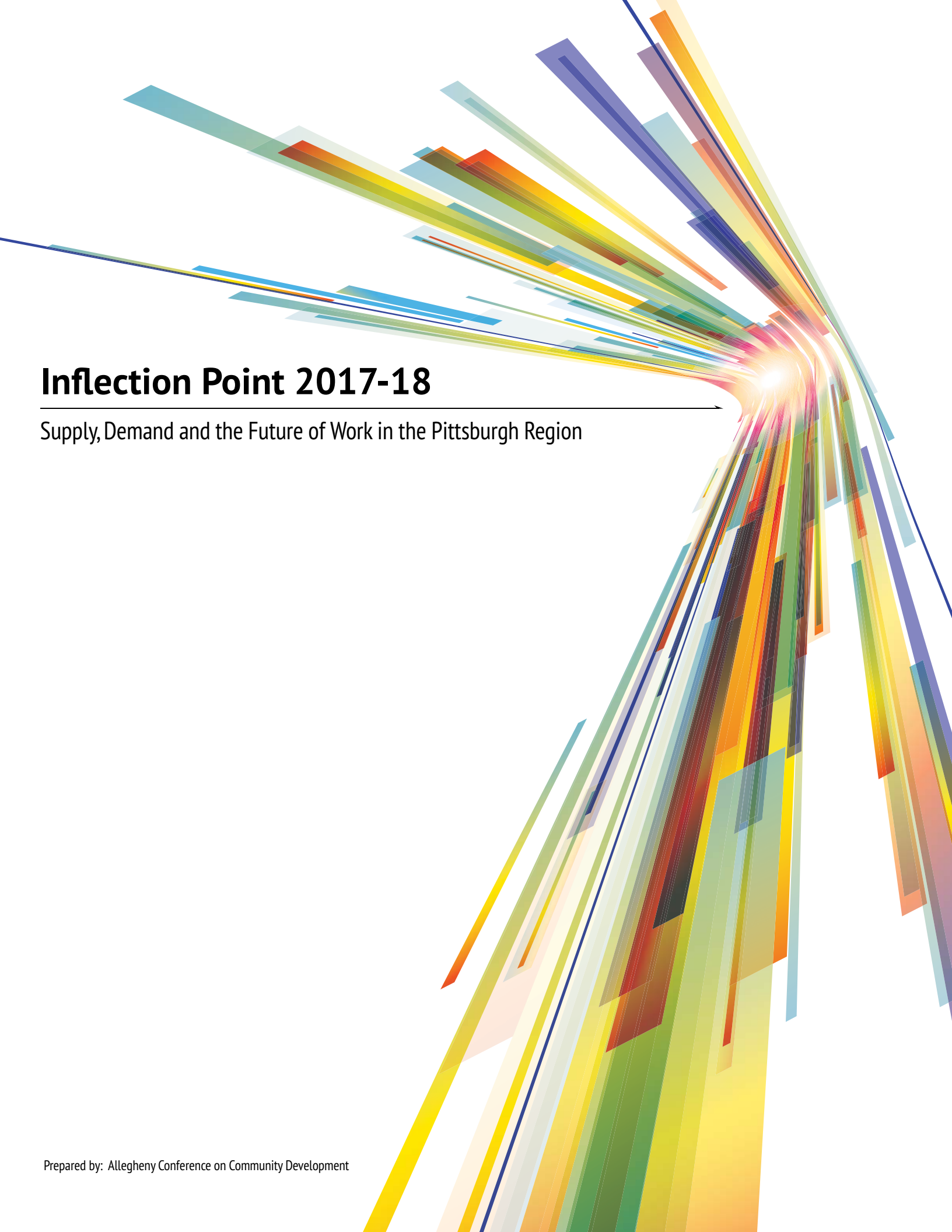

Inflection Point 2017-18

Supply, Demand and the Future of Work in the Pittsburgh Region

Prepared by: Allegheny Conference on Community Development

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INTRODUCTION

In May 2016, the Allegheny Conference issued *Inflection Point: Supply, Demand and the Future of Work in the Pittsburgh Region.* We undertook this work as an imperative: if we want to remain economically competitive and ensure a high quality of life for all our residents, resting on the success of Pittsburgh's past transformations would merely keep us tethered in place, rather than providing a competitive path forward.

Inflection Point 2016 documented workforce challenges we face given our demographics and the escalating pace by which technology is transforming virtually every occupation in our economy, and in so doing, also creating entirely new industries. The Conference's Inflection Point working group, led by Dmitri Shiry, suggested that brief annual updates of key metrics and workforce developments, to be used as a complement to the original report, would help sustain momentum for action. This 2017-18 report is the first of those updates.

The original report's findings, echoed in this year's update, indicate clearly that over the next decade our workforce will be characterized by large scale retirements, slow population growth, and increasing skill demand across all occupations. At the same time, many of our traditional industries will continue to be disrupted by technological advances, requiring that employers and talent keep pace with this change to remain competitive.

While the challenges are exacerbated by the fact that we face a potential shortfall of workers with the right skills for the jobs we will have, there is real cause for optimism. As this 2017-18 update documents, far reaching business investment decisions have been made in the past year that have strong, positive workforce implications, whether it be a multi-billion dollar investment in an ethane cracker, billion dollar investments in our unique technology assets such as autonomous vehicles, or those active investments of time and energy being made by our region's educators and businesses to grow a more nimble and strong talent pipeline.

Inflection Point changed the region's conversation about workforce and the future. Now it's time to move beyond conversation and to take definitive actions. While many promising new initiatives are underway, we need more employers to take a chance on young talent, more partnerships between educators and businesses to align our talent efforts, and an ongoing commitment to a collective effort to elevate, retain and attract talent to ensure our region's future prosperity.

As incoming Chair of the Allegheny Conference, I intend to continue to sound the alarm, echoing last year's wake-up call. We have begun to catalyze a proactive and aggressive approach by our employers, educators, civic leaders and citizens to tackling both the demographic and technology-driven changes making up our workforce challenges, and we will need to sustain and scale these efforts.

Please review this year's update, and decide how you can play a role in this important work.

Sincerely,

Bill Demchak

Bill Demchak
Chairman, President and Chief Executive Officer
The PNC Financial Services Group, Inc.

In undertaking the *Inflection Point* 2016 study to document workforce supply and demand, and the opportunities to directly shape our economic future as a region, our hope was that the report's findings would change the form or pitch – the inflection – of conversations in our region about the future of work.

With the help of Allegheny Conference's Regional Investors, and members of communities across all 10 counties, Conference staff fanned out and presented the report's findings to more than 5,500 people. Educators, business and civic leaders, elected officials and concerned citizens studied the findings, and have begun a conversation, and some early action, that is transforming how we talk about and act on our workforce challenges.

The report's close examination of employer demand—academic, technical and behavioral skills in highest demand—created a compelling and actionable data set that must be kept fresh. For the 2017-18 report, we've highlighted the sense of urgency in addressing our projected worker shortage and skills misalignment, while also examining fast-emerging industry clusters and the skills required for them to continue to grow, and providing an inside look at what some employers and education leaders are already doing to tackle our workforce challenge.

I was pleased to again chair the Working Group as we gathered in 2017 to assess how best to frame a process of annual updates, recognizing the span of the original report was 2015-2025. Large regional economies seldom change dramatically on an annual basis, and we agreed that a comprehensive update to the original report should be conducted in 2020, five years out from the original study. At the same time, any significant changes in our core data set, investments or other regional activities with important workforce implications, and examples of effective strategies to address our workforce challenges, should be noted on an annual basis. *Inflection Point* 2017-18 is the first of what will be annual updates to the original work. It should be used in close connection with the 2016 report.

Once again, real-time market insight across the economy is provided by Burning Glass Technologies' analysis of web-based job postings, offering current and detailed information about rising, declining, and steady employer skill demands and nascent trends.

The transformation spurred by innovation and technological change across every industry that we made note of last year has continued unabated. These trends are not unique to the Pittsburgh region, but our history of embracing our most significant challenges and working together to address them, is. We hope you will embed the report findings in your plans going forward, and join all of us in the region to continue to capitalize on our regional workforce challenges and opportunities.

Sincerely,

Dmitri Shiry
Managing Partner, Deloitte, LLP

ACKNOWLEDGEMENTS

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- The PNC Financial Services Group, Inc.
- PPG
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KEY FINDINGS

2016 findings and projections are on track

- *Worker shortage:* Potential shortfall of 80,000 by 2025 based on Baby Boomer retirements, modest job growth and a talent pipeline not large enough to fill these openings.
- *College students leaving:* 50% of our 40,000 annual college graduates leave the region, citing an inability to find a job as their number one reason. Moving this retention rate from 50% to 60% would add 4,000 to the annual talent supply, or 40,000 over ten years, filling half the need.
- *Need to upskill:* Traditional industries are being disrupted by technological advances, and employers and talent need to keep pace. All workers need to continually upskill, and become digitally fluent.
- *Fastest growing occupations:* Fastest growing sub-baccalaureate and BA+ occupations remain unchanged: Seven of the top ten fastest growing occupations are in healthcare, and the others are in production/maintenance, data science and IT, such as information security.

Emerging Industry Clusters will Intensify Workforce

- New regional investments, including in autonomous vehicles, additive manufacturing, robotics and the ethane cracker, have the potential to add substantial new job demand, particularly in engineering (mechanical, electrical and software), as well as highly skilled maintenance technicians.

Top skills in demand

- Baseline, or 'soft,' skills such as communications, problem-solving and customer service continue to grow in importance. Technical skills are considered table stakes to get a job interview, and soft skills will provide candidates with an edge. But the soft skills are also complex in nature: Autonomous vehicle companies cited the top attribute in demand as 'the desire and aptitude to learn a new, high-level skill – on the order of coding—every day, just to keep pace.'

Everyone is not equally connected to the workforce or paths for upward mobility

- While there is a large cohort of high wage/high skill workers, the region also has a large number of occupations with average wages of less than $15/Hour, with too few pathways for upward mobility.
- Our region's workforce is one of the least diverse of benchmark regions. Demographics across the 10-county region vary widely, but African Americans have persistently lower education levels, median yearly earnings, and higher levels of unemployment.

Employers need to accelerate efforts and shift HR practices to address growing competition for talent

- Regional job postings reveal that a significant number of employers continue to seek higher levels of credentials and years of experience in job candidates than the job may actually require, creating an artificial vacuum, often in fields that are in highest demand.
- Collaboration with other employers and the education system is needed to build a talent pipeline relevant to the region's workforce demands. Our HR survey showed that fewer than 10% of employers are even considering engaging with the K-12 system on this front, and fewer than half are providing internships for college students.

Educators need real-time career awareness tools to better prepare students

- Effective K-12 career awareness and preparation is hampered by educators' lack of access to real-time jobs and skills data, information about future workforce trends, and the time and ability to infuse classroom curriculum with relevant workforce information.
- Highest demand occupations are under-enrolled in our high school career and technical education programs with too many cosmetology and not enough machine technology students.

RECOMMENDATIONS: WHAT YOU CAN DO NOW

Take a fresh look at your hiring practices

- *Job postings:* Are your job postings asking for inflated education and experience credentials that aren't actually required for the job? *Inflection Point* shows this practice is widespread here, creating an artificial vacuum for high-demand talent. Who makes decisions about recruiting talent? HR? Hiring/ Department Managers? Are they both empowered to make change?
- *Diversity:* Take a look at your diversity and inclusion practices. Do your recruiting networks include sources of diverse talent and have you extended your reach to these networks recently?

Provide clear paths for upward mobility for all

- Invest in training and career pathways so all employees can keep pace with skill demand. Consider engaging with workforce boards (in most counties), community colleges and training providers to help shape programs to build core skills required across many occupations in your organization.
- Examine new sources and pathways for non-traditional candidates to enter your organization such as right out of high school, those re-entering the workforce, and those who are under-employed.

Invest in the region's talent pipeline by working with educators

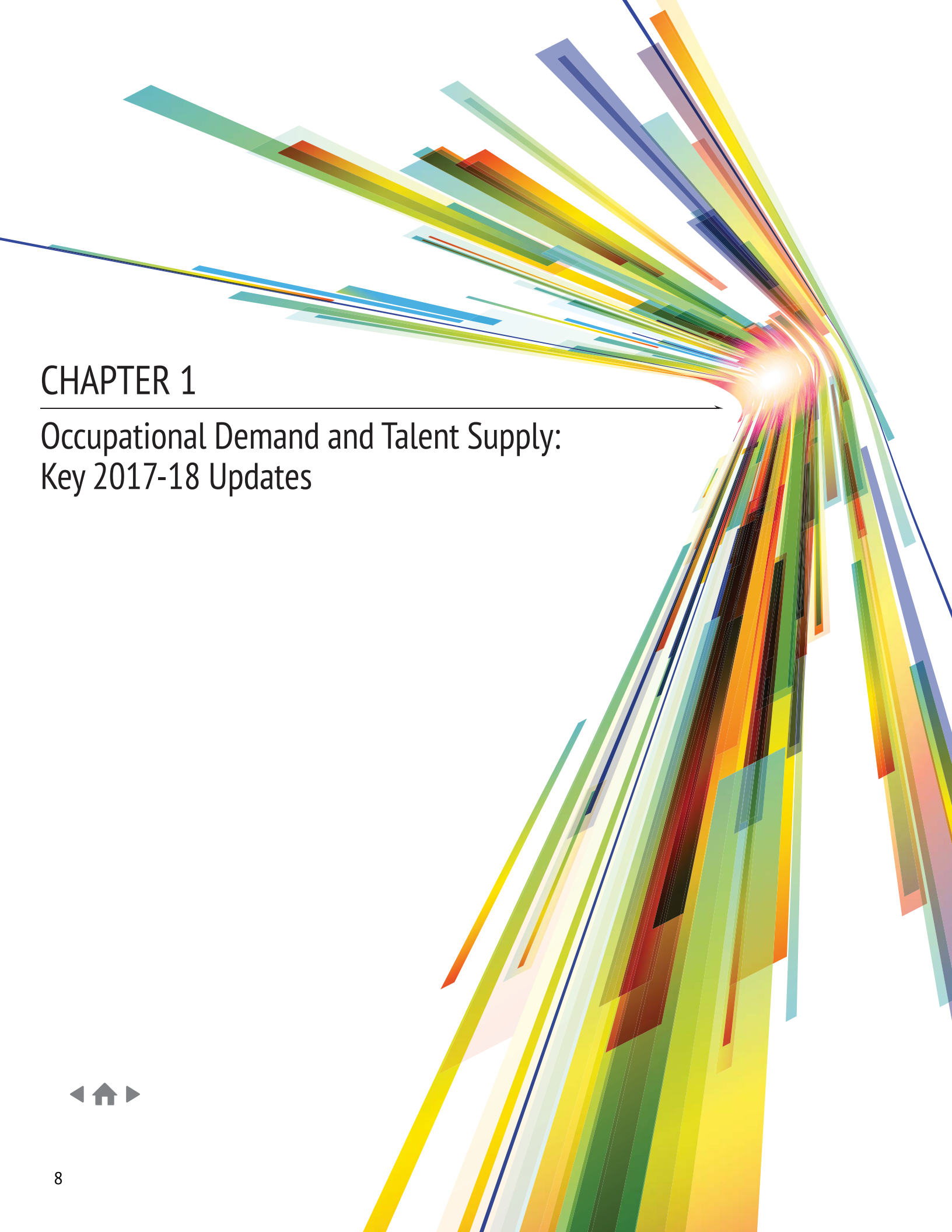
- Collaborate with companies, sometimes, in different sectors, with similar workforce needs and educators, to develop and scale curriculum to fill existing gaps
- Industry and educators must equally stress the need for everyone to have digital skills, work-ready behavioral skills, and the ability to continue to learn and grow on the job

Position the region for high-demand talent from our colleges and other markets

- Take advantage of the region's captive talent base of 40,000 annual graduating college students by beginning or expanding an internship program and hiring from that pre-tested pool.
- Are you effectively selling the Pittsburgh region to college students and talent from outside the market? Do you have the tools to best position the region when selling to high-demand talent, including Software and Engineering candidates from other markets?

