations within these groups. First, we examine selected occupations and their distribution across industry sectors and then explore the skill sets associated with the occupations that employers are looking for.

These occupation tables also show the relationships between job growth (2010-2018), openings, and replacements. In healthcare, for example, occupations included here experienced an absolute growth of some 27 thousand jobs. Yet the number of openings representing both new jobs due to economic growth as well as replacement jobs—jobs to be filled when workers leave positions or leave the labor force due to retirement or other circumstances-- was over 200 thousand positions. And, the occupations shown for information technology jobs grew by a relatively modest 10,700 jobs but reported nearly 45,000 openings over the ten years. By comparing total replacement jobs, total openings, and job growth among these occupations it is possible to get a sense of job growth due to economic growth and development within industries.

Projected Growth 2017-2028 (Tables B1, B3, and B5): Projected growth uses the most recent BLS methodology to assess the growth and change in employment in occupations and in sectors. The most important statistics here are total projected job openings and percent of change within an occupation. As noted, openings contain calculations of both job openings due to the replacement of workers leaving jobs and the labor force as well as new growth. These figures are relatively conservative measures of overall demand within occupations but do give a good representation of the relative scale of demand for occupations within the labor market. Using total openings 2017-2028, we can see the wide variation in the levels of openings in these occupations: business and finance occupations, again just those represented in the table, are projected to have over 400,000 total openings with Indiana employers followed by healthcare occupations and then by a smaller number of job openings in information technology-related occupations.

The level of openings among these occupations suggests two considerations relative to our discussion of supply and demand in the labor market. First, while we are concerned with the overall relationship between the demand for talent and its supply, it is clear there is a great deal of variation between different occupations and among different industry sectors. A second consideration revolves around the nature of the supply of talent to fill these openings: given variation between occupations and industries how are we to think about the quantity of the supply of talent for these projected jobs? Focus on the variation between occupations and industries tends to imply a more segmented view of both demand and supply. Our image of supply and demand may be far more unified than it actually is.

Top Common Skills: An important element knitting together characteristics of labor market demand and the supply of talent are what others increasingly refer to as common skills. Common skills are attributes and skills that are important to job performance but are not completely specific to an occupation's or job's technical tasks. Teamwork, problem-solving, verbal communications and general computer literacy skills are common skills. Employers are increasing their focus on assessing job candidates for common skills that are believed to be factors of successfully functioning in a work environment and for successful interaction with customers or the public. Groupings of common skills, in addition to the requisite technical skills for an occupation, is often referred to as a set of competencies.

Tables B2, B4, and B6 show top common skills identified by employers in job postings for our three occupational groups. We also provide an overall measure of the degree of overlap

among the occupations within each of the three groups. These are internally comparable and illustrate a very important aspect of common skills. For example, the business and financial occupation group shows common skills for the two occupational subgroups, as shown in Table B10 in the appendix. The percentage of overlap between these subgroups is 72 percent; in other words, there is a great deal of consistency between the two groups of common skills in each of the occupations. For the four healthcare occupational subgroups, as shown in Table B4, there is also 72 percent overlap in common skills. In information technology occupations (B7), there is a 42 percent overlap, indicating a more substantial spread of common skills between the professionals (Bachelor’s degree and above educational requirements) and technicians (Associate or some college requirements.) Yet, even so, there is a high number common to both groups despite their different jobs within either IT companies or other industries.

Viewed across the three occupational groups, the overlaps of common skills displayed here suggest that there is considerable uniformity among similar occupations in important common skills and across industries as well. In other words, many common skills truly are common. The clear implication is that the total number of common skills that are the focus of employers and frequently mentioned in job postings is not large. While one occupation may have a different ranking of importance for the common skills compared to another occupation, there is not a sharp schism between occupations; and, a relatively small number of common skills account for a large majority of the common skills identified in job postings. Moreover, these common skills are also like those in postings for all occupations across the state in job postings and those expressed in interviews with Indiana employers as shown later in Tables C1 and C2 in the appendix. This has implications for our subsequent discussion of matching skills and competencies between the demand and supply sides.