What the Allegheny Conference is doing, and how you can get involved

- *Series of HR Workshops* – Each focused on a specific, regional workforce challenge, including: Internships as a recruiting tool; Positioning the region more competitively to college students; Attracting and retaining foreign-born talent, and more. Register at alleghenyconference.org in 2018.
- *Regional Talent Attraction Toolkit* – Many employers sell the region with inadequate tools that don't promote the region's best assets. The Conference is building an online toolkit that employers can access when recruiting talent to the region. Access via ImaginePittsburgh.com in 2018.
- *College Student Tours* – The Conference began this program in 2016 to introduce students in high-demand majors, to the region's employment and quality of life opportunities. Employers can be part of this growing effort as tour hosts. Contact workforce@alleghenyconference.org
- *Energy and Manufacturing Talent Pipeline* – A working group of nearly 30 employers and educators focused on common skills in high demand and short supply such as for maintenance technicians; Focus in 2018 will be on middle school educators, parents and students to develop interest and awareness of these careers. Contact workforce@alleghenyconference.org



CHAPTER 1

Occupational Demand and Talent Supply: Key 2017-18 Updates

OCCUPATIONAL DEMAND AND TALENT SUPPLY

Inflection Point 2016 noted that during the decade 2015-2025, the Pittsburgh region faces a potential shortfall of 80,000 workers due to Baby Boomer retirements and new job growth. Each year, an average of 29,000 people in the Pittsburgh region will retire from the workforce, and 5,000 new jobs will be created, resulting in 340,000 job openings over the next 10 years. At the same time, our talent pipeline is only expected to produce about 260,000 workers, resulting in the shortfall. Our 2017 review of supply and demand shows we are still on track for this shortage.

Projected Workforce Shortage Ahead

Workforce openings	
Baby Boomer retirements 29,000/year	290,000
Job growth 5,000/year	50,000
	Total 340,000
Pipeline	
26,000/year	260,000
Potential shortfall	**80,000**

Source: *Inflection Point 2016*

New regional investments, made since the publication of *Inflection Point* 2016, including in the ethane cracker, autonomous vehicles, additive manufacturing, and collaborative robotics industries, have the potential to add substantial new job demand. Taken together, the workforce implications of these investments, in terms of the demand for talent quantity and skill level, add further urgency to the region's collective efforts to address potential worker shortfalls (view more details on these emerging clusters and skills in Chapter Two).

THE COUNTER-EFFECT OF "UPCREDENTIALING"

Analysis of current job postings in the Pittsburgh region documents that employers continue to seek higher levels of credentials and years of experience in job candidates than the job may actually require. In so doing, they may be eliminating individuals who are well qualified for the opportunity but for the degree or more extensive work history, thus potentially creating an artificial vacuum.[1] Given the region's acute demographic need to fully engage its future talent pipeline, as well as fill current jobs, such self-created barriers are counter-productive.

TECHNOLOGY'S IMPACT ON THE WORKFORCE

Technology is reshaping virtually every occupation at a rapid rate, changing the skills students must be equipped with, and driving the need for continuous upskilling of the incumbent workforce, often for much more complex skills. Even as these skills demands increase, there are new concerns about the impacts of automation. In the past year there have been a plethora of reports on the impact automation and technology advances may have in eliminating certain occupations, and whether advances in machine learning, artificial intelligence and robotics should be feared or welcomed.

One author points to full-blown "robot panic," but suggests that workers may actually have greater employment opportunities as routine tasks become automated, as long as they are able to learn how to use these new technology-based tools.[2] While all occupations are made up of multiple elements, many of which could potentially be automated, a recent McKinsey Global Institute report notes that multiple factors beyond simple technical availability will influence investments in automation, and that fewer than 5% of all current occupations are candidates for full automation. [3]

Using data gathered from a University of Oxford study examining the risk automation poses, the table below identifies a subset, in orange, of occupations in the seven-county Pittsburgh MSA that are at highest risk of automation (the complete list of occupations appears in the appendix). Those occupations collectively employ approximately 435,000 people, or 39% of all employment in the MSA.

Table 1: Select Occupations by Risk of Automation

Occupation	Risk of Automation	Total Employment in Pittsburgh MSA
Registered Nurses	Low	30,810
Nursing Assistants	Low	13,590
Software Developers, Applications	Low	7,920
Medical Assistants	Low	6,130
Computer Systems Analysts	Low	5,790
Management Analysts	Low	4,880
First-Line Supervisors of Construction Trades and Extraction Workers	Low	4,380
Electricians	Low	4,060
Mechanical Engineers	Low	3,420
First-Line Supervisors of Mechanics, Installers, and Repairers	Low	3,310
Customer Service Representatives	Medium	23,310
Heavy and Tractor-Trailer Truck Drivers	Medium	13,360
Maintenance and Repair Workers, General	Medium	10,810
Carpenters	Medium	7,340
Automotive Service Technicians and Mechanics	Medium	6,220
Computer User Support Specialists	Medium	5,950
Market Research Analysts and Marketing Specialists	Medium	4,990
Machinists	Medium	3,920
Industrial Machinery Mechanics	Medium	2,340
Dental Hygienists	Medium	2,130

Sources: University of Oxford and Burning Glass Technologies model, Pittsburgh 7-county MSA

Table 1: Select Occupations by Risk of Automation (continued)

Occupation	Risk of Automation	Total Employment in Pittsburgh MSA
Retail Salespersons	High	35,970
Laborers and Freight, Stock, and Material Movers, Hand	High	18,100
Construction Laborers	High	9,460
Operating Engineers and Other Construction Equipment Operators	High	5,220
Team Assemblers	High	4,380
Loan Officers	High	3,670
Pharmacy Technicians	High	3,250
Welders, Cutters, Solderers, and Brazers	High	3,160
Electrical and Electronic Equipment Assemblers	High	2,950
Inspectors, Testers, Sorters, Samplers, and Weighers	High	2,760

Sources: University of Oxford and Burning Glass Technologies model, Pittsburgh 7-county MSA

AGGREGATE LABOR DEMAND UPDATE

Inflection Point 2016 projections for occupational growth continue to be on track and are noted in the following table.

Table 2: Employment Summary by Occupation Family

Occupation Family	2017 Employment	Annual Openings 2015-2025	Projected Growth Rate	Unemployment Rate
Office and Administrative Support	**197,410**	**21,094**	**0%**	**5.1%**
Food Preparation and Serving Related	107,900	18,628	5%	9.2%
Sales and Related	124,127	17,188	0%	6.0%
Transportation and Material Moving	79,485	8,979	4%	7.4%
Personal Care and Service	53,561	7,190	10%	5.7%
Production	**66,754**	**6,542**	**-1%**	**6.4%**
Construction and Extraction	**59,460**	**5,422**	**5%**	**8.0%**
Business and Financial Operations	**61,756**	**5,356**	**5%**	**3.8%**
Building and Grounds Cleaning and Maintenance	37,939	5,252	4%	6.8%
Healthcare Support	**39,569**	**5,103**	**15%**	**5.5%**
Healthcare Practitioners and Technical	**84,830**	**4,174**	**12%**	**1.7%**
Installation, Maintenance, and Repair	**48,401**	**3,927**	**5%**	**4.8%**
Education, Training, and Library	66,411	3,844	2%	3.1%
Management	62,885	3,596	4%	2.0%
Community and Social Services	23,705	2,720	7%	1.5%
Protective Service	24,405	2,166	3%	4.4%
Computer and Mathematical	**35,945**	**2,104**	**11%**	**3.3%**
Arts, Design, Entertainment, Sports, and Media	18,906	1,496	2%	4.4%
Architecture and Engineering	**25,631**	**1,350**	**3%**	**3.6%**
Life, Physical, and Social Science	**10,565**	**671**	**7%**	**4.0%**
Legal	10,998	559	7%	1.1%
Farming, Fishing, and Forestry	1,800	243	-7%	7.9%
Grand Total	**1,242,443**	**127,604**		

Sources: 2017 employment and unemployment data from JobsEQ

Bold Occupations are those areas explored in-depth in "High-Demand Occupational Sectors" in *Inflection Point* 2016.

LOOKING BACK: FASTEST GROWTH OCCUPATIONS 2012-2017

The prevalence of online job postings serves as an excellent metric for measuring the industry demand for a particular occupation on a year to year basis. Visualizing the ebbs and flows of occupational demand from year to year can allow one to zero in on trends that will later affect the long-term outlook of the regional labor market. This differs from projected job growth, which serves as a longer-term trend metric and takes other workforce factors into consideration like unemployment compensation claimants and number of job seekers in the labor market.

In order to best understand where the regional labor market is headed, it is important to see what occupations have been the fastest-growing up to this point. While occupations across all sectors have seen demand grow between 2012 and 2017, a select number of them have seen their rate of demand reach far beyond the regional average. For example, industry demand (measured by the number of job postings) for Heavy and Tractor-Trailer Drivers has grown at just over eight times the regional average. Similarly, job postings for Registered Nurses have grown at just over four times the regional average.

Occupations that have seen demand spike since 2012 include:

- Heavy and Tractor-Trailer Drivers
- Real Estate Sales Agents
- Drivers/Sales Workers
- Registered Nurses
- Physician Assistants
- Cashiers
- Physicians and Surgeons
- Compensations, Benefits, and Job Analysis Specialists
- Teachers and Instructors
- Nursing Assistants

Source: Burning Glass Technologies

Notably, over half of the occupations listed here have not only seen sharp spikes in demand since 2012, but also pay a living wage (at least $15.00 per hour). Additionally, four of the 10 occupations listed are in the healthcare sector which continues to grow throughout the Pittsburgh region.

Source: Burning Glass Technologies

LOOKING AHEAD: FASTEST GROWTH OCCUPATIONS 2015-2025

For those occupations requiring Sub-BA or BA+ credentials, the following are projected to see the fastest growth through 2025. This data has not changed since 2016's *Inflection Point* report.

Table 3: Top-10 Sub-BA Occupations by Projected Growth Rate (Minimum 500 Employed)

Occupation	Projected Growth Rate
Physical Therapist Assistants	31%
Occupational Therapy Assistants	30%
Diagnostic Medical Sonographers	21%
Electrical Power-Line Installers & Repairers	20%
Industrial Machinery Mechanics	20%
Cardiovascular Technologists & Technicians	19%
Emergency Medical Technicians & Paramedics	16%
Computer-Controlled Machine Tool Operators	16%
Medical Secretaries	15%
Licensed Practical & Licensed Vocational Nurses	15%

Table 4: Top-10 BA+ Occupations by Projected Growth Rate (Minimum 500 Employed)

Occupation	Projected Growth Rate
Speech-Language Pathologists	28%
Personal Financial Advisors	23%
Operations Research Analysts	21%
Diagnostic Medical Sonographers	21%
Physical Therapists	21%
Information Security Analysts	20%
Occupational Therapists	20%
Computer Systems Analysts	19%
Healthcare Social Workers	18%
Market Research Analysts & Marketing Specialists	15%

Sources: Employment data from Burning Glass Application of Bureau of Labor Statistics Projections
Methodology Note: Minimum 500 employed, 2015. Only considers occupations that pay a living wage ($15/hr) based on median wage

SKILLS AND COMPETENCIES

The qualitative data developed for *Inflection Point* 2016 relied on research and focus groups with more than 130 industry leaders across all high-demand occupational sectors. Looking ahead to 2025, employers voiced confidence that academic and technical skills could be effectively taught, especially with the continued growth of online learning platforms. However, employers expressed considerable concern about the challenges of both teaching and effectively assessing behavioral skills needed in the workplace. Employers expressed strong consensus that workers will need to exhibit four key traits: digital fluency; soft skills or "baseline" competencies; interest and willingness to assume a leadership role; and an agile mindset geared to continuous learning.

These findings are echoed in numerous nationally and globally focused workforce studies which emphasize the importance of high level behavioral skills. As technology transforms occupations, specific human skills, such as emotional intelligence, understanding context and the ability to define business-related challenges, will become increasingly important.[5] Indeed, Thomas Friedman has suggested that the three "Rs," – reading, writing and arithmetic – must now be married to four "Cs," – collaboration, communication, critical thinking, and coding.[6]

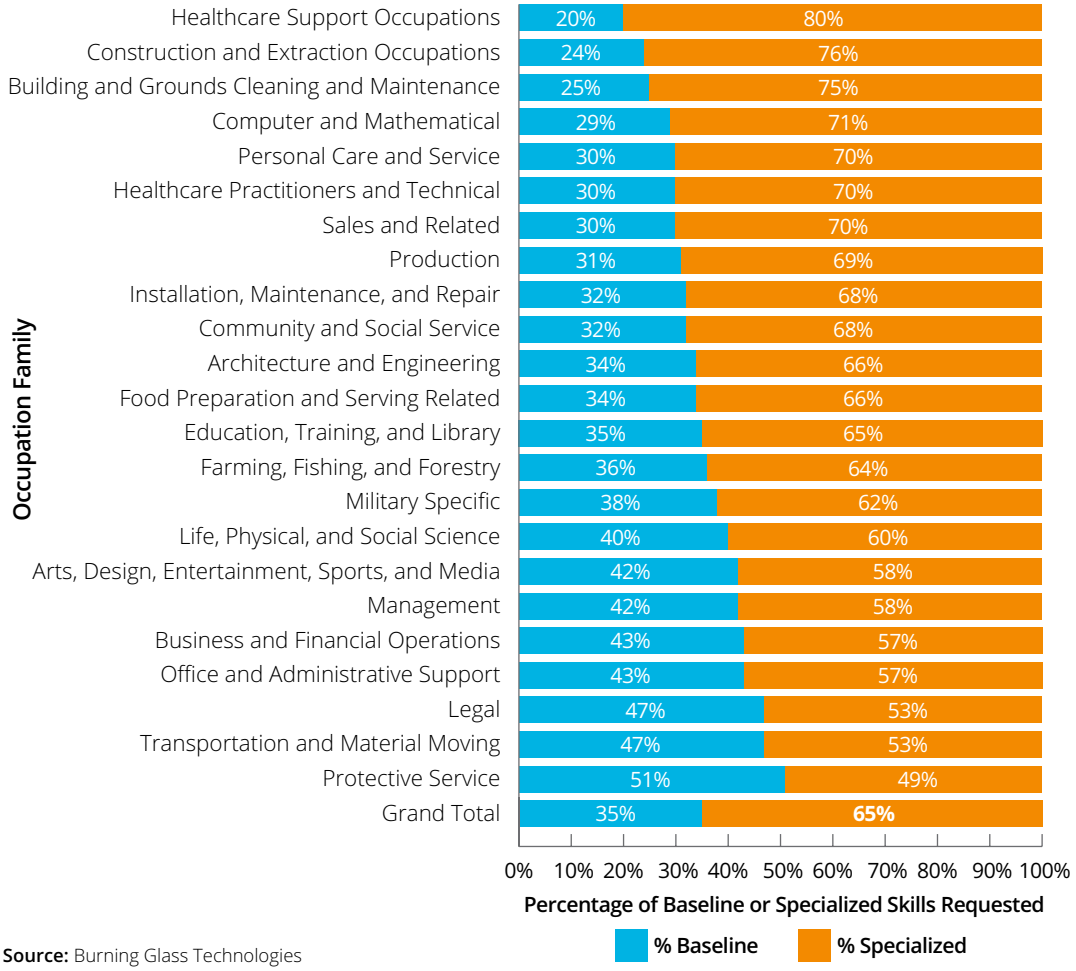
An increasing number of employers are seeking talent with robust behavioral skills, and those skills are seen as a prerequisite to be considered for a job. Baseline skills that are expected to increase in importance over the next decade include:

- Project Planning and Development Skills
- Troubleshooting
- Technical Assistance
- Self-Starter
- Creativity
- Performance Analysis
- Team Building
- Mentoring
- Decision Making
- Planning

Source: Burning Glass Technologies model

While all occupational families require a mix of baseline and specialized skills, it is critically important that educators, students and job seekers understand that the skill mix is not evenly divided across all occupations. Only a few occupations require a fairly even blend of baseline and specialized skills. Details on the particular skills requested for each occupational family can be found in the appendix.

Table 5: Baseline Skills vs. Specialized Skills Requested by Occupation Family



Source: Burning Glass Technologies

EMERGING JOB TITLES, OCCUPATIONS AND TRENDS IN EMPLOYER DEMAND

While technology is impacting every sector of the regional economy, its rapid development is also leading to new job titles and emerging fields. This development is taking place most notably within Information Technology occupations. In particular, job titles related to information security and web development have grown in prominence since 2012 and are showing no signs of reaching a plateau.

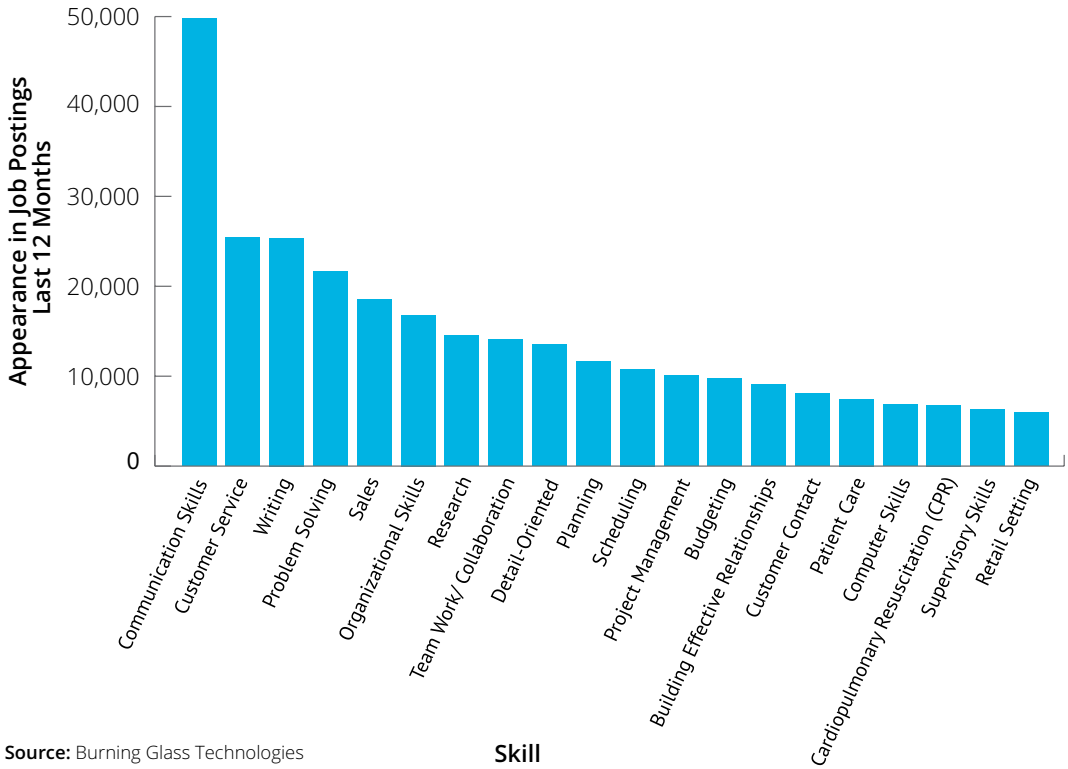
In the information security space, titles like "Security Specialist," "Data Security Analyst" and "Security Manager" are becoming more common. While regional growth in the field since 2012 has been slightly slower than regional job growth overall, long-term growth (2015-2025) is projected to be 20%.

For web development, employers appear to be particularly interested in individuals that have skills in user interface (UI) development. Postings for "User Interface (UI) Developer" and "Web User Interface (UI) Developer" increased more than fivefold from 2012-2017. Employers are increasingly specific and deliberate about the skills they are requesting (in this case, UI development). By putting the main skill they are seeking in the job title rather than posting for a less-specialized "Web Developer," employers are more effective in targeting talent. Long-term growth for web development-related occupations is projected at 23%, and much of that growth will be attributed to those who specialize in user interface development.

A still rare but growing job title in both the Pittsburgh region and nationally is "Machine Learning Scientist." Machine Learning is a rapidly expanding field of computer science that gives computers the ability to learn without being explicitly programmed to perform a task. There were no postings for this job title in 2012, but between August 2016 and July 2017 there were 23 online job postings. While demand for Machine Learning Scientists is currently small, this is a field and occupation that is expected to grow rapidly.

As highlighted in Chapter Two, new industries experiencing rapid growth are creating entirely new skill demand. However, interviews with autonomous vehicle companies in the region revealed that the number one demand overall is a *trait* rather than specific *skill:* the desire and ability to learn a new, high-order skill, such as coding, every single day.

Figure 1: Overall skill demand trends



Source: Burning Glass Technologies

DEMOGRAPHICS AND THE TALENT PIPELINE

Pittsburgh has a large cohort of high-skill, high-wage talent working in industries with low unemployment. At the same time, there continues to exist a large cohort of occupations with average wages of less than $15 per hour. Nationally, income inequality is at a record high, with one-fifth of wage earners receiving more than half of all overall income.[7]

The Construction and Production occupational sectors experienced the highest unemployment rates in 2016 and continue to have those pain points in 2017. However, employment has ramped up significantly for both sectors. In 2016, Construction and Production unemployment stood at 16% and 10%, respectively, but both rates have lowered significantly to 8% and 6.4%.

Figure 2: Unemployment in the Pittsburgh MSA is 4.8% –September 2017[8]
In spite of a tightening labor market and low unemployment, people in certain occupations continue to experience long-term unemployment:

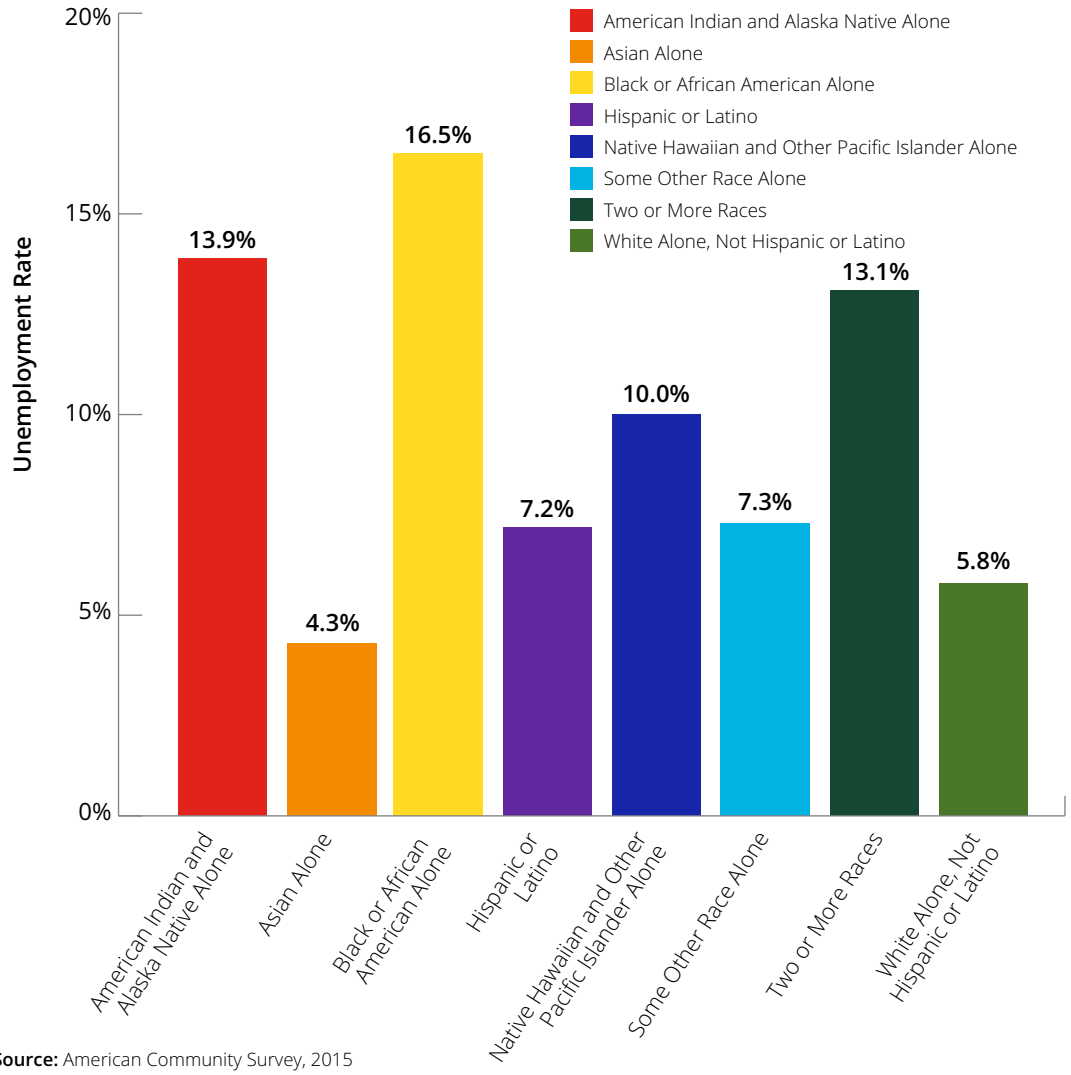
Unemployment, including long-term unemployment, is high in:
- Construction & Extraction Occupations (8% unemployment, 4,587 unemployed)
- Production Occupations (6.4% unemployment, 4,587 unemployed)

Unemployment is low in:
- Healthcare Occupations (2.9% unemployment, 3,726 unemployed)
  - Healthcare Practitioners (1.7% unemployment, 1,438 unemployed)
  - Healthcare Support (5.5% unemployment, 2,289 unemployed).
- Information Technology Occupations (3.3% unemployment, 1,323 unemployed)[9]

10-COUNTY DEMOGRAPHICS ON INCOME, EMPLOYMENT AND EDUCATION

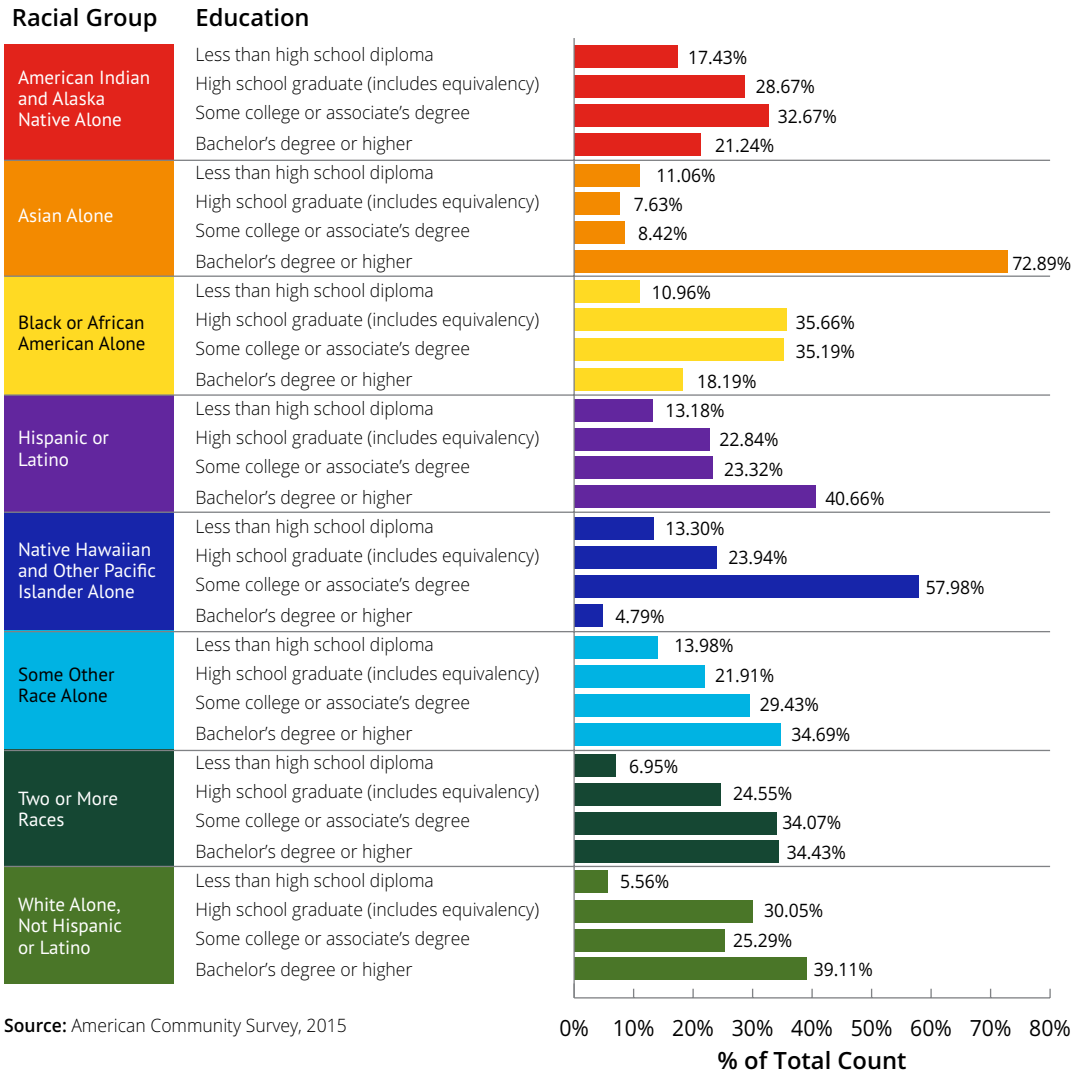
Levels of income, employment and education vary widely by race, gender and within each of the 10 counties of the Pittsburgh region. Figures 3-6 provide an overview of Allegheny County, followed by a link to detailed demographics on each county.