1. Healthcare Occupations

Table B1: Projected Growth 2017-2028

Healthcare Occupational Groups	2017 Jobs	2028 Jobs	2017 - 2028 Change	2017 - 2028 % Change	2017 - 2028 Openings
Registered Nurses, Nurse Practitioners, Physician Assistants	73,124	85,652	12,528	17%	1,325
Health Social Workers, Counselors, and Therapists	21,211	26,420	5,209	25%	27,514
Physicians and Medical Specialists	33,138	38,418	5,280	16%	18,866
Medical Secretaries and Health Records Techs	17,046	20,370	3,324	20%	23,131
LPN Nursing and Medical Aides	95,792	113,047	17,255	18%	127,339
Therapist Aides and Technicians	29,267	34,504	5,237	18%	32,196
Totals	269,578	318,411	48,833	18.1%	230,371

Table B2: Healthcare Common Skills, by Selected Occupational Groups, Frequency in Postings and Overlap

Registered Nurses, Practitioners, Physician Asst		Health Social Workers, Counselors, Therapists		LPN Nursing, Medical Aides		Therapist Aides, Technicians	
Common Skill	Posting Frequency	Common Skill	Posting Frequency	Common Skill	Posting Frequency	Common Skill	Posting Frequency
Management	12%	Management	13%	CPR	13%	CPR	13%
CPR	9%	Communications	7%	Management	12%	Management	8%
Communications	6%	CPR	6%	Customer Service	9%	Communications	5%
Leadership	6%	Problem Solving	5%	Communications	7%	Apple iPhone	4%
Coordinating	4%	Coordinating	5%	Operations	7%	Customer Service	3%
Problem Solving	4%	Leadership	4%	Written Communication	6%	Microsoft Windows	3%
Customer Service	4%	Mentorship	4%	Service-Orientation	5%	Creativity	3%
Innovation	3%	Innovation	4%	Listening	5%	Problem Solving	3%
Teaching	3%	Written Communication	3%	Clerical Works	4%	Listening	3%
Operations	3%	Research	3%	Innovation	4%	Leadership	3%
Interpersonal Skills	3%	Leadership Ethics	2%	Requirement Prioritization	3%	Interpersonal Skills	2%
Computer Literacy	3%	Customer Service	2%	Problem Solving	3%	Written Communication	2%
Critical Thinking	2%	Interpersonal Skills	2%	Computer Literacy	3%	Information Technology	2%
Written Communication	2%	Time Management	2%	Prioritization	3%	Decision Making	2%
Apple iPhone	2%	Decision Making	2%	Apple iPhone	3%	Computer Literacy	2%
Mentorship	2%	Creativity	2%	Sales	3%	Operations	2%
Decision Making	2%	Computer Literacy	2%	First Aid	2%	Innovation	2%
Creativity	2%	Teaching	2%	Microsoft Windows	2%	Mentorship	2%
Microsoft Windows	2%	Operations	2%	Leadership	2%	Leadership Ethics	2%
Research	2%	Apple iPhone	1%	Typing	2%	Sales	2%

Overlap = 72% in the top 50 common skills reported (top fifty not shown).

2. Information Technology Occupation Groups

Table B3: Projected Growth 2017-2028

Information Technology Occupational Groups	2017 Jobs	2028 Jobs	2017 - 2028 Change	2017 - 2028 % Change	2017 - 2028 Openings
Computer and IT Professionals	43,066	51,561	8,495	20%	41,831
Computer and IT Technicians and Support	17,554	20,918	3,364	19%	19,196
Totals	60,620	72,479	11,859	19.6%	61,027

Table B4: Information Technology Common Skills, by Occupational Group, Frequency in Postings and Overlap

Computer and IT Professionals		Computer and IT Technicians	
Common Skill	Frequency in Postings	Common Skill	Frequency in Postings
Management	46%	Management	33%
Communications	20%	Communications	23%
Architecture	18%	Troubleshooting (Problem Solving)	18%
Integration	18%	Problem Solving	14%
Infrastructure	16%	Operations	13%
Operations	16%	Customer Service	11%
Leadership	13%	Information Technology	11%
Problem Solving	13%	Microsoft Windows	8%
Information Technology	12%	Research	7%
Innovation	12%	Microsoft Office	7%
Project Management	10%	Innovation	7%
Troubleshooting (Problem Solving)	9%	Written Communication	7%
Computer Sciences	9%	Infrastructure	6%
Research	8%	Microsoft Excel	6%
Microsoft Windows	8%	Leadership	6%
Application Development	6%	Integration	6%
Presentations	6%	Sales	6%
Coordinating	5%	Architecture	5%
Mentorship	5%	Computer Sciences	4%
Sales	5%	Listening	4%

Overlap = 42% in the top 50 common skills reported (top fifty not shown).