Figure 3: Unemployment Rate by Race in Allegheny County



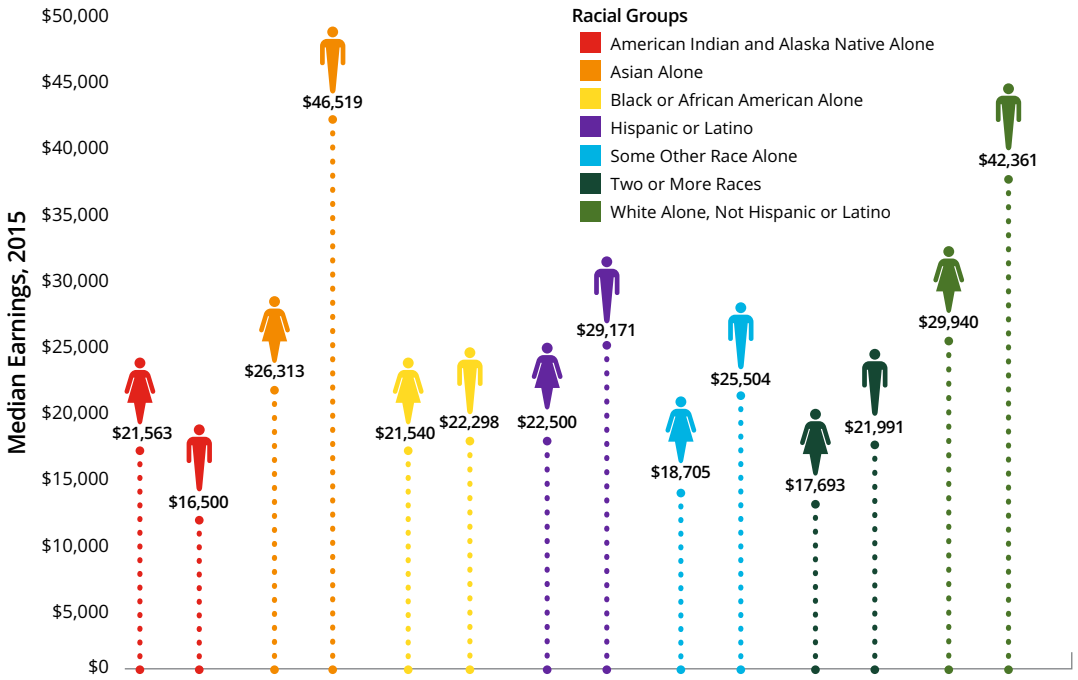
Source: American Community Survey, 2015

Figure 4: Education Attainment by Race in Allegheny County



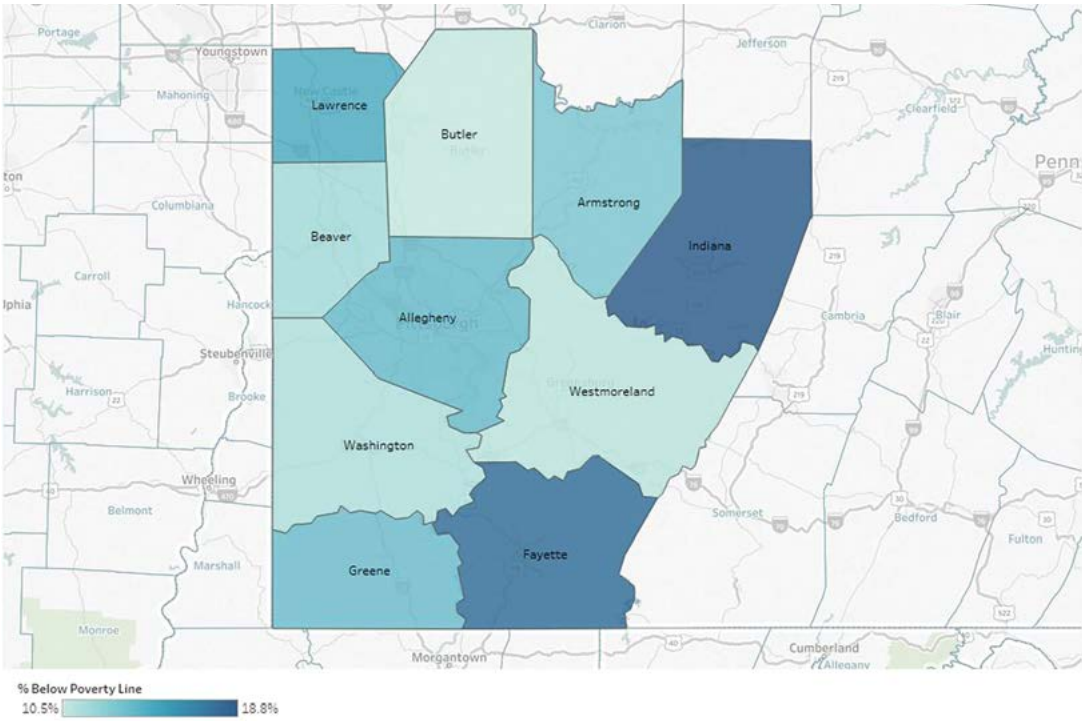
Source: American Community Survey, 2015

Figure 5: Median Yearly Earnings by Gender and Race in Allegheny County



Source: American Community Survey, 2015

Figure 6: Percentage Below the Poverty Line by County in the Pittsburgh Region



DEMOGRAPHIC DATA BY COUNTY

Detailed demographic data on income, education and employment by race for each county is available **HERE**.

DIVERSITY AND INCLUSION

The United States is becoming increasingly diverse. Research indicates that regions deliberately focused on diversity in the workforce do better overall economically, and high levels of racial inclusion and income equality correlate with better resilience in an economic downturn. By 2044, the U.S. will be majority-minority, but the workforce will hit that metric a decade earlier. Diversity and inclusion efforts that support black-, Hispanic-, and women-owned businesses, as well as immigrants, not only engage more of the resident population, they also drive economic growth as minority-owned businesses are among the fastest growing with high rates of entrepreneurship.[10]

While employers in the Pittsburgh region have consistently identified diversity as a priority, they also express difficulty identifying and recruiting a diverse workforce. In customer-facing roles, a diverse workforce is a requirement for companies to successfully meet the needs of an increasingly diverse customer base. For example, healthcare employers describe diversity of the workforce as a "service delivery imperative" in order to match the diversity of the patient base.

A Call to Elevate, Retain and Attract Diverse Talent

The Workforce Diversity Indicators Initiative identified that southwestern Pennsylvania struggles to mirror the rest of metropolitan America's workforce, and must increase its ability to elevate, retain, and attract minority talent. Minorities who work in administrative and support services—the most diverse occupational sector in the region—earn average incomes that are among the lowest reported across all industries. Minority workers in the Pittsburgh MSA are least likely to work in many of the highest-paying industries.[11]

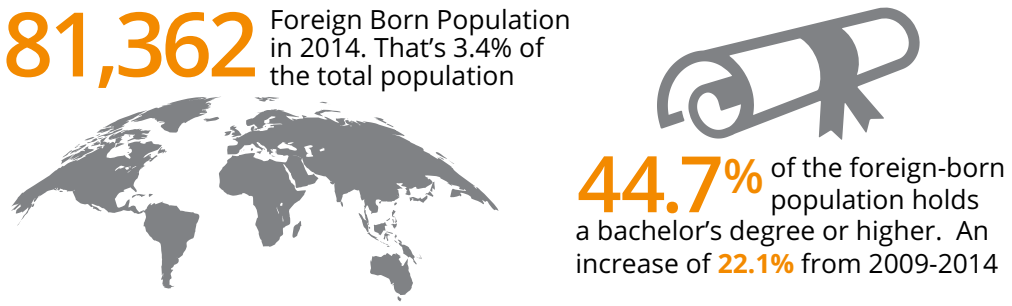
The Pittsburgh region also experiences a net loss of African American talent: 10% of African Americans who hold bachelor's degrees move into the region, but 14% depart. Focus groups conducted by the Allegheny Conference with African American leaders and stakeholders have indicated that decisive factors for leaving the region include the absence of economically stable African American neighborhoods, a perceived lack of both an African American middle class and limited employment and advancement opportunities. Lack of diversity, especially in professional occupations, makes recruiting – and retaining – external talent significantly harder for local employers. Some firms offer affinity or internal groups to help build a support network for new recruits, but the broader lack of community diversity poses challenges to retaining new workers, especially those with spouses and families.

Pittsburgh Immigrant Demographics

From 1970 to 1990 immigration fueled population growth across much of the U.S. However, during this period Pittsburgh experienced a mass exodus of talent due to the collapse of the steel industry. As a result of these massive job losses, immigrants bypassed Pittsburgh for employment opportunities elsewhere. As the regional economy has recovered, the immigrant population has grown, but is not on par with the pace of growth nationally.

While the overall population in Pittsburgh declined by 0.06% in 2014, the foreign-born population grew by 13.85% during that same time period in the region.[12] Looking at immigrant contributions from another perspective, without immigration from 2000-2015, the Pittsburgh region would have lost an additional 100,000 people. Yet even this progress leaves Pittsburgh far behind the rest of the nation, with just 3.4% of its population foreign-born versus a national average of 13%.

Figure 7: Foreign-Born Population and Education Levels



Source: World Affairs Council of Pittsburgh, Global Snapshot (2016-2017). Based on Pittsburgh MSA.

Pittsburgh has many of the ingredients that make for a globally diverse region, but has so far been unable to connect individual areas of strength into a coherent and connected welcoming message. For example, more than 400 foreign-owned companies, representing 37 different countries of ownership and employing 53,363 people, are based in the region. The Pittsburgh Public School system has students that hail from 57 countries, with 46 native languages that are spoken with Nepali, Spanish, and Swahili being the top three.

The educational attainment of its foreign-born population makes this talent cohort highly competitive, with nearly 50% holding a bachelor's degree or higher, contributing to the growing stature of Pittsburgh as one of the most highly educated cities in the country.[13]

Refugees also contribute to the regional workforce and are immediately eligible to work.[14] Since 2001, 5,035 refugees were resettled in just Allegheny County with Bhutan, Burma, Iraq, and Somalia as the top countries of origin. In 2016, 651 refugees were resettled, an increase from previous years.[15] Many refugees arrive with a wide range of vocational skills and technical expertise, but varying English-language abilities can make some employment transitions challenging. Highly skilled refugees also often face challenges transferring foreign credentials and certifications to a U.S. marketplace, creating barriers to working in their field.

International Student Impact

International students are a regional economic engine contributing more than $367 million to the higher education system in Pittsburgh through tuition, fees, and room and board, as well as supporting more than 5,000 higher education jobs. In 2015, Carnegie Mellon University and the University of Pittsburgh ranked among the top five universities with the highest number of foreign students in the state.[16]

Table 5: Top Local Universities that benefit from international students

University	Impact of Int'l Students	Jobs Supported
Carnegie Mellon University	$183.2M	3,240
University of Pittsburgh (Main)	$100.6M	1,723
Duquesne University	$29.5M	485
Robert Morris University	$19.3M	141
La Roche College	$10.9M	77
Chatham University	$7.9M	56
Point Park University	$5.5M	42

Source: World Affairs Council of Pittsburgh, *Global Snapshot* (2016-2017).

An Inside Look at Visa Categories

Absent comprehensive immigration reform, it can be extremely challenging for students who wish to remain in this country for employment to do so given both the complexity and competitiveness of visa programs. However, understanding the resources available to employers is an important step toward retaining top international talent in our region:

H1-B Visa Program: Allows companies in the United States to temporarily employ foreign workers in occupations that require the theoretical and practical application of a body of highly specialized knowledge who possess a bachelor's degree or higher in the specific specialty, or its equivalent. H-1B specialty occupations may include fields such as science, engineering and information technology.[17]

Each year, 65,000 H1-B visas are available nationwide and an additional 20,000 are available for those individuals with a Master's degree or higher from a U.S. academic institution. Petitions must be filed by April 1 of the year in question with an effective date of October 1; approximately 30% of applicants accepted into the program. It is important to note that universities and non-profits are exempt and can hire foreign nationals without being subject to this quota.

In 2015, 3,545 H-1B visa requests were made in the Pittsburgh region. The top five occupations included:

- Program Analyst
- Computer Programer
- Software Developer
- Business Analyst
- Resident – Internal Medicine

Source: World Affairs Council of Pittsburgh, *Global Snapshot* (2016-2017).

F1 Student Visa: Allows students to enter the United States as a full-time student at an accredited college, university, seminary, conservatory, academic high school, elementary school, or other academic institution or language training program. Student must be enrolled in a program that culminates in a degree, diploma, or certificate, and the institution must be authorized by the U.S. government to accept international students.[18]

Optional Practical Training (OPT): Upon completion of an academic program, students are eligible for temporary employment that is directly related to the F-1 student's major area of study. Students are eligible to receive up to 12 months of OPT employment authorization, and if the area of study was in a STEM discipline, they are eligible to extend up to 24 months if offered a job by an employer that participates in the "e-verify" employment verification process. If students are not able to attain OPT employment, they are required to leave the country 60 days after completing the program.[19]

O1 Visa: Allows individuals to gain employment status if they demonstrate extraordinary ability in their field as it relates to sciences, education, business, or athletics. These are often niche skills that are otherwise unavailable in the U.S. labor market and most often apply to Ph.D. professionals and researchers. All applicants are subject to burden of proof.[20]

K-12 AND THE CAREER AND TECHNICAL EDUCATION (CTE) SYSTEM

Inflection Point 2016 increased regional attention on the critical importance of effective career awareness and preparation for K-12 students, the long-term talent pipeline. Many educators lack access to real-time jobs data, information about future workforce trends, and the ability to infuse classroom curricula with relevant workforce information. Given current estimates that 65% of children currently entering elementary (or preK-6) school will work as adults in occupations that currently do not exist, a focus on future skill demand is critical.[21]

In September 2017, Pennsylvania Governor Tom Wolf and Secretary of Education Pedro Rivera released Pennsylvania's consolidated education plan in response to the federal Every Student Succeeds Act (ESSA). Pennsylvania's plan for the first time emphasizes the importance of career and post-graduation preparation for every K-12 student.

Strong and continued demand for workers with less than a four-year degree in key sectors such as healthcare and production will require a high-school Career and Technical Education (CTE) system closely aligned to employer demand. Further, as technology and job requirements will continue to evolve, students must also develop the cognitive skills to accompany technical ones which will allow them to remain competitive.[22] Several of the largest regional CTE programs are for occupations with low salaries and limited demand, while others with strong demand and higher wages remain under-enrolled.

Table 6: CTE Workforce Pipeline and Industry Demand: Cosmetology vs. Machine Tool Technology

CTE Program Name	Regional Enrollment 2013-14	Regional Enrollment 2015-16	Average Annual Openings
Cosmetology	1215	1265	1175
Machine Tool Technology	358	336	777

Source: 2015-2016 CTE Program Enrollment, Pennsylvania Bureau of Career and Technical Education; Regional Occupational Demand, Burning Glass Technologies model

POST-SECONDARY EDUCATION AND TALENT RETENTION

Over 40,000 students graduate from 61 higher education institutions in our region each year, but 50% of them leave for other regions, and the number one reason students cite for leaving is their inability to find a job. Based on student surveys, this is a combination of a lack of understanding of the employment and quality of life opportunities in the region, and an inflation of job posting requirements (e.g. years of experience and elevated degrees) that leave many candidates out of the running for entry-level positions.

As indicated earlier in this chapter and in Chapter 3, educational institutions responded quickly to the 2016 *Inflection Point* report to ensure that course offerings reflected high-demand occupations. IPEDS data is not yet available to determine if students are choosing majors in high demand more frequently than in previous years given the availability of regional data for projected job growth and high-demand occupations.

RECOMMENDATIONS FOR ACTION: UPDATE ON PROGRESS

Inflection Point 2016 defined itself as an initial "stake in the ground" to spur community discussion, and as outlined in Chapter Three, the region's response has been swift, but also widely varied. Both K-12 and postsecondary educators have been quick to embrace and begin acting on many of the report's findings.

Colleges and universities have focused on changes within their own institutions, including curriculum and programmatic, with many adding new courses reflecting growing occupational demand and new industries. Even more encouraging is their growing focus on collaboration, with new systemic initiatives devoted to building transfer credit and programming agreements with other regional institutions to better support college completion.

Industry overall has been slower to respond directly to the call to invest more intently and proactively in the talent pipeline. The Allegheny Conference conducted a survey of corporate Human Resource leaders over the summer of 2017. Among the 100 responding companies, the findings indicated that even in a tightening labor market, their number one strategy remains 'more local recruiting' in what is an increasingly competitive talent pool. Employers were not widely considering easing potential barriers to increasing that pool, such as degrees earned or years of experience, internships, or recruiting outside the region, as tactics to increase applicant flow.

THE EMPLOYER COMMUNITY MUST LEAD CHANGE AND SHIFT FROM BEING CONSUMERS OF TALENT TO BECOMING INVESTORS IN THE LABOR MARKETPLACE

Industry needs to frame and support a more effective and sustainable model to enable education and training providers to better understand changing skills demands.

Inflection Point 2016 suggested that an important first step would be using the report data to convene employers with common occupational needs. This work has begun in multiple occupational sectors, including healthcare, financial services, energy and manufacturing. Employers in these sectors clearly recognize that required skill sets in their industries are creating more urgency for new kinds of skill building, not only in incumbent workers, but as a critical element of developing a strong talent pipeline. Collaboration across industries on the basis of common, cross-sector occupational demand is also being recognized as a potentially effective tool to increase public recognition of the breadth of job opportunity, and to drive greater focus on training for the highest demand skills and competencies.

A significant challenge for employers is not only recognizing the need to prepare workers for lifelong learning and skill building, but also knowing specifically how to prepare individuals for work that is not yet clearly defined.[23] A recent McKinsey study suggests that successful companies will not simply have new technology tools, but will be distinguished by their employees' ability to make effective decisions on how best to use them.[24]

For its part, the Allegheny Conference has pledged to serve as a bridge, convening educators and employers to develop collaborative initiatives addressing elevation, retention and attraction. Since the 2016 report release, numerous initiatives have developed through Conference engagement as well as dozens of other organizations playing a similar role. The more companies that come forward proactively and ask to engage with other employers and educators, the faster effective solutions can be scaled.

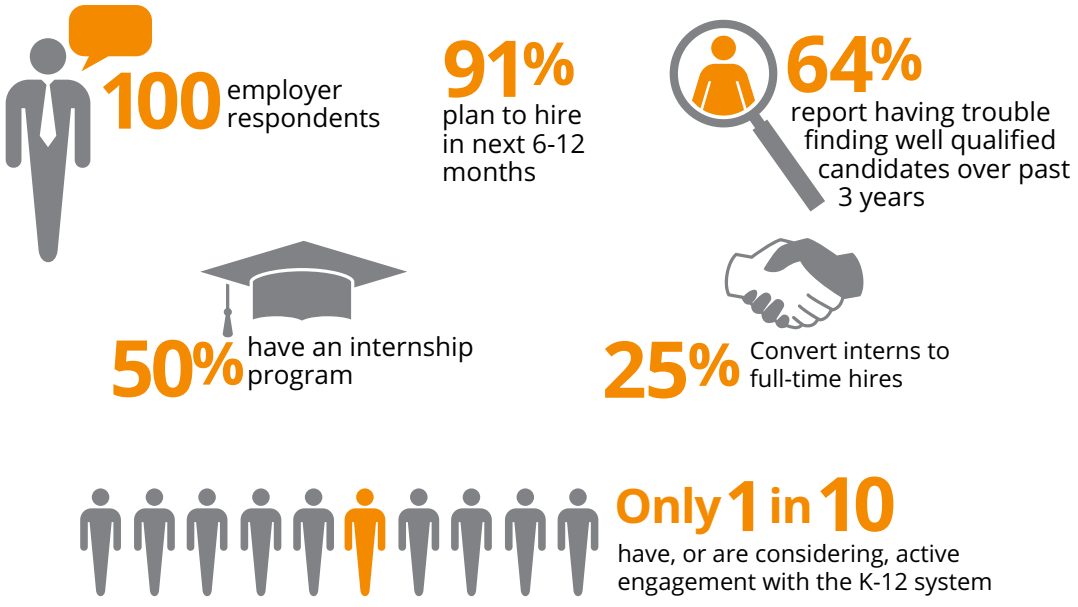
Engage employers directly in a collaborative effort to retain more college graduates
Across the region's 61 institutions of higher education, 50% of its 40,000 annual graduates leave the region, with the number one reason for departure being that they cannot find a job here. There continues to be an urgent and collective need by employers and educators to promote the region and its opportunities to college students to increase graduate retention.

A new Allegheny Conference program, designed to educate college students about regional employment and quality of life assets, began in 2016. The program focuses on students in majors that map to high-demand occupations and provides them with one-on-one access to hiring managers and young professionals in their field, as well as insight into cultural and recreational assets in the region. The program also focuses on enhancing the knowledge and capacity of career services departments to sell the region to students.

Student surveys fielded before and after four regional tours with students from six universities indicate that this experiential model is effective:

Pre-Tour Student Survey	Post-Tour Student Survey
66% said they 'sometimes' or 'rarely' leave campus to explore the city	80% said their impression of Pittsburgh somewhat or greatly changed
63% felt they had a good understanding of job opportunities in the region	100% felt they had a better understanding of employment opportunities
60% said they love Pittsburgh and plan to stay after graduation	94% said they are now more likely to stay in Pittsburgh after graduation

Less encouraging are findings from the Allegheny Conference's 2017 survey of Human Resource practices among 100 regional employers. As part of this year's report, the Allegheny Conference conducted a survey of HR directors to get an inside look at how employers are solving workforce challenges. Companies that participated in the survey ranged from fewer than 100 employees to more than 10,000, and represented all major sectors.



In a tightening labor market, the top strategy for nearly all is to increase local recruiting, even as the total labor pool is increasingly challenged by retirements and slow population growth. The responses indicate a continuing mindset of "just-in-time" approaches to hiring, rather than investing in growing talent and the future pipeline.

Of all hiring tactics cited, including increased wages, employee referrals and changes to company culture, employers were least likely to relax experience requirements. For "entry level" jobs requiring a college degree, more than two-thirds of employers either prefer or require at least 1-2 years of experience. The most frequent reasons cited for this are centered on not wanting, or being able, to train new employees in basic workplace skills.

In some of the region's highest demand and hardest to fill occupations, such as those in computer science and IT, 42% of current job postings require a minimum of 3-5 years of experience. Yet the evidence is clear that many IT students are hired away from this region before or upon graduation resulting in a shortage that is expected to be greater than 1,000 IT workers in the coming year.

Focus on collaborative approaches to the talent pipeline.
The HR survey showed that fewer than half of employers provide internship opportunities, and of those that do, only half convert their interns to full time employees upon graduation. Focus groups held with students indicate that the number one reason they leave the region is that they say they cannot find a job here.

Internship programming is one area ripe for more corporate collaboration. As the HR survey results indicate, the region has a captive talent base with its college students, many with work experience, but fewer than half the companies surveyed take advantage of this. Broadly promoting more internships, and collaborating on quality of life programming to complement the intern work experience, could help achieve more scale in selling the region to young talent.

In addition, too few employers have responded to the inflation of credentials required in job postings, artificially reducing their potential pool of applicants, and increasing the likelihood that college students will be lured away by other regions.

FOCUS ON UPSKILLING TALENT IN THE REGION

Create explicit pathways to upward mobility.
Without question, the ability to mine very specific employer skill demand – academic, technical and behavioral – provides much greater clarity about potential educational and training gaps among those seeking employment and career advancement. Workforce boards, educators and training providers are responding with new programs focused on building core skills required across numerous occupations, as well as introducing new tools to recruit potential talent.

In response to data that demand for tech workers will grow 2.6 times faster than the market overall, Partner4Work, the City of Pittsburgh, and the Allegheny Conference, came together to launch Tech Hire Pittsburgh – a program that aims to build a local, diverse pipeline to help meet demand for IT talent across sectors. The 2016-17 pilot sought to take an innovative approach to solving for the talent gap, starting with the mobile application "Booeys: A Ghost Code," developed by SimCoach Games, as a screening tool to determine applicant's aptitude for coding.

The inaugural boot camps launched with two cohorts aimed to quickly upskill motivated job seekers for entry-level positions in quality assurance and coding. While students graduated with demonstrable coding skills, finding full-time employment, in spite of industry stated demand, proved to be challenging because of persistent 4-year degree requirements in job postings for relevant occupations. The IT skills are in demand, but more work needs to be done to assess how best to present these skills in a credential or portfolio that would be better understood by hiring managers.

Focus on the development of emerging, cross-cutting skills and competencies.
There are a set of baseline skills and competencies which are increasingly in demand in the market and which employers across all sectors cited as gaps: digital skills, work-ready behavioral skills, and the ability to continue to learn and grow on the job.

Hospitality and retail occupations offer many youth their first professional experience. As a first job, these sectors can be an invaluable setting in which to develop lifelong learning skills. At the same time, incumbent workers in these sectors will also need to enhance or develop new skills to remain competitive. In February 2017, Pittsburgh became one of six cities nationally to be awarded funding by The Aspen Institute for a new program titled "Re-imagine Retail." It is an initiative designed to identify skills gained in frontline retail positions that can be rigorously developed through training, and then leveraged for upward mobility within retail, or made transferrable to other industry sectors, in occupations such as customer service and call centers in healthcare and business/financial services.

Reimagine Retail provides a framework for creating new understanding of how entry level workers across a range of ages and generations can best be encouraged to shift to a culture of continuous learning, and how that learning can be most effectively offered to workers. The goal is to grow upward mobility within retail and hospitality as well as to have these positions serve as a jumping off point for a skilled workforce, ready to fill the workforce pipeline in growing career fields (see Chapter Three/Eat'n Park use case).

CAPITALIZE ON INNOVATION IN INFORMATION TECHNOLOGY, ADVANCED MANUFACTURING AND BUSINESS/FINANCIAL SERVICES

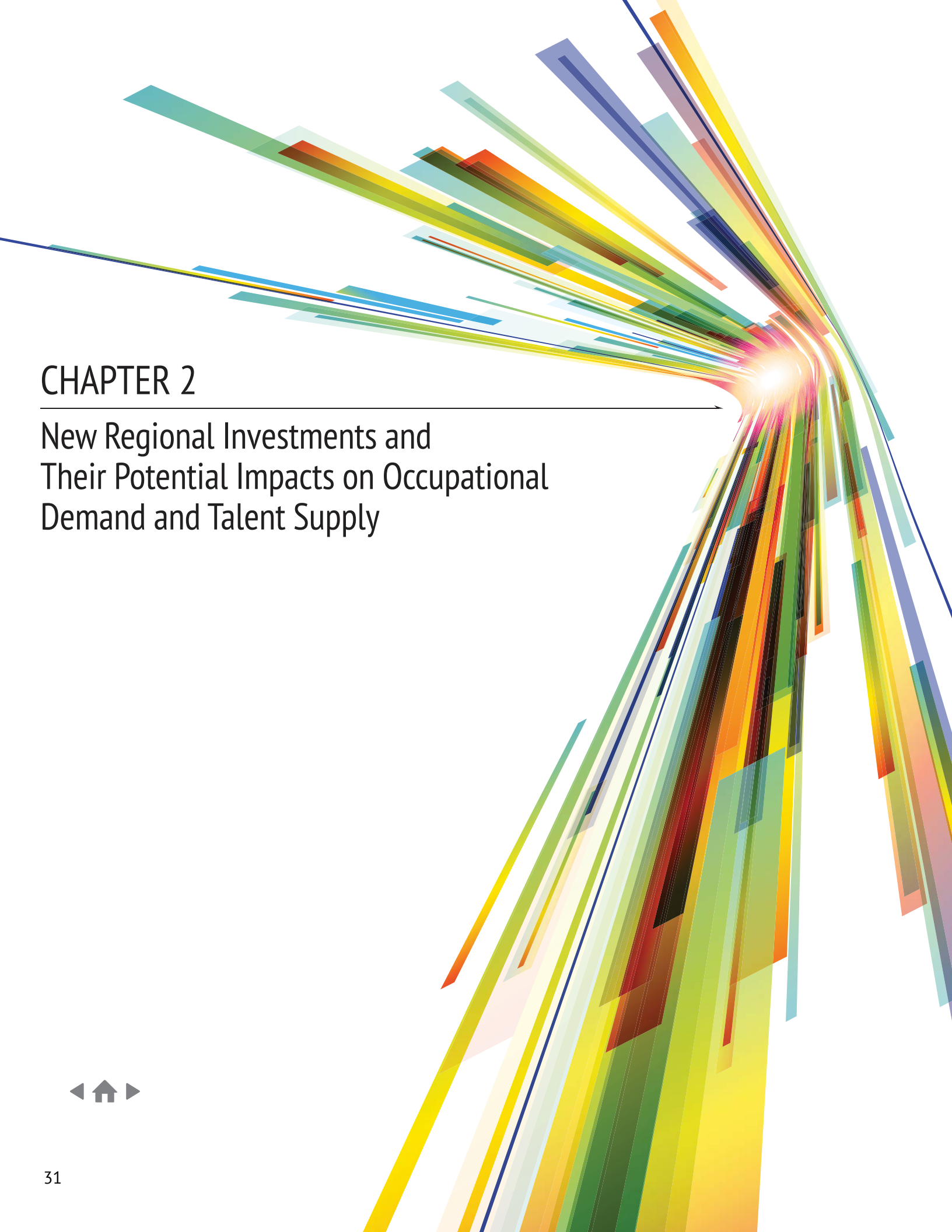
Build a bridge to connect larger regional employers and the start-up innovation economy.

Inflection Point 2016 noted that Pittsburgh faces a talent shortfall both in the overall number of workers and in the high-skill professions that drive the innovation economy.

New momentum to bridge larger employers and the start-up community was created by the September 2017 release of major new Brookings Institution study entitled *Capturing the next economy: Pittsburgh's rise as a global innovation city*. The report inventories Pittsburgh's most significant innovation assets as well as critical factors which can endanger the region's opportunity. The report suggests a focus on growing advanced manufacturing, life sciences and autonomous systems concomitantly with entrepreneurial support and the creation of an intentional focus on filling talent-related occupational gaps.

Pittsburgh's October 2017 response to Amazon's second headquarter competition provided the need impetus to develop a coordinated and sustained effort to define the Pittsburgh employment brand to promote inbound migration and talent retention. Further, the process of bringing multiple partners together to craft the response underscored the imperative to more effectively link and coordinate the many organizations promoting the region.

View the video that was part of Pittsburgh's bid to be Amazon's HQ2



CHAPTER 2

New Regional Investments and Their Potential Impacts on Occupational Demand and Talent Supply

NEW REGIONAL INVESTMENTS AND THEIR POTENTIAL IMPACTS ON OCCUPATIONAL DEMAND AND TALENT SUPPLY

As a center of research and innovation, the Pittsburgh region continues to attract business investments and talent that fuel rapidly emerging clusters such as autonomous vehicles, additive manufacturing and collaborative robotics. These newer industries actually play to Pittsburgh's historic strengths in manufacturing and leverage the research and innovation power of the universities here, putting the region on a plane with top innovation cities around the world. The implications of this for the workforce here include extremely high demand for certain software and engineering expertise, and the emergence of brand new skill sets and competencies that will be needed to drive explosive growth. For example, one autonomous vehicle company stated that the most in-demand skill is the desire and ability to learn a new high-level skill, on the order of coding, every day, just to keep pace.

At the same time, these industries will have growing talent demand for high skill technicians – field technicians, electrical engineering technicians, maintenance technicians – already in very high demand in a wide range of energy, manufacturing and logistics companies, ratcheting up further pressure on the local talent supply and pipeline.

In addition to brand new industries, the once-in-a-generation investment in the ethane cracker in southwestern Pennsylvania, and its associated downstream activity, will force the development and scaling of an entirely new workforce in petrochemicals that is on par with that of the Gulf Coast region of the U.S.

Reflective of major investments made in these innovative new clusters, this chapter focuses on the associated workforce supply and demand implications for the Pittsburgh region.

AUTONOMOUS VEHICLES

The immense promise and possibility of autonomous vehicles, both in Pittsburgh and beyond, is well documented. A study from Intel and Strategy Analytics estimates that the autonomous vehicle industry could be worth $7 trillion annually by 2050[25], and Pittsburgh's depth of autonomous vehicle companies and researchers, led by firms such as Uber, Argo AI, Delphi, and Aurora, places it at the vanguard of the industry. However, for Pittsburgh to retain its position at the forefront of the autonomous vehicle revolution and benefit from the vast opportunity in the field, it must ensure the region continues to build and support the resource that brought the industry to Pittsburgh in the first place: talent.

Pittsburgh is already a leader when it comes to autonomous vehicle talent. The region's deep bench of engineering graduates—many of whom come from the robotics and engineering programs at Carnegie Mellon University (CMU) and the University of Pittsburgh (Pitt)—is attracting pioneering autonomous vehicle firms to Pittsburgh at a rapid pace. In the last 12 months, there were 288 openings for jobs related to autonomous vehicles in Pittsburgh. This translates into twice as many per capita openings in Pittsburgh than the U.S. average. This also represents dramatic year-over-year (YoY) growth of 324% – six times faster than growth in the sector nationally and significantly faster than other autonomous vehicle hubs, such as San Francisco, San Jose, and Detroit. All signs point to continued demand growth in Pittsburgh, as Uber continues to hire aggressively in the region and both Delphi and Argo AI have publicly stated plans to grow their local workforces by dozens or hundreds of employees in the next one to two years.

Location	YoY Growth in Job Openings Related to Autonomous Vehicles
Pittsburgh	***324%***
San Francisco	228%
San Jose	70%
Detroit	61%
U.S. Overall	54%

Looking Beyond IT: The autonomous vehicle sector creates jobs in diverse domains
As the autonomous vehicle sector has grown, much of the discussion around jobs in the sector has focused on the core IT roles related to the field – such as Software Developers and Computer Systems Engineers – and these roles certainly play a large role in the industry. In Pittsburgh and the U.S. overall, Software Developers are the most in-demand role in the autonomous vehicle sector, which reflects the importance of digital technology in the field. In Pittsburgh, however, the autonomous vehicle industry has stronger demand for Mechanical Engineers, which are the 2nd-most requested job among Pittsburgh's autonomous vehicle employers. This underscores the value of Pittsburgh's depth of engineering and, especially, robotics talent coming from CMU, Pitt, and other local institutions as on-road fleets are designed and built.