3. Business and Financial Services Occupation Groups

Table B5: Projected Growth 2017-2028

Business and Finance Occupational Groups	2017 Jobs	2028 Jobs	2017 - 2028 Change	2017 - 2028 % Change	2017 - 2028 Openings
Business, Finance, and Operations	170,249	189,431	19,182	11%	183,070
Information Clerks and Technicians	174,238	185,128	10,890	6%	232,882
Totals	344,487	374,559	30,072	8.7%	415,952

Table B2: Healthcare Common Skills, by Selected Occupational Groups, Frequency in Postings and Overlap

Registered Nurses, Practitioners, Physician Asst		Health Social Workers, Counselors, Therapists		LPN Nursing, Medical Aides		Therapist Aides, Technicians	
Common Skill	Posting Frequency	Common Skill	Posting Frequency	Common Skill	Posting Frequency	Common Skill	Posting Frequency
Management	12%	Management	13%	CPR	13%	CPR	13%
CPR	9%	Communications	7%	Management	12%	Management	8%
Communications	6%	CPR	6%	Customer Service	9%	Communications	5%
Leadership	6%	Problem Solving	5%	Communications	7%	Apple iPhone	4%
Coordinating	4%	Coordinating	5%	Operations	7%	Customer Service	3%
Problem Solving	4%	Leadership	4%	Written Communication	6%	Microsoft Windows	3%
Customer Service	4%	Mentorship	4%	Service-Orientation	5%	Creativity	3%
Innovation	3%	Innovation	4%	Listening	5%	Problem Solving	3%
Teaching	3%	Written Communication	3%	Clerical Works	4%	Listening	3%
Operations	3%	Research	3%	Innovation	4%	Leadership	3%
Interpersonal Skills	3%	Leadership Ethics	2%	Requirement Prioritization	3%	Interpersonal Skills	2%
Computer Literacy	3%	Customer Service	2%	Problem Solving	3%	Written Communication	2%
Critical Thinking	2%	Interpersonal Skills	2%	Computer Literacy	3%	Information Technology	2%
Written Communication	2%	Time Management	2%	Prioritization	3%	Decision Making	2%
Apple iPhone	2%	Decision Making	2%	Apple iPhone	3%	Computer Literacy	2%
Mentorship	2%	Creativity	2%	Sales	3%	Operations	2%
Decision Making	2%	Computer Literacy	2%	First Aid	2%	Innovation	2%
Creativity	2%	Teaching	2%	Microsoft Windows	2%	Mentorship	2%
Microsoft Windows	2%	Operations	2%	Leadership	2%	Leadership Ethics	2%
Research	2%	Apple iPhone	1%	Typing	2%	Sales	2%

Overlap = 72% in the top 50 common skills reported (top fifty not shown).

APPENDIX C: ASCEND INDIANA NETWORK SKILLS LISTING

The following table shows the top 50 skill labels from Ascend Indiana’s Network of employers and positions at those companies posted with the Ascend Network. These skill labels were identified by the employers (Ascend did not provide a set of categories) for open positions within the organizations. Common skills are identified by the authors and are taken from top common skills identified by Indiana employers (see Table C1, included below).

Table C1: Top 50 Skills Requirements for Positions and Employers in Ascend Network

Skill Label	Frequency	Percent of Total	Common Skills*
Verbal Communication	288	12.6%	✓
Written Communication	251	11.0%	✓
Interpersonal Relations	243	10.6%	✓
Teamwork	176	7.7%	✓
Customer Service	172	7.5%	✓
Relationship Management	99	4.3%	✓
Microsoft Office	98	4.3%	✓
Data Entry	75	3.3%	
Data Analysis	64	2.8%	✓
Project Management	63	2.8%	✓
Excel	59	2.6%	
Leadership	55	2.4%	✓
Marketing	51	2.2%	✓
Database Management	46	2.0%	✓
Business Process Improvement	29	1.3%	
Finance	29	1.3%	
PowerPoint	24	1.1%	
Sales	23	1.0%	
Nursing	23	1.0%	
Public Relations	21	0.9%	
Research	19	0.8%	✓
Public Speaking	19	0.8%	✓
Market Research	18	0.8%	
Social Media	18	0.8%	✓
Troubleshooting	18	0.8%	✓
Event Planning	17	0.7%	
Engineering	16	0.7%	
Statistics	16	0.7%	✓
Content Creation	14	0.6%	
Regulatory Compliance	12	0.5%	
CRM	11	0.5%	
Interviewing	11	0.5%	
Recruitment	10	0.4%	
Budgeting	9	0.4%	
Logistics	9	0.4%	
Digital Marketing	8	0.4%	
Fundraising	7	0.3%	
Adobe Photoshop	6	0.3%	
Imaging	6	0.3%	
Insurance	6	0.3%	
Adobe Creative Cloud	5	0.2%	
Content Management	5	0.2%	
Auditing	5	0.2%	
Cybersecurity	5	0.2%	
Investments	5	0.2%	
Salesforce	5	0.2%	
Video Editing	5	0.2%	
Adobe InDesign	4	0.2%	
CNA	4	0.2%	
Coding	4	0.2%	
Grant Reporting	4	0.2%	