Key Technical Jobs in the Autonomous Vehicle Industry	
U.S.	**Pittsburgh**
Software Developer	Software Developer
Computer Systems Engineer	Mechanical Engineer
Electrical Engineer	Computer Systems Engineer
Mechanical Engineer	Engineering Manager
Network Engineer	Network Engineer
Software QA Engineer	Electrical Engineer
Engineering Manager	Computer Scientist
IT Project Manager	UI / UX Designer / Developer
Data Scientist	Software QA Engineer
Product Manager	Civil Engineer

The strong demand for IT and engineering roles doesn't capture the full impact of the autonomous vehicle sector on Pittsburgh's job market, however. The sector's emergence has also driven growth in downstream jobs that support the industry, which may offset job losses associated with automating driving-related roles. Some of these roles are clearly connected to the industry and its unique hiring needs – such as Automotive Service Technicians – but many roles support traditional business functions – such as Sales Representatives and Accountants. In Pittsburgh there is also heightened relative demand for Recruiters, which may reflect local employers' plans to rapidly expand their Pittsburgh workforce.

Moving forward, as more autonomous vehicle companies in Pittsburgh build self-driving fleets, their hiring needs will expand to include more roles supporting the maintenance and operation of self-driving cars. These roles may not require the technical expertise of engineers, creating new opportunities in the sector for workers from a diverse set of backgrounds. However, these roles may still be out of reach for workers displaced from driving-related roles, so upskilling initiatives may be needed to prepare these workers for other opportunities in the job market.

Key Autonomous Downstream Jobs	
U.S.	**Pittsburgh**
Automotive Service Technician	Sales Representative
Business Development Manager	Automotive Service Technician
Marketing Manager	Recruiter
Financial Analyst	Accountant
Account Manager	Technical Writer

Building the Talent Pipeline: Pittsburgh's strength lies in its universities, but the region must ensure graduates remain in the local talent pool

To support the rapid expansion of Pittsburgh's autonomous vehicle workforce and help the industry reach its full potential, there must be a steady pipeline of talent in the region. Much of this talent must come from local universities and, currently, Pittsburgh's institutions of higher education are producing an above average supply of graduates for some of the most important roles related to autonomous vehicles. For the three largest roles in Pittsburgh's autonomous vehicle sector – Software Developers, Mechanical Engineers, and Computer Systems Engineers – Pittsburgh has more graduates per entry-level opening than the national average. This gives Pittsburgh a competitive advantage when it comes to entry-level talent, and is a main draw for autonomous vehicle employers.

Occupation	BA+ Graduates Per Entry-Level Opening: Pittsburgh	BA+ Graduates Per Entry-Level Opening: U.S.
Software Developer	0.31	0.07
Mechanical Engineer	1.36	0.45
Computer Systems Engineer	2.06	0.46

However, openings for these roles in Pittsburgh are still taking longer to fill than the national average, suggesting that Pittsburgh's above average graduation rates aren't translating into decreased hiring difficulty for employers. For example, Software Developer openings remain open 13 days longer in Pittsburgh than the U.S. overall, while Mechanical Engineers and Computer Systems Engineers remain open nine and 17 longer, respectively.

Occupation	Average Opening Duration: Pittsburgh	Average Opening Duration: U.S.
Software Developer	56 Days	43 Days
Mechanical Engineer	52 Days	43 Days
Computer Systems Engineer	63 Days	46 Days

This disconnect between Pittsburgh's large talent pipeline and increased hiring difficulty may result from multiple factors. First, graduates may be leaving Pittsburgh for regions with higher salaries. Although Pittsburgh's cost of living is less than many other major cities, the average advertised salary in Pittsburgh's autonomous vehicle industry is below the national average. In Pittsburgh, the average advertised salary in the autonomous vehicle industry is $81,682 – nearly $4,000 below the national average. If openings for key jobs in the sector remain difficult to fill, however, this will place upward pressure on salaries and may close the gap between salaries in Pittsburgh and the rest of the U.S. This would cost more for employers, of course, but it also may make it easier to attract and retain talent in the region.

Location	Average Advertised Salary in the Autonomous Vehicle Sector
Pittsburgh	$81,682
U.S.	$85,487

Second, the mix of skills requested by Pittsburgh's autonomous vehicle industry creates a unique set of hiring requirements in the region. For example, autonomous vehicle firms in Pittsburgh are more likely to request skills related to robotics – a reflection of CMU's heavy influence on the local workforce. However, there are many other industries vying for Pittsburgh's finite pool of workers with robotics expertise, so regional competition for these skills is fierce. Therefore, if the autonomous vehicle industry is to continue to thrive in Pittsburgh, local training providers must band together with industry, policymakers, and other stakeholders to insure a steady supply of workers with the requisite skillsets.

Key Skills Requested in the Autonomous Vehicle Industry	
U.S.	**Pittsburgh**
Software Development and Engineering	Software Development and Engineering
C++	C++
Electrical Engineering	**LINUX**
Python	Python
LINUX	**Robotics**
JAVA	**UNIX**
MATLAB	Machine Learning
Machine Learning	Systems Engineering
Systems Engineering	Project Management
Project Management	MATLAB

Bolded skills are in greater demand in Pittsburgh than the U.S. overall.

PPG'S NEW ROLE IN THE AUTONOMOUS VEHICLE AND ADDITIVE MANUFACTURING INDUSTRIES

Pittsburgh's contributions to the autonomous vehicle and additive manufacturing sectors extend beyond developing the core enabling technologies for these industries. Local materials manufacturers – such as PPG – also play a significant role in developing innovative component technologies for the autonomous vehicle and additive manufacturing sectors.

For instance, one of the core enabling technologies for autonomous vehicles are Lidar sensors. Lidar works by sending pulses of light at objects, then using the speed of the reflection to calculate distance and position. Unfortunately, darker-colored vehicles – which are more common than lighter-colored vehicles – are poor at reflecting these light pulses, hindering Lidar's performance. To mitigate the poor reflective abilities of dark coatings, PPG developed dark coatings that reflect light as effectively as lighter-colored coatings. This one innovation can significantly improve the performance of Lidar sensors. PPG has also developed paint that may be used on road signage and markings to enhance their reflective abilities and to enable them to interact in an optimal way with Lidar sensors. In addition, PPG is adapting from its aerospace coatings, to improve the conductivity and dissipation of the excessive heat generated by sensors and electronics such as Lidar, computer controls and electrical controls in autonomous vehicles.

Advanced coatings also benefit the additive manufacturing sector. Many parts built using additive manufacturing are not yet as visually appealing as parts manufactured with traditional processes, and 3D printed-metal parts have micro ridges that can cause corrosion. To address these issues, PPG is developing coatings that are corrosion-resistant and integrated into the additive manufacturing process to help manufacturers develop more visually appealing and corrosion-resistant products.

Supporting these advanced coatings requires a hybrid workforce with individuals well-versed in multiple engineering disciplines. Creating more reflective coatings for the autonomous vehicle industry, for example, doesn't just require chemists and chemical engineers, but electrical engineers and engineers with backgrounds in sensor-related technologies. Considering these types of important downstream jobs that support the autonomous vehicle and additive manufacturing industries is necessary when evaluating the talent needs of Pittsburgh's emerging sectors, and underscores the true reach of these growing industries in the region.

ADDITIVE MANUFACTURING

Additive manufacturing – also known as "3D printing" – has emerged as a promising leap forward in manufacturing technology. The additive manufacturing process – in which physical objects are designed electronically and then built by adding layers of material on top of one another – enables rapid prototyping, faster time-to-market, and distributed manufacturing capabilities that can have a transformative impact on the manufacturing industry. The global additive manufacturing market is projected to exceed $6 billion by 2022.[26] Locally, Pittsburgh has seen a surge in the additive manufacturing industry, buoyed by investments such as General Electric's $39 million Center for Additive Technology Advancement (CATA) and Alcoa's $60 million expansion of its local R&D center, as well as R&D initiatives at local universities, such as Carnegie Mellon University (CMU), the University of Pittsburgh (Pitt), and Robert Morris University.

The Pittsburgh region's status as an emerging leader in this field is reflected in its additive manufacturing workforce. In the past 12 months, there were 132 postings for jobs explicitly related to additive manufacturing in the Pittsburgh region. This translates into twice as many per capita additive manufacturing job openings in the Pittsburgh region than the national average. Even more striking is the sector's rapid growth in the region. Year-over-year (YoY) growth of Pittsburgh's additive manufacturing job demand was 128% – over 14 times faster than the sector's national YoY growth. This easily makes Pittsburgh the nation's fastest-growing major metropolitan area for job openings related to additive manufacturing.

Location	YoY Growth in Job Openings Related to to Additive Manufacturing
Pittsburgh	***128%***
U.S.	9%

Chemical engineering features prominently in Pittsburgh's additive manufacturing workforce, as do local academic and research institutions

The majority of in-demand jobs in the additive manufacturing sector are technical roles related to engineering and IT. In Pittsburgh, additive manufacturing job demand skews more heavily toward chemical engineering, with chemical engineers and chemists both among the top 10 requested occupations. This is primarily driven by the presence of prominent materials manufacturing companies in the region, such Alcoa, Arconic and PPG, and underscores Pittsburgh's prominence across the additive manufacturing value chain: Pittsburgh doesn't just develop finished products using additive manufacturing, it develops the materials that make additive manufacturing possible.

Top Jobs	
U.S.	**Pittsburgh**
Mechanical Engineer	Mechanical Engineer
Software Developer / Engineer	**Chemical Engineer**
Manufacturing Engineer	Manufacturing Engineer
Sales Representative	**Materials Engineer**
College Professor	College Professor
Materials Engineer	**IT Project Manager**
Industrial Designer	**Chemist**
Business Development / Sales Manager	**Production Plant Manager**
Product Manager	**Manufacturing / Production Technician**
Marketing Manager	Business Development / Sales Manager

Bolded jobs are in higher demand in Pittsburgh than the U.S. overall.

Pittsburgh's local universities also exert a strong influence on the local additive manufacturing job market. In Pittsburgh, university talent accounts for a third of additive manufacturing hiring demand – double its national share. This demand is primarily driven by additive manufacturing research centers at CMU and Pitt.

Top Five Industries			
U.S.	U.S. Percentage	Pittsburgh	Pittsburgh Percentage
Manufacturing	46%	Manufacturing	54%
Professional Services	20%	Education	33%
Educational Services	16%	Professional Services	6%
Information	3%	Finance and Insurance	3%
Finance and Insurance	3%	Information	1%

Manufacturing the Talent: Pittsburgh has a strong pipeline of engineering talent for additive manufacturing, but some jobs remain hard to fill

To reach its full potential, Pittsburgh's additive manufacturing industry needs a steady pipeline of talent and evidence suggests local universities are already up to the task. Relative to the U.S. overall, Pittsburgh has more graduates per entry-level opening for the four largest roles in Pittsburgh's additive manufacturing sector, giving Pittsburgh a competitive advantage when it comes to entry-level talent.

Occupation	BA+ Graduates Per Entry-Level Opening: Pittsburgh	BA+ Graduates Per Entry-Level Opening: U.S.
Mechanical Engineer	1.36	0.45
Manufacturing Engineer	6.95	1.62
Chemical Engineer	11.78	3.10
Materials Engineer	7.14	4.32

However, Pittsburgh's high graduation totals don't always translate into decreased hiring difficulty for employers. Job listings for Mechanical Engineers and Manufacturing Engineers, for example, remain open considerably longer in Pittsburgh than the U.S. overall, suggesting the region's above average supply of graduates isn't reducing local hiring difficulty for these fields. On the other hand, Chemical Engineers and Materials Engineers both have shorter average opening durations in Pittsburgh than the U.S. average, which may partially explain their above average demand in the local additive manufacturing sector.

Occupation	Average Opening Duration: Pittsburgh	Average Opening Duration: U.S.
Mechanical Engineer	52 Days	43 Days
Manufacturing Engineer	61 Days	46 Days
Chemical Engineer	42 Days	44 Days
Materials Engineer	32 Days	40 Days

Pittsburgh's increased hiring difficulty for Mechanical Engineers and Manufacturing Engineers is likely due to additional factors constricting the local talent pipeline. One such factor may be heightened filtering requirements. For example, employers in Pittsburgh are considerably more likely to request graduate degrees for Mechanical Engineers or Manufacturing Engineers: 43% of Mechanical Engineer job openings in Pittsburgh require or prefer a graduate degree, compared to 28% nationally, and 24% of Manufacturing Engineers in Pittsburgh require or prefer a graduate degree, compared to 18% nationally. These advanced education requirements are accompanied by experience requirements that are at parity with employers in other regions. Employers who struggle to fill these roles must determine whether advanced education credentials are necessary, as lowering education requirements could reduce pressure on the talent pipeline and increase the pool of qualified workers supporting Pittsburgh's additive manufacturing sector.

Location	% of Openings that Require or Prefer Graduate-Level Degrees	
	Mechanical Engineer	Manufacturing Engineer
Pittsburgh	43%	24%
U.S.	28%	18%

ROBOTICS

Robotics is a rapidly growing field with deep roots in Pittsburgh. Local universities and research institutions, such as CMU and Pitt, have long driven innovation in the field, and the region is poised to be an epicenter of the boom in the robotics industry. Boston Consulting Group (BCG) estimates that worldwide spending on robotics will jump from just over $15 billion in 2010 to about $67 billion by 2025[27], and Robotics technologies are disrupting a diverse range of industries, from manufacturing to healthcare, to logistics and entertainment. The impact of robotics is rippling across the labor market as well, in Pittsburgh and beyond. Local employers are demanding robotics talent across industries, such as Omnicell, University of Pittsburgh Medical Center (UPMC), and Smith & Nephew in Healthcare, and Seegrid, Uber, and Delphi in Automotive Technology Manufacturing. While much of the national workforce conversation related to robotics has focused on the potential loss of jobs, many in-demand roles reflect growing opportunity in the field. Pittsburgh's workforce is already tapping into these opportunities, and is well-positioned to capitalize on the emerging demand for robotics technologies.

When it comes to the robotics-related workforce, Pittsburgh is already a leader. In the last 12 months, there were 768 openings for jobs related to robotics in Pittsburgh. Per capita, this translates to over twice as many openings in Pittsburgh than in the U.S. overall, underscoring Pittsburgh's role as a hub for robotics talent. The region has also seen a dramatic year-over-year (YoY) growth in the robotics sector of 59% – almost triple the national average of 22%. The intense growth in robotics job openings in Pittsburgh far outpaces other competitive regions such as New York, Detroit, and San Francisco, indicating that Pittsburgh is a front runner in the growing supply and demand for robotics talent.

Location	YoY Growth in Job Openings Related to Robotics
Pittsburgh	***59%***
New York	54%
Detroit	27%
San Francisco	25%
Boston	18%
U.S. Overall	22%

A Tale of Two Jobs: The Robotics Workforce Breaks into Producers and Consumers
Demand for robotics-related roles falls into two broad categories: "Producer" roles who design and build the actual robotics technologies, and "Consumer" roles who are primarily focused on the application and maintenance of robotics technologies in various industrial sectors.

Producer roles are at the center of most conversations related to robotics-related job opportunities and comprise some of the core technical roles tasked with developing robotics technologies, such as Software Developers, Mechanical Engineers, and Electrical Engineers, to name a few. The strong demand for these roles, both in Pittsburgh and the U.S. overall, highlights the importance of technology as a core driver of growth in robotics, as well as the value that a strong talent supply chain in engineering can bring to the sector. Pittsburgh's education and training infrastructure is well-positioned to prepare workers for Producer roles, with institutions such as CMU and Pitt heavily invested in the field. The Robotics Institute at CMU, for instance, not only trains students to build a skilled robotics workforce, but also serves as one of the region's largest employers of robotics graduates, hiring for roles related to design, development, and testing of robotics systems. This strong pipeline of Producers could place Pittsburgh in a key position within the robotics supply chain for years to come.