Source: Ascend Indiana, May 2018. * Identified as common skills in job postings compiled by EMSI for 853,112 Indiana job postings 2016-2017.

Table C2: Common Skills in Job Postings, Jobs Requiring Postsecondary Education, Indiana, 2016-2017

Skill	Frequency in Postings	Skill	Frequency in Postings
Management	20%	Writing	2%
Communications	12%	Verbal Communication Skills	2%
Sales	9%	Listening	2%
Operations	9%	Time Management	2%
Leadership	8%	Decision Making	2%
Innovation	7%	Problem Solving	2%
Customer Service	7%	Infrastructure	2%
Problem Solving	5%	Project Management	2%
Research	4%	Data Analysis	1%
Written Communication	4%	Integration	1%
Presentations	3%	Prioritization	1%
Coordinating	3%	Training and Development	1%
Interpersonal Skills	3%	Mathematics	1%
Computer Literacy	3%	Clerical Works	1%
Teaching	3%	Computer Sciences	1%
Mentorship	2%	Creativity	1%
Information Technology	2%	Leadership Ethics	1%
Investigation	2%	Negotiation	1%
Troubleshooting	2%	Quality Assurance	1%

Source: EMSI Job Posting Analytics, Top Common Skills, 2016-2017, Total N = 853,112 Postings. Occupational specific skills removed.

APPENDIX D: METHODOLOGIES AND REFERENCES

Employment and Projection Data

Industry and Occupational Employment. These are jobs as reported by businesses and collected through national employment statistics programs. The primary source of industry and occupational employment data in this report is EMSI's collection and aggregation of the Bureau of Labor Statistics national employment statistics program called Quarterly Census of Employment and Wages (QCEW). QCEW is the standard governmental program that reports employment data for regions and states across the country. EMSI supplements the QCEW data with self-employed estimates derived from the US Census Bureau Non-employer Statistics and County Business Patterns. The data for this report is from EMSI's 2018.2 data set.

Employment Projections: Projections in employment are based on national industry projections (BLS national employment projections) as well as state and regional projections provided by state labor market organizations. EMSI also benchmarks these projections based on short-, mid-, and long-term trend lines for every industry and county based on historical data.

Job Openings: Job openings are defined by the Bureau of Labor Statistics as openings due to (1) new jobs created by expanding companies, (2) workers exiting the workforce (retirements, discouraged workers, or parents halting their participation in the labor force to be with their children, etc.), and (3) workers permanently leaving an occupation, but staying in the workforce. Job openings do not include workers simply switching jobs within an occupation.

Job Postings: Job postings denote the total and unduplicated number of online job advertisements listed by different companies on career sites and job boards. The total number of postings can be used to define occupational demand as well as demand for specific skill sets.

Job Postings v. Job Openings: Job postings can represent the ceiling of demand for a job in the state, but only if employers are actively advertising online. Job openings take a more conservative approach to demand, accounting for job growth and estimating replacement needs for workers who change careers or retire. It's likely that the true demand for a job is somewhere between job postings and openings.

Postsecondary Institutional Credential Completions

The Universe of Institutions: Our methodology calculates the supply of credential completions for postsecondary granting educational institutions in the state of Indiana. Excluded from the analysis are smaller or single purpose schools such as bible institutes or cosmetology schools. Though closed in 2016, ITT Institute is included through 2015.