Key 'Producer' Jobs in Robotics	
U.S.	**Pittsburgh**
Software Developer	Software Developer
Electrical Engineer	Mechanical Engineer
Mechanical Engineer	Electrical Engineer
Manufacturing Engineer	Computer Systems Engineer
Computer Systems Engineer	Software QA Engineer
Network Engineer	Network Engineer
Chemical / Process Engineer	Hardware Engineer
Engineering Manager	Computer Scientist
IT Project Manager	Industrial Engineer
Industrial Engineer	IT Project Manager

The second half of the robotics workforce are Consumers. Although Consumers are less visible than Producers, they nevertheless play a central role in the robotics job market. Consumers are roles that leverage robotics technologies to perform key job functions. Key Consumer roles include maintenance and field service technicians, engineering technicians, physicians and other healthcare roles, as well as various production occupations. Given the rapid growth of investment in robotics, expected to quadruple by 2025, demand for highly skilled technicians could dampen growth if this talent pipeline is not significantly expanded. The same high-skill technicians are already in very high demand in a wide range of energy, manufacturing and logistics fields, and employers frequently cite a lack of qualified applicants as the reason for numerous unfilled positions.

In Pittsburgh, there is also heightened demand for business process and analysis roles related to robotics, such as business intelligence analysts, management analysts, and data mining analysts. Most Consumer roles do not require as extensive a technical background as most Producer roles, but they reveal the growing downstream opportunities that robotics supports.

Key 'Consumer' Jobs in Robotics	
U.S.	**Pittsburgh**
Maintenance Technician	Field Service Technician
Physician	Business Intelligence Analyst
Electrical Engineering Technician	Electrical Engineering Technician
Welder / Solderer	Maintenance Technician
Production Worker	Business / Management Analyst
Physician Assistant	Data Mining Analyst
Maintenance / Service Supervisor	Physician
Surveyor	Welder / Solderer
Manufacturing Machine Operator	Health Technician / Technologist
Surgical Technician / Technologist	Security / Defense Intelligence Analyst

Strengthening the Talent Pipeline for Robotics in Pittsburgh

To reach its potential and keep pace with the rapidly growing needs of employers, Pittsburgh's robotics industry needs a steady pipeline of talent. Historically, Pittsburgh has been a key source of robotics talent for the nation: the very first robotics PhD program was founded at CMU in the late 1980's[28]. Graduates from CMU, Pitt, and other universities in the area continue to become the next- generation leaders in robotics research and education. For the top three most demanded roles in Pittsburgh's robotics sector – Software Developers, Mechanical Engineers, and Electrical Engineers – Pittsburgh has far more graduates per entry-level opening than the national average. This puts Pittsburgh at an advantage as it relates to access to talent from top-tier educational institutions.

Occupation	BA+ Graduates Per Entry-Level Opening: Pittsburgh	BA+ Graduates Per Entry-Level Opening: U.S.
Software Developer	0.31	0.07
Mechanical Engineer	1.36	0.45
Electrical Engineer	0.86	0.28

However, openings for two of these three roles take longer to fill in Pittsburgh than the U.S. average. Specifically, job openings for Software Developers and Mechanical Engineers stay open for 13 and nine days longer, respectively, in Pittsburgh than the U.S. overall. This indicates that employers are not able to take full advantage of the high supply of graduates in the region to quickly fill some key roles. Positions for Electrical Engineers, however, are filled nine days faster on average in Pittsburgh compared to the U.S. overall, demonstrating that not all jobs that are critical to the robotics industry are harder to fill in the region.

Occupation	Average Opening Duration: Pittsburgh	Average Opening Duration: U.S.
Software Developer	56 Days	43 Days
Mechanical Engineer	52 Days	43 Days
Electrical Engineer	41 Days	50 Days

Average salaries for robotics roles in Pittsburgh reflect the difficulty employers have finding robotics talent. The average advertised salary in Pittsburgh's robotics sector is $72,437 – nearly $8,000 higher than the sector's average salary nationally. Continued difficulty to fill roles will push these salaries further upward to close the gap between supply and demand for talent. Although this is good news for workers in the sector, it places a financial strain on employers sourcing talent in the region.

Location	Average Advertised Salary in the Robotics Sector
Pittsburgh	$72,437
U.S.	$64,766

Increased salaries and hiring difficulty in Pittsburgh's robotics sector may also be tied to the unique mix of skills requested by local employers. Software and Engineering skills are in greater demand among Pittsburgh's robotics employers, with skills like Software Engineering, Python, LINUX, and Machine Learning all demanded with greater relative concentration in Pittsburgh than the national average. Many of these skills are central to the engineering and robotics programs at universities in the Pittsburgh region, suggesting that robotics employers in Pittsburgh can benefit from greater collaboration with local training providers. Such collaboration can strengthen the local robotics talent pipeline and ensure that Pittsburgh's workforce can meet the growing demands of this dynamic industry.

Key Skills Requested in the Robotics Industry	
U.S.	**Pittsburgh**
Robotics	Robotics
Programmable Logic Controller (PLC) Programming	**C++**
Project Management	**Software Engineering**
Welding	**Python**
Machinery	**Software Development**
Physical Demand	**LINUX**
Electrical Engineering	**Project Management**
C++	**Electrical Engineering**
Inspection	**Machine Learning**
Mechanical Engineering	**Debugging**

Bolded skills are in greater demand in Pittsburgh than the U.S. overall.

LEVERAGING THE REGION'S NATURAL GAS RESOURCES

Nearly a decade into full-scale development of the Marcellus and Utica natural gas plays, a clear strategy to mine natural gas' economic potential is now in place, focused on driving three complementary industry clusters: petrochemicals, advanced materials, and data-driven automated manufacturing.[29]

In June 2016, Royal Dutch Shell announced its final investment decision to proceed with building a multi-billion dollar ethane cracker in Potter Township, Beaver County, signaling one of the largest industrial investments in the region's history. Site preparation and design and engineering work for the facility was conducted from 2012-2017, with Shell Pennsylvania Chemicals announcing the official start of the principal construction phase in November 2017.

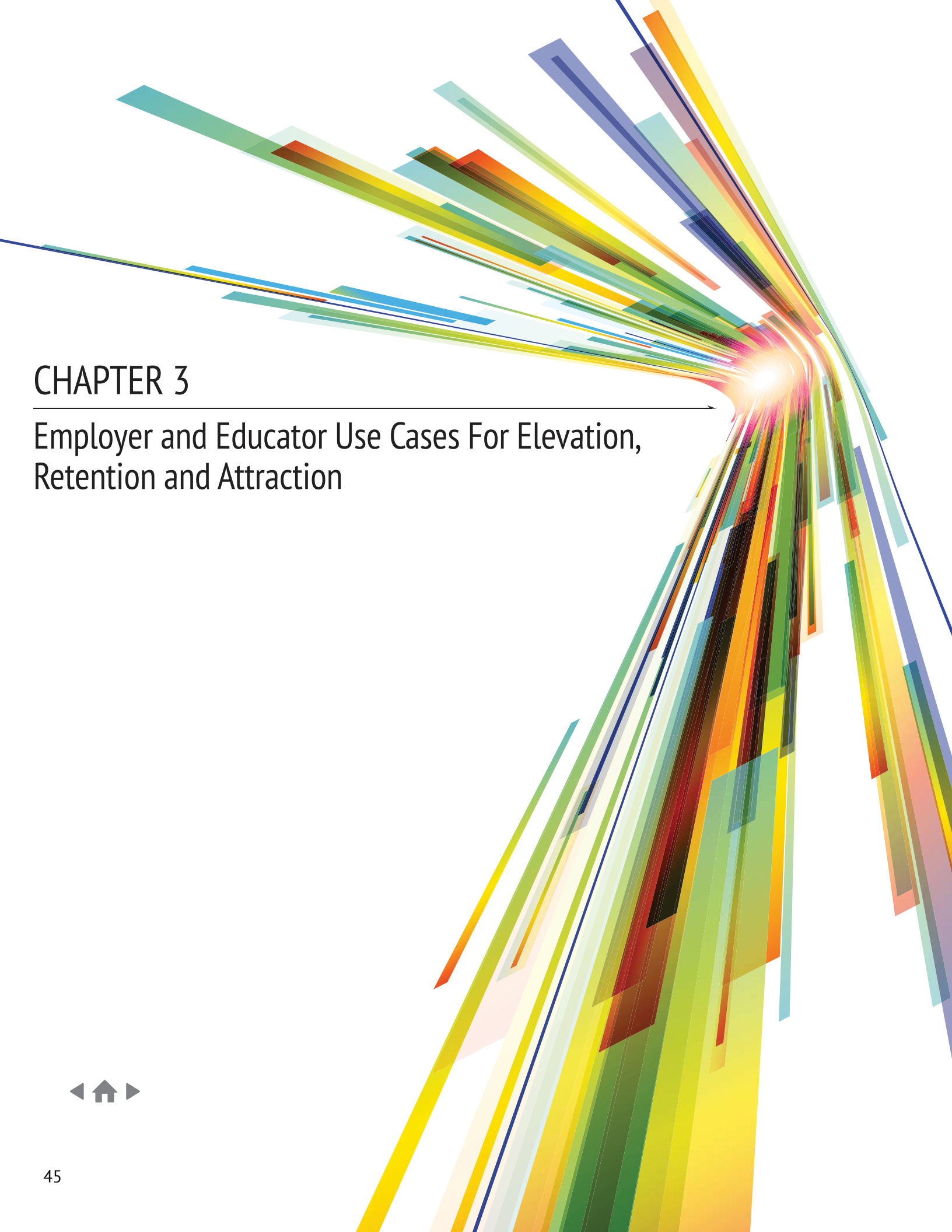
As of December 2017, some 900 construction workers were on site, and up to 6,000 construction workers will be involved in building the facility, with projected operations commencing early in the next decade.

Shell has announced its expectation that there will be 600 permanent employees for the operational phase comprising three main occupational categories: engineers, field personnel and professional disciplines:

- A mix of chemical, electrical, mechanical and environmental engineers will serve as operational site and personnel managers.
- The second occupational category, made up of process operators and craft positions, will work in control rooms and field positions. Wide-ranging positions within this category include process operators and technicians, electricians, analyzer technicians, welders, pipefitters, boilermakers, crane or rig operators, carpenters, insulators, painters and millwrights. This work will be planned and coordinated in conjunction with maintenance supervisors, planners and production team leads.
- Lastly, specific professional disciplines such as health and safety managers, safety specialists and environmental personnel will be on site.

Over time, the abundance of natural gas in the region, and the economic activity created by the Shell Pennsylvania Chemicals facility, will lead to additional business investments.

Other follow-on investments could include plastics manufacturing, ammonia and propane production, additional ethane crackers, and hundreds of miles of mid-stream natural gas pipeline construction.



CHAPTER 3

Employer and Educator Use Cases For Elevation, Retention and Attraction

EMPLOYER AND EDUCATOR USE CASES FOR ELEVATION, RETENTION AND ATTRACTION

Employers

- Appalachia Partnership Initiative
- Duquesne Light Company
- Eat'n Park Hospitality Group
- PNC Financial Services Group, Inc.
- UPMC

Educators

- Carlow University
- Robert Morris University
- University of Pittsburgh
- Regional Tours to Retain College Talent

A wide range of educators and employers were already facing and responding to workforce challenges when the 2016 *Inflection Point* report was released. The report informed efforts further and the following use cases highlight several of these efforts to rethink, and redesign how we elevate, retain and attract talent in the region.

Appalachia Partnership Initiative

Program Description: The Appalachia Partnership Initiative (API) is a model of coordinated private sector funding that can help scale efforts to close the workforce gap. Since its founding in 2014, API partners* have invested millions of dollars and other resources in education and training programs. Chevron Appalachia alone has dedicated $20 million to the regional effort.

Regional Model for Collaborative Funding

Guided by research and stakeholder input, API brings together educators, business leaders and community members to support innovative, fit-for-purpose education and training opportunities across the region, with an emphasis on rural communities. API members make their own independent funding decisions, but coordinate investments to yield maximum impact.

API has invested in FabLabs, to give students a first-hand experience with the importance of STEM and fabrication skills to modern workplaces. The regional flagship lab is located in the Carnegie Science Center, but others are in places like the Intermediate Unit 1 facility in Grindstone, Fayette County – bringing hands-on learning to students who often miss out on such opportunities. Other, mobile Fab Labs serve Pittsburgh neighborhoods as well as rural communities in Fayette, Greene, Washington and Westmoreland counties as well as parts of Ohio and West Virginia.

API also supports project-based learning in schools as well as career and technology centers across rural southwestern Pennsylvania. These unique learning spaces present students with opportunities and the gear to design, engineer and produce products with 3-D printers, laser cutters and other software-driven tools.

For those soon to enter or already in the workforce, API supports workforce development programs including ShaleNET, a partnership among employers and technical colleges in Ohio, West Virginia and Pennsylvania.

The ShaleNET model, with API support, has been expanded to create a deeper network of technical training capacity across a range of energy and manufacturing occupations with common high skill demand. TEAM, or Tri-state Energy and Advanced Manufacturing, will connect educator and training providers across the 27-county tri-state footprint of API.

**The Appalachia Partnership Initiative was created in 2014, by Chevron Corp., the Claude Worthington Benedum Foundation, the RAND Corp. and the Allegheny Conference on Community Development to develop a new generation of energy and advanced manufacturing workers across 27 counties in southwestern Pennsylvania, northern West Virginia and eastern Ohio. Members continue to join the partnership, including The Grable Foundation and Catalyst Connections.*

Duquesne Light Company

Company Description: As a next-generation energy company, Duquesne Light Company's nearly 1,500 employees are dedicated to delivering reliable and safe energy to more than half a million customers in southwestern Pennsylvania.

Building a Pipeline for the Future Workforce

Utilities in the Pittsburgh region felt the impact of an aging workforce earlier than some other sectors, but forward thinking and strategic planning from Duquesne Light Company's leadership put the infrastructure in place to start combatting their workforce challenges five years ago. Leadership recognized the need to re-envision the company by targeting a younger workforce and creating a pipeline for talent. This strategy included rebranding efforts, advertising, website development and the creation of a talent acquisition department to meet the demand for full-time recruitment and community outreach.

In anticipation of retirements and workforce turnover, hiring jumped from 100-200 in previous years to 700-800 in the last two to three years. In 2012, capitalizing on data analytics, the company determined that 48% of its overall workforce was eligible for retirement. To get ahead of that potential wave of retirements, Duquesne Light partnered with the Community College of Allegheny County to revitalize the Electrical Distribution Technology (EDT) program, a 12-month certificate program that prepares students for entry-level skilled craft positions. Many skilled craft workers started in the EDT program and have since moved on to management positions, which the company hopes to continue facilitating as a means of in-house upward mobility and career growth. Duquesne Light also collaborates with regional Career and Technical Education programs and technical colleges as a talent source for positions that don't require four-year degrees, such as lineworkers, protection and control technicians, substation mechanics and underground splicers.

In response to the *Inflection Point* report, Duquesne Light and Chevron are leading an initiative with the Allegheny Conference to promote an energy and manufacturing workforce talent pipeline structured around common skills and competencies that overlap across several industries. Todd Faulk, vice president of human resources, explains, "We understand that having a well-qualified workforce for our region is imperative to economic growth and sustainability. Throughout our company's history, we've had a strong connection within our communities and this continues to build those partnerships." In an effort to train and elevate the regional workforce collectively, efforts like this move away from "stealing" top talent from other companies and move toward growing a larger pipeline of top talent locally that can stay in the region and thrive.

Eat'n Park Hospitality Group

Company Description: Eat'n Park Hospitality Group is a portfolio of regional foodservice concepts with nearly 10,000 employees that serve 50 million guests every year in their restaurants, on college and corporate campuses, and in every state through their online store, Smileycookie.com.

Reimagine Retail: A First Job with Upward and Outward Mobility

Promoting a family-friendly culture has been a core value at Eat'n Park Hospitality Group since 1949. Its mission of "creating smiles" extends from customers to staff as the company recognizes and prioritizes the happiness and well-being of staff as core to the success of the company. Benefits like healthcare coverage (before it was required by law and before it was a common practice in retail and hospitality), a 401K retirement plan that continued throughout the recession, and flexible work schedules have created a workforce that now spans five generations. Management promotions come from within to drive an internal pipeline based on growth and retirements, but much like the rest of the industry, turnover can be high, and the impending regional workforce shortage has prompted another round of innovative strategic planning.

In 2017, Eat'n Park partnered with the Allegheny Conference for a grant opportunity through the Aspen Institute called Reimagine Retail. Many workers gain invaluable baseline skills in retail and hospitality that are transferable for career growth within retail or outward to other industries that require similar skill sets, such as customer service positions in financial services and healthcare.