Credential Completions: We use the credential completions reported and organized by the program of study by each private and public institution of higher education in Indiana through the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS). We include the credentials or certificates of less than one year's academic credit, certificates between one and two years of academic credit, associate degrees, Bachelor's degrees, Master's degrees, and PhDs (professional practice) codified in the U.S. Department of Education's Classifications of Instructional Programs (CIP).

Credential Projections: We project the supply of credentials using a straight-line projection based on past credential completion for each institution, award category, and program of study. We recognize that projected credential completion, like the occupational projections, are not fixed - future credential completion will change based on enrollment, completion rates, and other institutional and exogenous factors in the labor market.

Crosswalk from Postsecondary Credentials to Occupational Projections: We use a crosswalk to build connections between the projected demand for the key occupational groups with program completions from public and private higher education institutions in the universe. We use the nationally generated SOC to CIP crosswalk – or Standard Occupational Classification (SOC) to the Classification of Instructional Programs (CIP) crosswalk – to complete this analysis. The SOC to CIP crosswalk links the skills and competencies needed for an occupation to the content delivered in an academic program of study. Labor market and education experts from the National Center for Education Statistics (NCES) and U.S. Bureau of Labor Statistics (BLS) generate the crosswalk.

Limitations

- Projections are not based on a pre-destined outcome. The future is ever changing, and economic, demographic and policy changes can have an impact on what happens to demand jobs and supply of educated talent in an economy. For example, most forecasts made prior to the Great Recession did not come to fruition as the sudden downturn in the economy had major impacts across many economic and social dimensions.
- Demand projections are based on the trends and forecast that researchers from the Bureau of Labor Statistics consider will likely happen to the labor force, aggregate economy, final demand (GDP) by consuming sector and product, industry output, industry employment, and employment and openings by occupation.
- Supply projections are based on current state of production among public and private institutions of higher education in Indiana from the National Center for Education Statistics and do not account for changes in enrollment or completion rates that may or may not occur across institutions or in programs.

APPENDIX E: LIST OF INDIANA COLLEGES USED IN SUPPLY AND DEMAND

Ancilla College

Anderson University

Aviation Institute of Maintenance-Indianapolis

Ball State University

Bethany Theological Seminary

Bethel College-Indiana

Brightwood College-Hammond

Brightwood College-Indianapolis

Brown Mackie College-Fort Wayne

Brown Mackie College-Indianapolis

Brown Mackie College-Merrillville

Brown Mackie College-South Bend

Butler University

Calumet College of Saint Joseph

Chamberlain College of Nursing-Indiana

Christian Theological Seminary

Concordia Theological Seminary

DePauw University

DeVry University-Indiana

Earlham College

Fortis College-Indianapolis

Franklin College

Goshen College

Grace College and Theological Seminary

Hanover College

Harrison College-Indianapolis

Holy Cross College

Huntington University

Indiana Institute of Technology

Indiana State University

Indiana University-Bloomington

Indiana University-East

Indiana University-Kokomo

Indiana University-Northwest

Indiana University-Purdue University-Fort Wayne

Indiana University-Purdue University-Indianapolis

Indiana University-South Bend

Indiana University-Southeast

Indiana Wesleyan University-Marion

International Business College-Fort Wayne

International Business College-Indianapolis

ITT Technical Institute-Fort Wayne

ITT Technical Institute-Indianapolis

ITT Technical Institute-Indianapolis East

ITT Technical Institute-Merrillville

ITT Technical Institute-Newburgh

ITT Technical Institute-South Bend

Ivy Tech Community College

Lincoln College of Technology-Indianapolis

Manchester University

Marian University

Martin University

MedTech College

MedTech College-Ft Wayne Campus

MedTech College-Greenwood Campus

National American University-Indianapolis

Oakland City University

Ottawa University-Jeffersonville
Purdue University-Calumet Campus
Purdue University-Main Campus
Purdue University-North Central Campus
Rose-Hulman Institute of Technology
Ross Medical Education Center-Fort Wayne
Ross Medical Education Center-Kokomo
Saint Elizabeth School of Nursing
Saint Josephs College
Saint Mary's College
Saint Mary-of-the-Woods College
Saint Meinrad School of Theology
Taylor University
The Art Institute of Indianapolis
Trine University
Trine University-Regional/Non-Traditional
Campuses
University of Evansville
University of Indianapolis
University of Notre Dame
University of Phoenix-Indiana
University of Saint Francis-Fort Wayne
University of Southern Indiana
Valparaiso University
Vincennes University
Wabash College