This initiative will develop a detailed framework to provide rigorous skills training to develop talent within Eat'n Park or, should staff choose to leave, prepare them for a next position. This training will signal to other employers that the individual has received focused and carefully assessed customer service training by an employer of choice in the region. Eat'n Park recognizes that investing in an internal pipeline will assist their own talent attraction and retention, and that training for common, high-demand skills will benefit the Pittsburgh employer community. Senior Vice President and Chief People Officer, Karen Bolden, explained, "We recognize that many people have their first jobs in our restaurants in high school or college and we want to be an employer of choice for the best first job in the region."

Get an inside view of how PNC builds its pipeline of talent.

The PNC Financial Services Group, Inc.

Company Description: The PNC Financial Services Group is one of the largest diversified financial services institutions in the United States. With employees in more than 40 states across the country; Regional Presidents in 36 markets; a retail branch network that stretches across 19 states and the District of Columbia; and strategic international offices in Canada, China, Germany and the United Kingdom, PNC is organized around its customers and communities for strong relationships and local delivery of retail and business banking, including a full range of lending products; specialized services for corporations and government entities, including corporate banking, real estate finance and asset-based lending; wealth management and asset management.

PNC Offers Pathways to Development – Which Helps It Attract and Retain Great People

More than a decade ago, as a member of The PNC Financial Services Group's Executive Committee, Bill Demchak noticed that PNC's workforce was skewed. The company had a lot of people with deep experience and institutional knowledge, but Bill and other senior leaders recognized the need to develop greater "bench strength" to plan for the future. That prompted PNC to make significant changes to its recruiting approach.

Now, as Chairman, President and CEO of PNC, Bill leads a company that has become a model for how to recruit and retain great people at various points in their careers, with specific actions taken to ensure PNC has an ongoing influx of top talent.

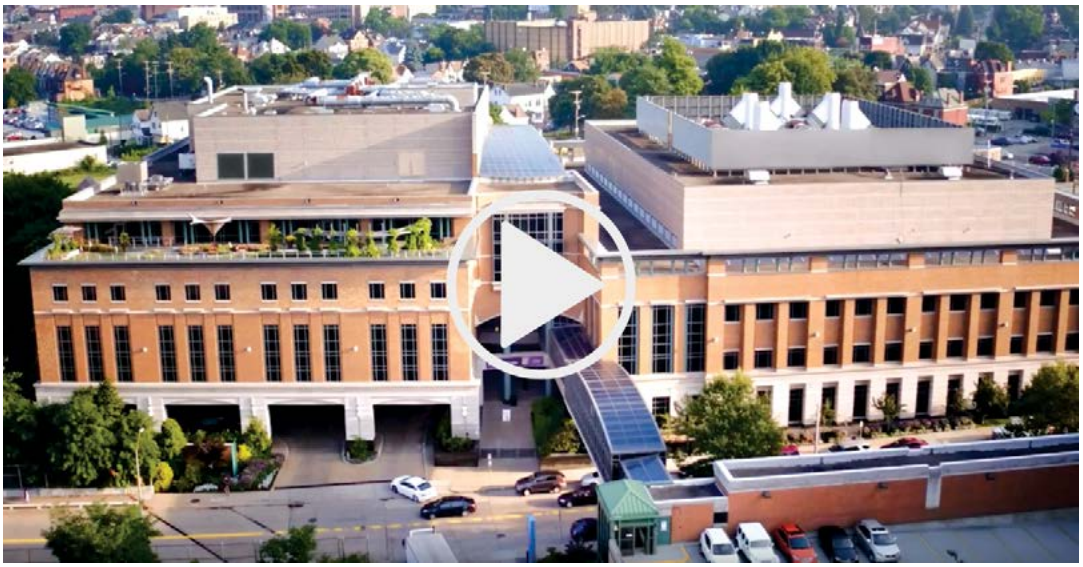
Serving as the foundation of an extensive approach to recruitment and retention, PNC launched Talent Framework as a way to emphasize development for every employee. Every PNC employee has numerous career paths open to them. And every manager has an obligation, as well as access to tools and resources, to help their employees identify and advance on the path that is right for them. That might include development in their current role or opportunities for lateral and vertical moves into other roles across the organization.

"Our employees have ongoing opportunities to see how they can grow in many different directions in our company," says Caitlin McLaughlin, Executive Vice President and Director of Talent Acquisition and Total Rewards. "Talent Framework has shown tremendous return on investment in terms of tracking high performers and retaining them. We've seen a significant decline in turnover since implementing the program," she says.

In addition, PNC's campus recruiting strategy ensures a pipeline of new talent from more than 50 colleges and universities across the country, many of them in the Pittsburgh region, whose student populations are diverse and a good fit for the company.

PNC hires approximately 400 interns every summer, and treats internships as 10-week job interviews for those interested in future opportunities with the company. On average, PNC extends offers to nearly 75 percent of its interns for full-time Development Program positions once they graduate and has seen a significant return on investment on its efforts to identify, attract and develop young talent. In fact, among Development Program participants, former interns perform at a higher level and are more likely to stay with the company than non-interns.

Erin Baker, Vice President and Director of Campus Recruiting and Line of Business Development Programs, points out three ways that hiring interns provides value: they are able to hit the ground running because they have already spent time on the job, getting to know the company; they are familiar with PNC's culture and values; and they start full-time employment with a network already in place, all of which contribute to retention.



Learn about UPMC's strategies for building a diverse talent pipeline.

UPMC

Company Description: Pittsburgh-based healthcare provider and insurer and the largest non-governmental employer in Pennsylvania with over 600 locations, more than 30 hospitals, more than 3.2 million members and 80,000+ employees

Innovative Approaches for Diverse Talent Training and Leadership

As the largest employer in the Pittsburgh region, UPMC faces many of the same workforce challenges companies across all sectors are facing, but on a much larger scale. Currently, UPMC has 3,000 open jobs across a very broad spectrum of careers, from nursing and allied health professionals to information technology, communications, human resources and finance positions. As part of an overarching commitment to be a premier employer in the region and its operating areas, UPMC has developed innovative strategies for entry-level pathways for all talent, and to attract top talent from across the country.

The three pillars of its elevation strategy are: 1) engaging a diverse talent pipeline; 2) providing opportunities to enter the company at all levels, with opportunities for upward mobility; 3) creating leadership programs that grow talent in-house.

"UPMC benefits from having access to a great pool of applicants. The ability to come through the UPMC framework to train and grow and connect with leadership, provides people with a support system that makes them want to stay. That said, we have to have strategies to bring talent to the region and that has to be a partnership. We can't do that by ourselves; we have to do that with community groups, employers and others in the region to elevate, retain and attract a stronger workforce," said John Galley, senior vice president and chief HR officer.

Opportunity for access into the company – from entry-level to upper management positions – is also a core value for the organization. UPMC provides entry-level positions for job seekers with a high school diploma and the ability to upskill and grow within the company. UPMC invests in the Pittsburgh Public Schools through a $100M commitment to The Pittsburgh Promise, a scholarship fund in support of improved access to post-secondary education for local students. In addition, it started Project SEARCH, in partnership with Goodwill SWPA, a one-year training and education immersion program to help children with mental and developmental disabilities gain work skills and work with coaches to train for entry-level positions within the company.

College talent and internship programs are also a major focus for building an internal pipeline, as well as training future leaders. The competitive Finance Management Rotation program and other similar programs in IT, Finance, and Marketing/Communications receives applications from thousands across the country for 50 to 60 annual openings. The program exposes new hires to various areas of the company and provides ongoing performance evaluations, mentor and professional coaching opportunities, plus an accelerated pathway to leadership positions for high performers.

Engaging a diverse workforce is important not only for diversity of thought within the organization, but also so that leaders and staff reflect the communities that are served by UPMC, including patients. Recognizing that talent and ability are not limited, but enhanced by the diversity and cultural experience that employees bring to the workplace, UPMC's diversity strategies are aimed at all levels of the organization from executive management to management, to professional level roles, entry level roles and career pathways.

"We have initiatives to bring talent to UPMC from across the country, keeping in mind that we believe we make better decisions when we have diverse viewpoints at the table," Galley explained. "With a tighter labor market, recruiting in new spaces and reaching new talent are essential, and UPMC has the advantage of being located in a city that has a wealth of amenities from arts, culture and sports to affordable housing and access to world-class educational institutions and research."

Carlow University

School Description: Founded by the Sisters of Mercy, Carlow is a private, liberal arts university located in the Oakland neighborhood of Pittsburgh that offers transformational educational opportunities for a diverse community of learners and empowers them to excel in their chosen work as compassionate, responsible leaders.

Hub for Community Workforce Development and Innovation

During the past decade, employers have expressed concern that new employees, many of them recent college graduates, lack the soft skills required to operate successfully in the workplace. These baseline skills include competencies such as effective communications, teamwork, critical thinking and an awareness of how the modern workplace operates. This skills deficiency limits a new hire's ability to contribute their full potential, and also raises the important question of where responsibility for developing these skills lies. Carlow recognized the need to more intentionally embed these skills in their curriculum, and to do so on a larger scale.

Carlow established *The Carlow Hub for Workforce Development and Innovation* to provide training for high-demand skills identified in the Inflection Point report. The intended audiences are college students, business professionals and community members. Programming is designed to impact three tiers of the community: 1) Elevate un- and under-employed community members to help them gain baseline skills to access in-demand jobs that provide family sustaining wages and upward mobility through partnerships with employers and community partners; 2) Promote professional advancement courses focused largely on in-demand technology and data analytics skills that can be taken independently or bundled into a MicroMasters degree; 3) Provide training for professional competencies (soft skills) including interpersonal communication, problem solving, agility, and resilience, among others, that the region has identified as in-demand and lacking.

The vision for the Hub is to assist in strengthening and reshaping an evolving economy in the greater Pittsburgh region and respond to clear workforce needs through industry and community partnerships.

Robert Morris University

School Description: Robert Morris University is a private, suburban Pittsburgh university that focuses on providing opportunities for experiential learning, professional internships and networking opportunities, service learning and global study, as well as campus leadership and a wide array of extracurricular activities to students.

Strategic Curriculum Development and Corporate Partnerships

As a small, private institution, Robert Morris University (RMU) is taking an interdisciplinary approach to curriculum development, specifically integrating information technology and data analytics courses across the university. As the first (and only) member of Amazon Web Services' AWS Academy program in the state of Pennsylvania, RMU is able to teach cloud computing architecture to students across disciplines and prepare them for certification in AWS technology. RMU has cross-disciplinary undergraduate and graduate degrees in cybersecurity. Students often collaborate with their peers from the criminal justice program who are currently working to develop a virtual crime lab to help law enforcement and corporate IT workers fight hacking and other forms of cyber-crime. RMU recently formed

the Center for Cyber Research and Training to foster collaboration among disciplines and provide education and training to IT professionals throughout the region.

In addition to supporting collaboration among students, RMU collaborates with corporate partners to meet regional employer need. In 2017, RMU announced a partnership with Koppers Holding Inc. that will provide a customized program for corporate leadership development and executive education. Koppers sought to boost their internal leadership pipeline, as well as provide RMU students with mentoring and leadership development aligned with the business goals of a global manufacturer. The mutually beneficial relationship aims to prepare current employees for leadership roles and to address the skills gap by upskilling students who will soon be entering the workforce.

See how Pitt prepares students for in-demand soft skills and engages employers.

University of Pittsburgh

School Description: The University of Pittsburgh is a leading research university with campuses throughout Western Pennsylvania. Pitt faculty, staff, and students have led the way in achieving various breakthroughs including the polio vaccination, DNA research, organ transplantation, pioneering TV and heavier-than-air flight, among its many accomplishments.

Engaging the Corporate Community and Preparing the Workforce of the Future
As one of the highest ranked and most well-funded research institutions in the country, the University of Pittsburgh (Pitt) thrives on strong relationships with the business community that are mutually beneficial.

Pitt launched the Office of Corporate Engagement in the spring of 2017, having identified the need to engage companies more effectively so that the University's educational and research capabilities were more effectively leveraged. Employer Advisory Boards, consisting of corporate industry experts, provide feedback regarding recruiting trends and best practices for career services, as well as faculty engagement regarding curriculum and development, research collaboration, and consulting services.

The Panther Shadow program is a job shadow experience designed to provide groups of students with exposure to, and knowledge of, a company or organization. Students connect to employers in the region through on-site visits and gain an inside look at career options for undergraduate talent. Working with the Allegheny Conference, Pitt and other universities have participated in student tours in high-demand majors such as computer science, engineering, and business, to highlight what Pittsburgh has to offer. These tours provide students with access to local companies and hiring managers, and an opportunity to explore quality of life assets such as outdoor recreation, and leadership opportunities. They also assist career services staff in understanding how to better "sell" the region.

In addition to world-class academic programs, Pitt also focuses on preparing the region's workforce for employment through its Outside the Classroom Curriculum (OCC) program. The OCC is a University-wide initiative designed to help students receive a well-rounded education that develops leadership and communication skills, sense of self, and global and cultural awareness, in addition to other necessary soft skills, many of which were identified by employers as critical and in high demand in Inflection Point. There is positive return on investment for students, employers, and the University, as employers recognize the OCC brand and the high-caliber students who complete the program. OCC graduates are eligible for financial aid to encourage participation in experiential learning opportunities such as study abroad, internships, and service projects, and Pitt has received national recognition for its contributions to providing workforce training beyond the classroom.

Regional Tours to Retain College Students

Program Description: Regional bus tours with students from high-demand occupations to showcase employment opportunities and quality of life assets in the Pittsburgh region.
Retaining Critical Talent for High-Demand Occupations

Over 40,000 students graduate from 61 higher education institutions in our region each year, but 50% of them leave for other regions. The number one reason students leave? They can't find a job. Based on student surveys, this is a combination of a lack of understanding of the employment and quality of life opportunities in the region, and an inflation of job posting requirements (e.g. years of experience and elevated degrees) that leave many candidates out of the running for entry-level positions.

With input from CEOs and HR directors, educators and student focus groups, the Allegheny Conference built a strategy to retain more students through direct outreach to college presidents, career services professionals, students and employers. Part of this strategy focuses on engaging students in regional tours to educate them about regional employment opportunities and quality of life assets, while enhancing the knowledge and capacity of career services departments to sell the region to students, as well.

In 2016-2017, the Allegheny Conference hosted five tours with over 100 students and faculty from Carlow University, Carnegie Mellon University, Chatham University, Duquesne University, Point Park University, and the University of Pittsburgh, to showcase the breadth of opportunity for employment in high demand sectors like IT and Computer Science, Healthcare, Business and Finance and Engineering. Employer participants focused on a variety of company sizes and industries to highlight the region's assets and included: AlphaLab Gear, BNY Mellon, Carmeuse Lime and Stone, Deeplocal, Duquesne Light Company, Federated Investors, Google, Huth Technologies, PNC iLab and Tower, Truefit, UPMC Center for

Connected Medicine, UPMC Health Plan, and Uber. Additional participants to showcase regional quality of life opportunities and assets included The Andy Warhol Museum, NEXTpittsburgh, Venture Outdoors, VisitPittsburgh, and various "Neighbors" from the Imagine-Pittsburgh.com site.

Feedback from employer and student participants alike was overwhelmingly positive. Employers felt they had access to high performing students and the opportunity to showcase their companies and the innovative programs and opportunities they have available. Student surveys from pre- and post-tour indicated that 100% of students felt they had a better understanding of employment opportunities after the tour and 89% said they are now more likely to stay in the Pittsburgh region after graduation.

Pre-Tour Student Survey	Post-Tour Student Survey
66% said they 'sometimes' or 'rarely' leave campus to explore the city	80% said their impression of Pittsburgh somewhat or greatly changed
63% felt they had a good understanding of job opportunities in the region	100% felt they had a better understanding of employment opportunities
60% said they love Pittsburgh and plan to stay after graduation	94% said they are now more likely to stay in Pittsburgh after graduation

If your organization is making changes in response to *Inflection Point* we'd like to hear from you. Please send us a note at **workforce@alleghenyconference.org**

END NOTES

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